STATE WATER RESOURCES CONTROL BOARD

PUBLIC HEARING

CALIFORNIA DEPARTMENT OF FISH AND GAME'S LOWER YUBA RIVER FISHERIES MANAGEMENT PLAN AND A COMPLAINT BY THE UNITED GROUP AGAINST YUBA COUNTY WATER AGENCY AND OTHER DIVERTERS OF WATER FROM THE LOWER YUBA RIVER IN YUBA COUNTY

TUESDAY, MAY 16, 2000

PAUL R. BONDERSON BUILDING

SACRAMENTO, CALIFORNIA

9:00 A.M.

Reported by: MARY R. GALLAGHER, CSR #10749

A P P E A R A N C E S

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HEARING OFFICER:

JOHN BROWN

BOARD MEMBER:

ARTHUR BAGGETT

COUNSEL:

DANIEL N. FRINK, ESQ.

STAFF:

ALICE LOW - ENVIRONMENTAL SPECIALIST
ERNEST MONA - ENGINEER

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REPRESENTATIVES

---oOo---

YUBA COUNTY WATER AGENCY:

BARTKIEWICS, KRONICK & SHANAHAN
1011 Twenty-Second Street
Sacramento, California 95816
BY: ALAN B. LILLY, ESQ.

BROWNS VALLEY IRRIGATION DISTRICT:

BARTKIEWICS, KRONICK & SHANAHAN
1011 Twenty-Second Street
Sacramento, California 95816
BY: RYAN BEZERRA, ESQ.

SOUTH YUBA WATER DISTRICT &
CORDUA IRRIGATION DISTRICT:

MINASIAN, SPRUANCE, BABER, MEITH, SIARRES & SEXTON
1681 Bird Street
Oroville, California 95965
BY: PAUL R. MINASIAN, ESQ.

CALIFORNIA DEPARTMENT OF WATER RESOURCES:

DAVID A. SANDINO, ESQ.
1416 Ninth Street, Room 1138-2
Sacramento, California 95814

SOUTH YUBA RIVER CITIZENS LEAGUE:

LAWRENCE D. SANDERS, ESQ.
216 Main Street
Nevada City, California 95959

CALIFORNIA SPORTFISHING PROTECTION ALLIANCE:

ROBERT J. BAIOCCHI
P.O. Box 1790
Graegle, California 96103

---oOo---

REPRESENTATIVES

---oOo---

BROPHY WATER DISTRICT:

DANIEL F. GALLERY, ESQ.
929 J Street, Suite 505
Sacramento, California 95814

WESTERN WATER COMPANY & WESTERN AGGREGATES, INC.:

KRONICK, MOSKOVITZ, TIEDEMANN & GIRARD
400 Capitol Mall, 27th Floor
Sacramento, California 95814
BY: SCOTT A. MORRIS, ESQ.

NATIONAL MARINE FISHERIES SERVICE:

STEVEN A. EDMONDSON
777 Sonoma Aveneue, Room 325
Sant Rosa, California 95404

CALIFORNIA DEPARTMENT OF FISH & GAME:

OFFICE OF THE ATTORNEY GENERAL
1301 I Street, Suite 1101
Sacramento, California 95814
BY: WILLIAM D. CUNNINGHAM, ESQ.

UNITED STATES DEPARTMENT OF THE INTERIOR:

REGIONAL SOLICITOR'S OFFICE
2800 Cottage Way, E-1712
Sacramento, California 95825
BY: EDMUND GEE, ESQ.

WALTER COOK:

WALTER COOK
42 Northwood Commons
Chico, California 95973

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TUESDAY, MAY 16, 2000, 9:00 A.M.

SACRAMENTO, CALIFORNIA

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H.O. BROWN: Good morning. This is the continuation of the Supplemental Water Right Hearing regarding the Lower Yuba River. We're in rebuttal of Yuba County Water Agency, the cross, thereof.

And I believe next up is Mr. Sanders.

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY SOUTH YUBA RIVER CITIZEN'S LEAGUE

BY MR. SANDERS

MR. SANDERS: Good morning, Mr. Brown. Good morning, gentlemen.

THE PANEL: Good morning.

MR. SANDERS: I think I'm going to start with Mr. Mitchell. Let's start with Figure 7, I'm not sure what the exhibit number on that figure was.

MR. FRINK: Is it Exhibit 103 of Yuba County Water Agency?

MR. SANDERS: Yes. That's correct, exhibit 103. I have just a couple of questions on that. First of all, are you talking about fry-size fish in this data?

MR. MITCHELL: No. These are large juveniles.

MR. SANDERS: Okay. Do the really small fish -- I'd

like to be very specific, under 65-millimeter fish, migrate at the same time that the smolts do?

MR. MITCHELL: Well, under 65, actually, includes fish that are leaving as smolt size.

MR. SANDERS: Okay. Okay. So then how about the really small fish, the fry size, do they migrate at the same time?

MR. MITCHELL: The majority of fry do not.

MR. SANDERS: When do they then?

MR. MITCHELL: Chinook salmon fry fall-run migrate primarily in January, February, and March.

MR. SANDERS: And they're not reflected in this data. What about steelhead?

MR. MITCHELL: Steelhead, we don't have specific data on steelhead migration in the Lower Yuba. However, the general life history pattern for Central Valley steelhead is the smolts leaving primarily during the early spring to late spring.

MR. SANDERS: Okay. I'm going to move on to Exhibit 43. Now, you corrected the analysis to reflect the different data collection methodology; is that correct?

MR. MITCHELL: Yes.

MR. SANDERS: And the corrected graph indicates the increase in population but smaller than what you had previously -- the graph that you had previously shown?

MR. MITCHELL: Yes --

MR. LILLY: Objection. I object that the word "correction" misstates the prior testimony. The prior testimony was that he adjusted the numbers so that they could be consistent with the DFG's methodology. In fact, the earlier numbers were a more accurate methodology.

So I think it would be more proper if Mr. Sanders would use a term like "change" or "adjusted" rather than "corrected," because "corrected" implies there was an error before when there was not.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Sanders.

MR. SANDERS: Well, I'm not a scientist, but I think I'm using the term in a more technical sense of correcting -- that it is corrected for data, different sorts of data methodology. But if Mr. Lilly has an objection I will try not to use the term "corrected."

So where were we? Okay. So the new graph indicates an increase in population but smaller than the previous graph; is that correct?

MR. MITCHELL: The averages are different depending on the method -- or are slightly different depending on the method that's used.

MR. SANDERS: Okay. I see. I see. So when you -- if you consistently followed the DFG methodology you come

up with a somewhat smaller average; is that correct?

MR. MITCHELL: That's correct.

MR. SANDERS: Okay. And this graph is a depiction of pre-Bullards Bar versus post-Bullards Bar. Is this escapement data, or is it more general fish population data?

MR. MITCHELL: These are spawning escapement estimates.

MR. SANDERS: Spawning escapement estimates, okay. And using the DFG methodology we show an increase of about 1500 fish on average per year, increased -- yeah, during -- hold on. Let me rephrase that.

During the two periods being compared there is an apparent increase of 1500 fish; is that correct?

MR. MITCHELL: I'm sorry. I am not clear on the question.

MR. SANDERS: Okay. From -- we're looking at the average of two periods, pre-Bullards Bar and post-Bullards Bar; is that correct?

MR. MITCHELL: That's correct.

MR. SANDERS: And the average has increased by approximately 1500 fish?

MR. MITCHELL: Approximately.

MR. SANDERS: Okay.

MR. MITCHELL: Yes.

MR. SANDERS: Okay. I have an exhibit here, an article that I'm going to hand you. And I have copies for everyone. I have got this marked as S-SYRCL-14.

MR. FRINK: Excuse me, Mr. Sanders. Mr. Mona advises me that I believe we already have an exhibit by that number. If it were to be next in order, Mr. Mona, what would it be?

MR. MORA: It would be Number 20.

MR. SANDERS: Number 20. I'm sorry. I must have messed something up there. All right. Let's renumber this 20. Okay. And this is entitled, "Chinook Salmon in the California Central Valley: An Assessment."

And it was published in the journal, "Fisheries." The authors are Yoshiyama, Gerstung, Fisher, and Moyle. And it was published in February of 2000, I believe.

Are you familiar with this article?

MR. MITCHELL: I'm trying to remember whether I had read this, or a similar article by these authors and I can't recall at this moment.

MR. SANDERS: Okay. You are familiar with these authors though; is that correct?

MR. MITCHELL: Yes.

MR. SANDERS: And are they generally respected in the field?

MR. MITCHELL: Yes.

MR. SANDERS: Okay. I'm going to ask you to go to Page 11, Figure 2 -- Table 2. And now you see on the top of this table it says,

(Reading):

"Estimates for average spawning escapements of fall-run chinook."

Is that correct?

MR. MITCHELL: Yes.

MR. SANDERS: Okay. And then underlined there's Yuba River -- before we talk about Yuba River, you see where there's -- it says "period." And there's several different years that they have down there?

MR. MITCHELL: Yes.

MR. SANDERS: Okay. None of those corresponds exactly to the same time period that you're talking about with your Exhibit 43; is that correct?

MR. MITCHELL: No, they don't.

MR. SANDERS: Okay. So now we're going to go to the Yuba River. And you see where it says 1953 to '66 the estimate, the average is 14,000 fish?

MR. MITCHELL: Yes.

MR. SANDERS: Okay. Now, that was -- '53 to '66 was all pre-New Bullards Bar; is that correct?

MR. MITCHELL: That's correct.

MR. SANDERS: Okay. And then you see '92 to '97?

MR. MITCHELL: Yes.

MR. SANDERS: And the estimate is 11,000 fish?

MR. MITCHELL: Yes.

MR. SANDERS: And that's post-Bullards Bar?

MR. MITCHELL: That's correct.

MR. SANDERS: So based on the averages in this table have the escapement numbers actually gone down since -- from the prior period to the latter period?

MR. MITCHELL: I'm looking over the numbers here and they don't -- I haven't averaged the numbers that we have, but there could be some differences in the estimates that were used.

MR. SANDERS: Okay, that's fine. But my question is: The actual number from the former period to the latter period they went down -- it went down?

MR. MITCHELL: According to these data -- again, I haven't reviewed this article or looked at where these estimates came from -- these do indicate somewhat of a decline.

MR. SANDERS: Okay. Now, let's go to the following page. And now you see Table 3?

MR. MITCHELL: Yes.

MR. SANDERS: And now you see how it's entitled, "Results from statistical tests to detect differences between two time periods for average spawning escapement"?

MR. MITCHELL: Yes.

MR. SANDERS: Okay. Now I'm going to go to the Yuba River again. Now, they're comparing there the 1953 to '66 period versus '67 through '91; is that correct?

MR. MITCHELL: Yes, that's correct.

MR. SANDERS: Okay. And, again, neither of those are correlated precisely to pre-Bullards and post-Bullards Bar?

MR. MITCHELL: That's correct.

MR. SANDERS: Okay. Now, with that said, you see how the following column it says, "Comparisons of Escapements." And under the column called "averages" it says "NS." Do you see that?

MR. MITCHELL: Yes, I do.

MR. SANDERS: Okay. And then do you see the first footnote at the bottom, it says "NS" denotes nonsignificant outcomes?

MR. MITCHELL: Yes.

MR. SANDERS: Okay. So they -- comparing these two sets of data, these authors find that there is nonsignificant difference; is that correct? I know you haven't read the article, but just based on your sitting right here and looking --

MR. MITCHELL: Looking at this table, yes.

MR. SANDERS: Okay. Now, can we look at this

footnote again, it says, "Based on a T-test for equality of means." Do you know what that is?

MR. MITCHELL: Yes.

MR. SANDERS: Did you -- can you do that sort of a statistical analysis on your data for YCWA-43?

MR. MITCHELL: No.

MR. SANDERS: Okay. "And a F-test for equality of variances." Do you know what that is?

MR. MITCHELL: Yes.

MR. SANDERS: And, likewise, have you done that sort of analysis on the pre- and post-Bullards Bar data?

MR. MITCHELL: No.

MR. SANDERS: Okay. "P values are given for significant outcomes." Do you understand what they mean by "P" in that?

MR. MITCHELL: Yes.

MR. SANDERS: And once again, have you done that sort of statistical analysis on your data for Bullards Bar, pre- and post-Bullards Bar?

MR. MITCHELL: No.

MR. SANDERS: So basically, you just compared the averages? That's what YCWA-43 does --

MR. MITCHELL: Yes.

MR. SANDERS: -- it compares the averages? And based on that comparison, you testified that your

conclusion is Bullards Bar has, in fact, increased the fishery -- the escapement numbers; is that correct?

MR. MITCHELL: I said that the numbers have increased in recent years above the post- -- or pre-New Bullards Bar average. And my testimony regarding the entire pre-New Bullards Bar period -- or post-New Bullards Bar period was that the numbers were sustained on average and increased in recent years.

MR. SANDERS: Okay. But you didn't do any kind of statistical analysis to verify that conclusion of increased numbers?

MR. MITCHELL: No.

MR. SANDERS: And you didn't do a linear regression analysis on the data like Mr. Nelson did; is that correct?

MR. MITCHELL: That's correct.

MR. SANDERS: Okay. Okay. We'll move on. Are reduced growth rates in themselves always adverse?

MR. MITCHELL: No.

MR. SANDERS: Okay. Do you recall -- I know this was a couple weeks now -- but Mr. Lilly asked you if maintaining the temperature at 60 degrees would result in adverse effects. Do you remember that?

MR. MITCHELL: Yes.

MR. SANDERS: And you answered "yes" and indicated that growth rates would be reduced. Do you remember that?

MR. MITCHELL: Yes.

MR. SANDERS: So are you testifying that food conversion efficiency would be reduced at 60 degrees or just growth rates?

MR. LILLY: Wait. Objection. When he says, "Reduced at 60 degrees," the question is vague, because there's no baseline from which the 60 degrees is compared. We don't know whether he's talking about a temperature increase or a temperature decrease.

H.O. BROWN: Okay. Mr. Sanders.

MR. SANDERS: Well, I'm a little confused, because I wrote this question down as Mr. Lilly was cross-examining his witness on direct. And he just indicated that he remembers Mr. Lilly asking him if maintaining the Marysville temperature at 60 degrees would result in an adverse effect. And he remembers indicating that his answer was, yes, and that the growth rates would be reduced.

So --

H.O. BROWN: I agree with Mr. Sanders. I understand the question. If you understand it, go ahead and answer it. If you don't, you may ask for a clarification.

MR. MITCHELL: The clarification I do need is the comparison with what temperature.

MR. SANDERS: Well, it's difficult. "Reduced from

what," I understand. Well, let's go back to what you meant when you testified.

Mr. Lilly asked you if maintaining the Marysville temperature at 60 degrees would result in adverse effects, let me ask you that. Maintaining the temperature at 60 degrees, would it result in an adverse effect to the fish?

MR. LILLY: I'm still going to state the same objection. There's still no baseline from which the comparison is being made so the question is ambiguous.

H.O. BROWN: I understand. Evidently Mr. Lilly got away with that without anybody --

MR. SANDERS: I understand that. That's okay. In that case --

MR. LILLY: Excuse me, Mr. Brown, with deference, I'm going to object to that characterization of the prior testimony. I know you're trying to inject a little humor into the process, but I'm going to object to any characterization that any of my questions were improper. I don't think that's appropriate to say that.

MR. SANDERS: Right. I --

H.O. BROWN: Wait a minute.

MR. SANDERS: Sorry.

H.O. BROWN: That's enough of that. Mr. Lilly, you know that's not what I meant. And that's not what I meant. When Mr. Lilly asked the question, nobody

questioned him about what his data line was. That was the meaning of the question, or the statement prior.

Now, if you have a data line from which you wish to make reference to, go ahead, Mr. Sanders, and so mention it. If not, let's proceed.

MR. SANDERS: Right. Thank you, Mr. Brown. I'm just going to move on. And that's it.

Mr. Bratovich, you testified that the DFG recommended temperatures do not reflect history temperatures as indicated in S-YCWA-41; is that correct?

MR. BRATOVICH: I don't recollect my specific testimony, but I'll take your word for it, Mr. Sanders.

MR. SANDERS: Okay. Well, once again how about I just ask you: Do you believe that the DFG recommended temperatures do not reflect the historic temperatures?

MR. BRATOVICH: I'm looking at S-YCWA-41 and I can see that for the distribution of temperatures, averages and variances associated with those averages at both Daguerre Point Dam on Page 1 and at Marysville on Page 2, and as I recollect the recommended temperatures above Daguerre Point Dam are 56 degrees year-round, examining Page 1 of S-YCWA-41; and looking at the average of historic monthly temperatures estimated for Daguerre Point Dam, I can see that these averages exceed 56 degrees during what appears to be June, July, August, and

September clearly.

MR. SANDERS: Okay.

MR. BRATOVICH: And possibly slightly in October.

MR. SANDERS: All right. And YCWA-41 refers to historic temperature in the Lower Yuba River; is that correct?

MR. BRATOVICH: It refers to both historic temperature and simulated temperature with -- let's see here. I should defer to Mr. Grinnell specifically.

MR. SANDERS: Well, okay. That's all right. You've answered the question enough.

MR. BRATOVICH: Okay.

MR. SANDERS: And by "historic" the exhibit refers to the years 1989 through '99; is that correct?

MR. BRATOVICH: For the characterization of historic, that's correct.

MR. SANDERS: So "historic" does not refer to the time before the dams were built?

MR. BRATOVICH: In this exhibit it does not.

MR. SANDERS: Okay. And before the dams were built, spring-run chinook did not spend the summer or spawn in the Lower Yuba River; is that correct?

MR. LILLY: Objection. I'm sorry if I'm being difficult, but precision is important here. And the phrase, "Before the dams were built," is ambiguous as to

whether he means before New Bullards Bar was built in the mid 1960's, or before Englebright Dam was built in approximately 1941. And I think it would help --

MR. SANDERS: Okay.

MR. LILLY: -- to make the question clear if he would talk about which of those periods he's referring to.

H.O. BROWN: All right, Mr. Sanders.

MR. SANDERS: I'll happily comply.

Before Englebright Dam was built did spring-run chinook salmon ascend to higher elevations, or did they spend the summer in the Lower Yuba River?

MR. BRATOVICH: My understanding based upon testimony presented at this hearing as well as the article you brought forward today entitled Exhibit SYRCL-20, as I recall that spring-run did ascend into the upper watersheds of the Yuba River in conformance with what would be classified as a stream-type anadromous salmonid.

MR. SANDERS: Okay. So historically -- and when I use "historically" I'm not talking about 1989 through 1999, but I'm talking about prior to Englebright. Historically several spring-run chinook life stages were spent in the upper reaches of the watershed. Is that your understanding?

MR. BRATOVICH: Prior to the construction of Englebright Dam, that is my understanding.

MR. SANDERS: So is it fair to say that spring-run chinook have adapted to the water temperatures that would typically occur in the upper reaches of the watershed?

MR. BRATOVICH: I'm not sure it would be fair to say that. May I provide some clarification?

MR. SANDERS: Please, do.

MR. BRATOVICH: Historically, they evolved presumably to conditions that occurred in the upper watershed. The degree to which they have adapted to conditions in the several generations that have occurred since 1941 is uncertain --

MR. SANDERS: Okay.

MR. BRATOVICH: -- to that restricted Lower Yuba River as it exists today.

MR. SANDERS: Okay. So that you're saying that the fish we have today are not exactly the same fish, perhaps, that we had in 1930?

MR. BRATOVICH: I'm saying it's uncertain.

MR. SANDERS: Okay.

MR. BRATOVICH: They may have had some time to exhibit some adaptation to these conditions, but that is somewhat speculative.

MR. SANDERS: Okay. And do you have any temperature evidence -- leaving aside the adaptation to the conditions, leave that aside for a moment -- do you have

any temperature data on what temperatures the spring-run chinook encountered historically in the upper reaches of the Yuba River?

MR. BRATOVICH: I do not.

MR. SANDERS: Okay. You testified that the Yuba County Water Agency's recommended flows will contribute to the continued recovery of spring-run chinook salmon. Is that correct?

MR. LILLY: Excuse me, Mr. Brown, I'm going to object now that this is going back to the testimony that was given during the initial stage of the hearing. And it's going beyond the scope of the rebuttal testimony.

I believe Mr. Bratovich's rebuttal testimony was limited to temperatures rather than the flows, which this question is addressed to.

H.O. BROWN: Mr. Frink, was that included in the rebuttal?

MR. FRINK: I don't actually recall the scope of Mr. Bratovich's rebuttal. If, in fact, it was beyond the scope of what he talked about on rebuttal, the question would not be proper unless it is necessary to lay the foundation for a question which does address what Mr. Bratovich talked about on rebuttal.

So I guess if Mr. Sanders could explain where he's going it might help.

MR. SANDERS: Well, I wrote these questions down while Mr. Bratovich was testifying. So something kind of made me -- you know, it's hard to recall what happened a couple weeks ago and every word that was said, but something made me write it down in response to --

H.O. BROWN: All right. Ask the question again, Mr. Sanders.

MR. SANDERS: Well, actually, I willing to defer to Mr. Lilly and drop this line of questioning entirely. I'm just in a good mood, I guess.

Just a couple more questions. Mr. Mitchell, you testified about steelhead trout abundance on the Lower Yuba; is that correct?

MR. LILLY: Again, I'm going to state the same objection. I believe that was in the original testimony rather than in the rebuttal. I know he had extensive graphs and figures regarding the sampling of steelhead that he testified on in the original hearing, but I don't recall specific testimony on abundances of steelhead during the rebuttal.

H.O. BROWN: All right. Thank you, Mr. Lilly.

Did you write those notes down from the --

MR. SANDERS: As a matter of fact, I did.

H.O. BROWN: -- rebuttal?

MR. SANDERS: So this time I would really like to

move time to continue a little bit.

H.O. BROWN: I'll allow the question. Go ahead and answer.

MR. MITCHELL: Actually, I don't recall testifying to an abundance of steelhead in my rebuttal.

MR. SANDERS: Okay. Did you testify in rebuttal that all of the steelhead spawning you observed occurred above Daguerre Point Dam?

MR. MITCHELL: Yes. This was based on our observations this winter and spring.

MR. SANDERS: And is there suitable habitat for steelhead below Daguerre Point Dam?

MR. MITCHELL: That's difficult to say.

MR. SANDERS: Okay. So can you speculate on why steelhead don't utilize habitat below Daguerre?

MR. MITCHELL: I can speculate.

MR. SANDERS: Can you briefly speculate, or should we just move on?

MR. MITCHELL: We've been asking ourselves these questions, particularly in light of these new observations. And there are a number of hypotheses, one of which is that steelhead are migrating in a manner that is a distinct one, and that is they are migrating higher into the watershed than other species. And, therefore, they would be more likely to ascend to the upper

elevations of the watershed.

MR. SANDERS: Okay.

MR. MITCHELL: There's other explanations that could relate to habitat quality in the river. Again, that would be difficult to say without assessing the quality of the habitat relative to the steelheads' needs.

MR. SANDERS: Okay. And you testified that you witnessed people catching spawning steelhead; is that correct?

MR. MITCHELL: Steelhead/rainbow trout, yes.

MR. SANDERS: Right. Okay. And I believe on cross-examination you said you specifically witnessed somebody with a male fish; is that correct?

MR. MITCHELL: That's correct.

MR. SANDERS: Do you know if that was a wild or a hatchery fish?

MR. MITCHELL: Based on the assumption that all hatchery fish are adipose clip, this one did not have an adipose clip. And, therefore, based on the assumption you would assume that it was wild.

MR. SANDERS: Okay. Thank you very much.

Mr. Brown, let me just take a quick look and see if I have anything else. Yeah, I have two or three questions for Mr. Grinnell.

Let's see, are you aware of any operational or

structural modifications of the Yuba River Project that could lower temperatures?

MR. GRINNELL: Yes, I am.

MR. SANDERS: Okay.

MR. GRINNELL: Potentially lower them.

MR. SANDERS: Right. Now, leaving aside the new inflow device for Englebright, because we've already testified to that, or heard a lot about it, is there anything else that could be done to lower temperatures?

MR. GRINNELL: Structural modifications only?

MR. SANDERS: Yeah, let's go structural.

MR. GRINNELL: Well, it depends on what -- adjust the Yuba River Development Project, there's already a low-level outlet for New Bullards Bar so that's -- or used. So excluding Englebright, I don't believe so.

MR. SANDERS: Okay. Are you aware of any warm water discharges into the Lower Yuba River?

MR. GRINNELL: Warm water --

MR. SANDERS: Would you like me to be a little more specific?

MR. GRINNELL: Yeah.

MR. SANDERS: All right. During the summer and fall, it's limited to that time period, are you aware of warm water discharges into the Yuba River from the Yuba Goldfields?

MR. GRINNELL: Summer and fall, no, I don't have specific knowledge of the water temperature coming out of the Goldfields --

MR. SANDERS: Okay.

MR. GRINNELL: -- in the summer and fall. It varies.

MR. SANDERS: Okay. Were you here when -- let me scratch that. I'll move on.

Back in the 1992 Hearings, Yuba County Water Agency presented testimony that Lake Wildwood released warm water every fall and that such releases made it difficult to achieve the temperature requirements.

Are you aware of that testimony?

MR. GRINNELL: Yes, I am aware of that testimony.

MR. SANDERS: Okay. Did you consider the Lake Wildwood warm water contribution in your modeling?

MR. GRINNELL: Well, we did a regression analysis. We used -- the basis of that analysis was the historic temperatures. And so to the extent that warm water was being released from Lake Wildwood, that would be included in the recorded data and, therefore, it would be included in the analysis.

MR. SANDERS: Okay. Now, in your opinion, does the release of warm water from Lake Wildwood make it difficult or impossible for Yuba County Water Agency to achieve the

temperature goals?

MR. LILLY: Objection. It's not clear when he says, "the temperature goals," which ones he means.

MR. SANDERS: Okay.

MR. LILLY: He needs to make that clearer.

H.O. BROWN: Mr. Sanders.

MR. SANDERS: Okay. You testified that it's not feasible to meet the temperature requirements in the DFG's recommended temperature requirements; is that correct?

MR. GRINNELL: At certain times, yes.

MR. SANDERS: And you presented on rebuttal exhibits about your monthly model. Is that generally correct?

MR. GRINNELL: Yes.

MR. SANDERS: Okay. So does Lake Wildwood's release of warm water make it more difficult to achieve the temperature goals that DFG recommends?

MR. GRINNELL: Actually, I don't know. It is my understanding that there has been greater cooperation with the releases of Lake Wildwood in recent past. So, certainly, any water -- I can generalize and say that any warmer water that contributes to the elevated temperatures of the river are going to make it more difficult to meet the temperature requirements. However, the amounts of warmer water play into that.

I'm not aware of the specific flow rates out of

Lake Wildwood. And, certainly, it varies depending on time frame. We certainly have some of that information in our analysis, but --

MR. SANDERS: Okay.

MR. GRINNELL: -- I don't believe that's the driver.

MR. SANDERS: Okay. Thank you very much. Thank you, all.

H.O. BROWN: Thank you, Mr. Sanders.

Do you have any cross-examination?

MR. COOK: I have just a couple of questions.

H.O. BROWN: Okay.

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY MR. COOK

MR. COOK: Mr. Bratovich, you have testified here today about the historic runs of salmon in the Lower Yuba. And I'm wondering the extent of your review of the history of salmon runs in the Lower Yuba. Would you explain that?

MR. BRATOVICH: Mr. Cook, I'm not -- I don't recollect testifying to the historic runs in the Lower Yuba.

MR. COOK: Didn't you testify on cross-examination here a short time ago, that the temperatures -- the temperature relationship to spring-run salmon was impacted by Englebright Dam, and that prior to Englebright the

temperatures were lower, or the fish were greater in number?

Did you go into that? I thought I heard you.

MR. BRATOVICH: I didn't. I didn't. To the best of my recollection, I did not testify regarding the numbers of fish. Mr. Mitchell did testify regarding the numbers of fish.

MR. COOK: Yeah. I thought you went into something on the history. Was that limited to temperature?

MR. BRATOVICH: I was -- to the best of my recollection, Mr. Cook, I was asked if it was my understanding that prior to the construction of Englebright Dam, did spring-run migrate into the upper headwaters to fulfill various of their life cycles? And I answered, yes, that was my understanding.

And the other question I was asked was -- I don't quite recollect specifically the other question -- oh, I believe I was asked if I knew what the temperatures were in these headwater areas and I testified that I did not.

MR. COOK: I recall that. You did, however, testify about the salmon spending the summer in the upper reaches of the Yuba before Englebright Dam. And that at that time they did not, as a rule, stay in the Lower Yuba River. Did you do that?

MR. BRATOVICH: I don't recall specifically

mentioning the summer, but I'd be willing to do that now if you wish.

MR. COOK: Yes.

MR. BRATOVICH: I would say, yes, it's my understanding that spring-run would have migrated upstream into the headwater areas during the spring and held over during the summer, if that's what you're asking.

MR. COOK: That's true. And in your review then of the impact of Englebright Dam, have you reviewed the impact of Daguerre Point Dam?

MR. BRATOVICH: Regarding the potential affects of migration, I have not.

MR. COOK: All right. Have you considered, or studied the impact of Daguerre Point Dam on the temperatures in the Lower Yuba River?

MR. BRATOVICH: I have. We have reviewed the resultant temperature model output at Marysville and at a location referred to in Mr. Grinnell's testimony as above or at Daguerre Point Dam, yes.

MR. COOK: Have you reviewed any temperatures prior to the construction of Daguerre Point Dam?

MR. BRATOVICH: No, sir, I have not.

MR. COOK: And have you considered that there were several dams below the Parks Bar -- what is known as the Parks Bar Bridge at the present time?

MR. BRATOVICH: Specifically as it affects temperature, I personally have not.

MR. COOK: All right. I see. Do you know that one of the dams, at least, washed out after it was constructed? Did you know that?

MR. BRATOVICH: Not that I recollect, sir.

MR. COOK: And do you know that at one time the fish were unable to pass upstream from Daguerre Point Dam? Did you know that?

MR. BRATOVICH: No, I do not recollect that.

MR. COOK: Mr. Grinnell, you testified here today about the methods of lowering temperature in the Lower Yuba River; is that correct?

MR. GRINNELL: Structural?

MR. COOK: Yes.

MR. GRINNELL: Yes.

MR. COOK: And in your review of that particular subject, have you considered the South Fork facilities in the upper portions of the South Fork?

MR. GRINNELL: They're not within the purview of the Yuba County Water Agency. So, no, we have not examined structural issues with the upper reservoir.

MR. COOK: No, I realize that they are not part of the Yuba County Water Agency's facilities, however, they do have an impact on the Yuba River. Do you know if

there's a temperature impact?

MR. GRINNELL: Well, certainly.

MR. COOK: There is?

MR. GRINNELL: Yes.

MR. COOK: And is it higher temperature? Does it increase the temperature, or otherwise change the temperature in the Lower Yuba?

MR. GRINNELL: It depends on the time of the year.

MR. COOK: Let's say, certainly not the wintertime, but in the summer and the fall?

MR. GRINNELL: In the summertime flows from the South Yuba are entering into Englebright and are, to my knowledge, generally warmer than the water coming from Colgate Powerhouse and New Bullards Bar. So in addition to the heating effect of the Lower Yuba River, there's also the heating effects of warmer inflows from the South Yuba, yes.

MR. COOK: Do you know if the temperature increase in the South Yuba as a result of these facilities, or do you know if that temperature increase is the result of these facilities upstream?

MR. GRINNELL: I do not know that. I do know based on review of some information on a recent temperature study that there is significant warming in the transit from those upper reservoirs down to Englebright, but the

specific effect at those reservoirs, I'm not aware of.

MR. COOK: As a general rule, would you say that the lower the flow in a stream the higher the temperature?

MR. GRINNELL: All else being equal and, of course, it's highly dependent upon a number of factors including river geometry, you know, very flat versus a rectangular section, but lower flow generally will see a higher Delta increase over the same river distance.

MR. COOK: Do you know how much water is taken out of the South Fork of the Yuba River above Englebright Dam?

MR. GRINNELL: The South Fork itself, I don't have those numbers in my head, no.

MR. COOK: With respect to what you just testified to about lower flows, do you know how much water is taken out of the Middle Fork of the Yuba River and Oregon Creek and sent into Bullards Bar Reservoir?

MR. GRINNELL: Again, I don't carry those numbers around in my head, so I couldn't answer it specifically.

MR. COOK: Have you studied that issue?

MR. GRINNELL: Certainly, in our model analyses we looked at all of the inflows to the Lower Yuba River including diversions out of the basin and also diversions over to New Bullards.

MR. COOK: Would you say as a general rule that the Yuba River above the lower portion of the Lower Yuba River

is substantially artificially controlled?

MR. GRINNELL: Again, it depends on what time frame. There certainly are reservoirs on those.

MR. COOK: There are reservoirs and also diversions of water out of all branches, correct?

MR. GRINNELL: That's correct.

MR. COOK: And in studying how to lower the temperatures of the Lower Yuba River, would you say that it is necessary to review and consider changing all of those artificial facilities?

MR. GRINNELL: Well, certainly all of the facilities have an impact. And all of the facilities, in a general sense, in working in concert could do a better job than only a limited number of those facilities.

MR. COOK: Is it fair to say that there are substantial or numerous areas of study that should be made to determine how to lower the temperature in the Lower Yuba?

MR. GRINNELL: Certainly, there are avenues both structural and nonstructural examinations that are not within the Yuba River Development Project or under the purview of the Yuba County Water Agency that would potentially have benefit to flow and temperature.

MR. COOK: Then what you're saying is that anything affecting the Yuba River temperature which is outside of

the Yuba County Water Agency's facilities' impact you haven't studied; is that correct?

MR. GRINNELL: I would not say that. We looked at the watershed in general, which in fact, studied quite extensively what the effect of the upstream diversions have on the flows and on temperatures.

So we looked at the effects. We have not looked at measures, specific measures outside of the purview of the Yuba County Water Agency that would improve, but we have just looked at the resulting effects of those existing operations and facilities.

MR. COOK: Is there anything that could be done to Englebright Dam that would impact or reduce the temperature in the Lower Yuba River?

MR. GRINNELL: Certainly the AC has undertaken a study and a proposition of a temperature control device at Englebright.

MR. COOK: That doesn't exist at the present time?

MR. GRINNELL: That is correct, it does not.

MR. COOK: Does the water heat up as it passes out of Bullards Bar into the tube and on down into the Colgate Powerhouse, does that operation increase the temperature?

MR. GRINNELL: Well, again, it depends on what time. It depends on in the summertime, depending upon the flow rate also, there is heating. Although, that heating -- if

the flow rate is of any significant amount, that heating effect of the transit from the bottom -- or from the intake to the outlet of Colgate is not substantial.

MR. COOK: Have you tested temperatures for that purpose?

MR. GRINNELL: There's -- all of the information that we used is looking at the release temperatures, the temperature profiles in Bullards Bar, the temperature profiles in Englebright, we have examined all of these issues.

MR. COOK: When you say temperature at Englebright you're talking about the reservoir itself; is that correct?

MR. GRINNELL: Reservoir and release temperatures.

MR. COOK: Now, Englebright Dam itself, creating the Englebright Reservoir causes a certain amount of solar heating of the water in the Yuba River. Does it not?

MR. GRINNELL: Yes. Because it is a reservoir it's got a surface area that provides heating of the waters that transit Englebright.

MR. COOK: Would that solar heating have an impact on the temperature of the Lower Yuba?

MR. GRINNELL: Certainly. Englebright has a significant impact on the temperature in the Lower Yuba River.

MR. COOK: What about Daguerre Point Dam, is the solar radiation and, thereby, heating of the water backed up behind Daguerre Point Dam?

MR. GRINNELL: Well, because Daguerre Point Dam is essentially silted in, or there's fill behind with sediment, there is some spreading -- in my estimation, some spreading over Daguerre, but the river is very wide in that area both upstream and downstream of Daguerre for a considerable ways.. So to attribute that specifically to Daguerre Point Dam, I think would be speculative.

MR. COOK: Well, if the reservoir behind Daguerre Point Dam is shallow, would not that solar radiation have a larger impact on the temperature of water going out of Daguerre Point Dam?

MR. GRINNELL: I think you're characterizing Daguerre Point Dam as having a significant reservoir behind it, I don't know that that's the case.

MR. COOK: As water enters the reservoir at Daguerre Point Dam, does not the flow decrease?

MR. GRINNELL: Again, characterizing Daguerre Point Dam as having any reservoir behind it that has any significance on the river, I think, is probably not appropriate in that it may not exist, or it's not significant regarding the channel geometry.

MR. COOK: Have you observed the reservoir behind

Daguerre Point Dam?

MR. GRINNELL: I have observed the area behind Daguerre Point Dam, yes.

MR. COOK: There's no reservoir, is that your testimony?

MR. GRINNELL: Well, I think it's pretty strong to -- there certainly was a reservoir, but to the extent that it's now silted up, there's only a very small portion of that volume that's occupied by water now. Most of it is occupied by gravel and sediment.

MR. COOK: Does the reservoir still extend back into the river upstream as it originally did despite the fact that the bed which is below the surface has increased?

MR. GRINNELL: I don't quite understand that question.

MR. COOK: Very well. With the increase in the bed of Daguerre Point Dam, hasn't that resulted in probably a higher temperature in whatever we would call the reservoir or the water backed up by Daguerre Point Dam?

MR. GRINNELL: I don't know what you mean by "increase in bed."

MR. COOK: Well, I think you testified that it's silted up. Is that correct?

MR. GRINNELL: That's correct.

MR. COOK: And when it silts up it raises the bed;

is that right?

MR. GRINNELL: It fills it in.

MR. COOK: And so the water, however, still either passes over Daguerre Point Dam or goes through the fish ladder?

MR. GRINNELL: That's correct.

MR. COOK: And so the water elevation is controlled not by how much silt there is in the bed, but by the height of the dam; is that right?

MR. GRINNELL: The flow below Daguerre is controlled by the crest of the dam, yes.

MR. COOK: And so really as you silt up whatever you call the water behind Daguerre Point Dam, as you silt it up you decrease the depth of the water behind the dam?

MR. GRINNELL: Correct.

MR. COOK: And as you decrease the depth you lower the volume of water behind Daguerre Point Dam?

MR. GRINNELL: That's correct.

MR. COOK: And --

MR. GRINNELL: It's held.

MR. COOK: Pardon me?

MR. GRINNELL: It's held behind it.

MR. COOK: Yeah. And so as you have a lower volume of water behind Daguerre Point Dam with less depth then it would have originally been, I believe I'm characterizing

it correctly, would that not increase the temperature behind Daguerre Point Dam?

MR. GRINNELL: No, not necessarily. By holding -- if you were holding more water, or a greater volume of water behind Daguerre Point Dam, you provide the opportunity for that water to have a longer chance at time of heating. So to answer it's kind of a bit of a complex question to determine what the resultant temperature below Daguerre would be with a larger reservoir behind than there is now.

MR. COOK: Is the substance of your testimony then that you are not sure whether or not there is any impact from solar heating on the area of water behind Daguerre Point Dam?

MR. GRINNELL: I know there's an impact.

MR. COOK: And what is that impact?

MR. GRINNELL: It heats it up.

MR. COOK: It heats it up behind Daguerre Point Dam?

MR. GRINNELL: Throughout the river.

MR. COOK: Well, does the dam have any impact on this heating?

MR. GRINNELL: Does the dam have a -- to the extent that it affects the flow, yes, it will have some effect.

MR. COOK: And that would be a heating affect?

MR. GRINNELL: In the summertime, yes.

MR. COOK: I think you testified that you are not familiar with any outflow into the river from the Yuba Goldfields; is that correct?

MR. GRINNELL: I don't have specific knowledge of temperature measurements of the outflow of the Yuba Goldfields.

MR. COOK: So you have not considered whether that would have an impact on the temperature of the Lower Yuba?

MR. GRINNELL: We've considered it, I just don't have that specific information.

MR. COOK: How did you consider it if you don't know --

MR. GRINNELL: It is -- because of the analysis that we have done, we do regression analysis on the historic data. All of the affects on temperature for the Lower Yuba River are taken into account in that analysis. So to the extent that it impacts temperature, that is folded into our analysis.

MR. COOK: Well, I don't understand. Do your studies consider the amount of temperature impact of any inflow from the Goldfields into the Yuba River?

MR. GRINNELL: Yes, it does --

MR. LILLY: Excuse me, Mr. Brown. I'm going to object to the continuation of this line of questioning.

Mr. Grinnell and his team testified at length

during their initial examination back in February regarding their analysis of temperatures and the flow temperature relationships in the Lower Yuba River.

On rebuttal, the only discussion about temperatures was to take those same methods and apply them to the Department of Fish and Game's recommendations.

This questioning is getting back to the methods which were testified to in the original direct testimony, but not in rebuttal. So I object on the grounds that we're beyond the scope of rebuttal at this point.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Cook.

MR. COOK: Well, unfortunately, Mr. Brown, I missed the last hearing and so I didn't hear the rebuttal direct, if you will. But there has been testimony this morning by these witnesses who are basically here on rebuttal about temperatures in the river and what could the Yuba County Water Agency do to reduce the temperatures.

The flat conclusion is that we cannot do anything to meet the standards of the Department of Fish and Game or the requirements. And I'm trying to explore that, because I think many of the matters are still open including at the present time, the last question -- or the last answer I think was to the effect:

We've considered the temperatures over the whole

river, we've considered all of these temperatures and, yet, the testimony is that we don't know what the temperature is going from the Goldfields into the Yuba.

And I find that very difficult to put into any kind of context. I may be unskillful, but I'm at least trying to find out what -- when they say they have the model that has checked all these temperatures and then repeat, "But we don't know what the temperatures are," I believe it's proper to question that.

H.O. BROWN: Thank you, Mr. Cook.

Do any members of the panel have experience on heat transfer, or thermodynamics?

MR. GRINNELL: Yes.

H.O. BROWN: You ought to be able to answer that question, then, I suspect. Go ahead, I'll allow the question, Mr. Cook.

Your answer stood there's a difference in heat transfer from the small reservoir to the mainstream, I suspect that's where you're headed?

MR. COOK: Well, basically, the testimony has been that water goes from the reservoir behind Daguerre Point Dam into the south canal and that much of it flows out of the south canal, which is in the Goldfields, back downstream into a bypass channel and then into the river about a mile, I believe it is, below Daguerre Point Dam.

I'm interested in: Have they checked the temperature going into the Yuba River from inside the Goldfields?

H.O. BROWN: Mr. Morris, you rise.

MR. MORRIS: I'm going to object to that line of questioning, because the only thing that we've heard this morning from this witness is he does not know anything about the temperatures in the Goldfields. And these questions have been asked many times during the direct testimony. So I object to that line of questioning because it goes beyond the scope of the rebuttal.

H.O. BROWN: Thank you, Mr. Morris.

MR. COOK: May I just say one more thing?

H.O. BROWN: Go ahead.

MR. COOK: I believe the testimony was this morning --

H.O. BROWN: Pull the microphone closer to you, Mr. Cook.

MR. COOK: Sure. I believe the testimony was this morning that, no, we haven't checked the temperature, but, two, we have considered the temperature in our model. And that's what I'm driving at.

I think there's an inconsistency there. And I don't know, maybe I can drop it because apparently the inconsistency is on the record, but that's where I'm

driving at what has been testified to this morning.

H.O. BROWN: All right. That may be a good alternative, Mr. Cook. Why don't you proceed along those lines.

MR. COOK: You mean to drop it?

H.O. BROWN: Yes.

MR. COOK: All right. I'll cancel that. In fact, that's the end of my cross-examination.

H.O. BROWN: Okay.

MR. COOK: Thank you very much.

H.O. BROWN: Yes, Mr. Lilly.

MR. LILLY: And, Mr. Brown, just so the record is clear we disagree with any statement from Mr. Cook that there is an inconsistency in Mr. Grinnell's testimony.

H.O. BROWN: Thank you, Mr. Lilly.

MR. COOK: The testimony, of course, speaks for itself.

H.O. BROWN: Yes, sir, it certainly does.

Mr. Minasian.

MR. MINASIAN: I might do this better from the overhead, if I could address the witnesses from that position, it would be faster.

H.O. BROWN: Sure. You need the screen?

MR. MINASIAN: Yes, please.

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY SOUTH YUBA WATER AGENCY

BY MR. MINASIAN

MR. MINASIAN: Mr. Mitchell, a part of your Exhibit 51 is a very interesting set of curves which show temperature and accumulative spawning. The rising curve is the cumulative spawning counts; is that correct?

MR. MITCHELL: This was rebuttal testimony provided by Mr. Bratovich.

MR. MINASIAN: I'm sorry. Mr. Bratovich, I'll give you credit for this. These drawings were prepared by you?

MR. BRATOVICH: They were and they were based on the cumulative spawning distribution information obtained and given to me by Mr. Mitchell. That's correct.

MR. MINASIAN: Okay. And you'll see on the drawings a red line. Is that approximately what the temperature conditions if the DFG or staff proposals were adopted would be at Daguerre, which is the top and Marysville at the bottom, approximately a two-degree difference?

MR. BRATOVICH: I'm looking at this exhibit. This is S-YCWA-Exhibit 51. What year is this?

MR. MINASIAN: Thank you. It's '92.

MR. BRATOVICH: 1992. To the best of my recollection, I believe CDFG's recommended temperatures

are 56 for the spawning life stage.

MR. MINASIAN: Right. That's correct.

MR. BRATOVICH: I believe that red line looks like it's drawn at 55.

MR. MINASIAN: Right. In order to maintain 56 at Marysville you'd have to maintain a colder temperature at Daguerre; would you not?

MR. BRATOVICH: I'd defer to Mr. Grinnell regarding the flow temperature relationships, or temperature temperature (sic) relationships.

MR. MINASIAN: I'm not asking you for the accuracy of the spread on a given day.

MR. GRINNELL: Okay.

MR. MINASIAN: I'm just trying to get this in proportion

MR. GRINNELL: Yes, yes, you would.

MR. MINASIAN: Okay. Back to you, Mr. Mitchell. When we change a temperature regime like this on a river, do we change the adaptation of fall-run, spring-run, or any species that are in the river?

MR. MITCHELL: If water temperatures are changing on a consistent basis, yes.

MR. MINASIAN: And the longer the period of the change the more the fish will change, or try to change their life history, will they not?

MR. MITCHELL: Yes, their life history --

H.O. BROWN: Mr. Cunningham?

MR. CUNNINGHAM: If I might, this goes beyond the scope of the rebuttal provided by Mr. Mitchell or Mr. Bratovich.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: It is simply to try to illustrate the relationship of the rebuttal testimony to the points we're dealing with in this hearing.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, these witnesses presented these graphs with a very simple explanation of what these graphs contained, provided no rebuttal opinions as to the interpretation or to biological significance as to any elements of these graphs. I believe we're once again well into information and testimony that's far beyond the scope of the rebuttal.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Minasian, I agree with Mr. Cunningham.

MR. MINASIAN: Let me -- if I could, let me then try to understand the scope that you want us to utilize on cross-examination. We've had various exhibits submitted by Yuba County Water Agency. I want to understand the significance of those in terms of the issues of this proceeding.

How -- what -- where should I draw the line?

H.O. BROWN: I think we've just drawn it, Mr. Minasian.

MR. MINASIAN: Okay. Shall I keep trying and see if I abridge --

H.O. BROWN: Try another one.

MR. MINASIAN: Okay.

Mr. Bratovich, a second drawing. Now this is 1991, this is again part of 51, is it not?

MR. BRATOVICH: It appears to be, yes.

MR. MINASIAN: Yeah. And if you just look over on the lower portion at Marysville, do you see the temperature looks like it gets into the range of 44 to 48 degrees in 1991 which is a dry year?

MR. BRATOVICH: By the end of November that appears to be true, yes.

MR. MINASIAN: Mr. Grinnell, based on your experience is that because of air temperature primarily?

MR. GRINNELL: Air temperature, at that lower temperature it's generally driven by the colder water coming down the Yuba River both from the releases through New Bullards and also the inflows at that time are cold to the --

MR. MINASIAN: Okay. And did you want to add to your --

MR. GRINNELL: Less effective solar heating.

MR. MINASIAN: Okay. Now, if we -- your previous testimony, Figure 8 of the bound version of your testimony you gave us a diagram which basically gave us the buffered temperatures in Englebright at various elevations.

Do you remember that?

MR. GRINNELL: Yes.

MR. MINASIAN: Okay. Now, are you aware that it is proposed in the Draft Decision that we release water in order to maintain the minimum release made after October 31 under the Draft Decision?

MR. GRINNELL: Yes.

MR. MINASIAN: Okay. And if one attempts to release water from a reservoir to meet that requirement between November 1 and March 31, would we tend to be releasing temperatures that might be warmer than the temperatures experienced in 1991?

MR. GRINNELL: Yes. As you start to release generally because of the temperature profiles of the reservoirs, as the reservoirs get drawdown, you tend to release warmer waters as that happens.

MR. MINASIAN: Okay. So, in essence, is there a potential contradiction if one wants colder water in a period in which incubation is occurring, is there contradiction between a requirement of releasing stored

water to maintain a minimum flow down the river?

MR. GRINNELL: Yes. At some point you end up fighting yourself, so to speak, of trying to release higher flows which draws down storage which then propagates the release of warmer water, which then would require even greater releases. It's kind of a downward spiral.

MR. MINASIAN: Exhibit 31 is a temperature report in regard to releases from Narrows 2 Powerhouse over time; is it not?

MR. GRINNELL: That's correct.

MR. MINASIAN: And you remember that drawing that went into the range of 44 to 48 was 1991, the fall of '91?

MR. GRINNELL: Yes.

MR. MINASIAN: Do you see the readings from Narrows 2 in the fall of 1991 after October 31 and up to January have been outlined in red?

MR. GRINNELL: Yes.

MR. MINASIAN: And do you see the range of those temperatures?

MR. GRINNELL: Yes, I do.

MR. MINASIAN: Okay. So in 1991 we had 44 to 48 degrees at Marysville, if we applied the temperature -- the flow regime for the period of November 1 through March 31 that is recommended in the staff decision to the Board,

we'd actually be releasing water between 50 and 58 degrees at Englebright during that same period, wouldn't we?

MR. GRINNELL: I'm trying to see if they line up.

MR. MINASIAN: It's really hard, isn't it?

MR. GRINNELL: Yeah.

MR. MINASIAN: How about looking at it this way?

MR. GRINNELL: Yeah. Thank you. Yes, the temperatures range after -- after the October date on the graph up to 58 degrees.

MR. MINASIAN: Mr. Grinnell, would you do something for me? I show you Exhibit 37, we've been using exceedances and confidence levels. Would you help me understand how we would explain to an operator of the Yuba River Project how to provide for operations as proposed by DFG, or the Draft Decision?

Let's start with a 20-percent exceedance based upon temperatures at Marysville. If we said to an operator based upon your conclusions from the model run, you can use a 20-percent exceedance, what would that mean in terms of number of days, or the number of instances in which he would the violate the Draft Decision requirements?

MR. CUNNINGHAM: Objection. Mr. Brown, this mischaracterizes the testimony presented in this graphic. This graphic doesn't indicate anyplace on it, nor has the

testimony in rebuttal indicated that this graph refers to flows to be released from the New Bullards Bar or any part of the Yuba County Water Agency Project. These are just flows, flows below Englebright Dam, flows below the Englebright Dam that include both the North Fork, South Fork, and the Middle Fork of the Yuba River.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: I must say that my understandings of exceedances and probabilities are so rudimentary that I have to tell you that I think the witness is going to tell us that you have to use these in a probability sense to make decisions regarding operations. But I'm hoping that he will tell us how you do that. That is the purpose of the question.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I stand by my initial objection. To the extent that this graphic is used as part of this cross-examination testimony, this graphic does not refer to releases required from New Bullards Bar Reservoir or any Yuba County Water Agency specific facility.

If Mr. Minasian wishes to talk about exceedance curves, how to operate a project, then I would suggest that goes outside the scope of rebuttal. None of these witnesses here presently have testified in rebuttal about

the actual operational parameters of New Bullards Bar Reservoir or any Yuba County Water Agency Project in an attempt to obtain compliance with proposed temperatures of the Department of Fish and Game in this proceeding.

H.O. BROWN: Mr. Frink, do you have any counsel on this?

MR. FRINK: I agree with Mr. Cunningham. I don't believe Mr. Grinnell was making recommendation or commenting on the operation of criteria for the reservoir. I think he was just giving some numbers based on his modeling of flow that would be needed for meeting the Department of Fish and Game's recommendations on temperature.

MR. MINASIAN: Let me try it just a different way so that -- I assume that the Board would follow -- Board Member would follow Mr. Frink's advice on this, so let me just rephrase the question so you don't have to rule upon it.

You see the phrase, "Additional flow needed," up there, Mr. Grinnell?

MR. GRINNELL: Yes.

MR. MINASIAN: This was an exhibit used in the rebuttal testimony that I'm now cross-examining you on, isn't it?

MR. GRINNELL: That's right.

MR. MINASIAN: What did you mean by the phrase, "additional flow"?

MR. GRINNELL: It is the additional flow above the flow standard in the Draft Decision that would be needed in order to meet the temperature requirements at various exceedance probabilities of monthly average of daily air tolerance.

MR. MINASIAN: That additional flow could come from God or it could come from a reservoir, you don't care, do you?

MR. GRINNELL: That's correct.

MR. MINASIAN: Okay. Now, if it was to come from a reservoir, how would you instruct the operator in regard to the 10-percent exceedance column?

MR. GRINNELL: Well, I wouldn't instruct him to use the --

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, this is again going outside of the scope of this witness's rebuttal. This witness did not testify about how he would instruct or speculate on how he would instruct any operator of any reservoir or storage project to comply with the terms of this graphic.

MR. MINASIAN: That's certainly absolutely right, but the exhibit was used and the concept of the

probability has a practical application. And I should be entitled to get into that, because you're going to draft a decision that tells us how to operate the project, Mr. Brown.

H.O. BROWN: How far are you going with this, Mr. Minasian?

MR. MINASIAN: Not very far.

H.O. BROWN: How many more questions?

MR. MINASIAN: I have about three questions.

H.O. BROWN: Counting this one?

MR. MINASIAN: Yes, counting this one, if I ever get it out.

H.O. BROWN: All right. Go ahead.

MR. MINASIAN: Okay. Understand, Mr. Grinnell?

MR. GRINNELL: Yes. We would not recommend using those lower-percent exceedance probabilities, because what would happen is that most of the time you would be underestimating the amount of water that would be needed, because the monthly -- the temperature, the daily air temperature would exceed that and, therefore, you would miss the target.

MR. MINASIAN: Okay. And when you use confidence levels in your exhibits, what -- what involvement or use of that is a confidence level for an operator making a decision?

MR. GRINNELL: Well, really it's to the standard. The standard is daily standard. So there's no variation or allowance for not meeting the standard. And so you have to be confident that you're going to meet the standard.

Because our prediction is based on the regression analysis have some uncertainty associated with them, then confidence level is used to envelope that uncertainty to make sure that you will meet the standard. And it has to do with the uncertainty of the prediction.

MR. MINASIAN: Okay. Now, going back to Exhibit 37, do you see the months where the most additional water is necessary are basically down to about July 1?

MR. GRINNELL: Yes.

MR. MINASIAN: Okay. I circled the 80 percent just so we don't have to fire the guy. Do you understand that?

MR. GRINNELL: Okay.

MR. MINASIAN: Okay. Now, how would one make a decision in regard to trying to meet the temperature requirements at Marysville without knowing what the temperature was going to be in the summer months and without being able to curtail crop production, that is the irrigation water going outside the project, based upon those amounts of water needed before July 1?

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I'm going to object. This is so far outside the scope of rebuttal it's beyond question. I also believe this goes beyond Mr. Minasian's three questions.

MR. MINASIAN: This is my last.

MR. CUNNINGHAM: Mr. Brown, this has nothing to do with rebuttal provided by this witness.

H.O. BROWN: Okay.

Mr. Morris.

MR. MORRIS: Again, I try not to get up too often, but I think Mr. Minasian's point is very, very important for the Board hear. And I think it was opened up by Mr. Cunningham himself who basically made the point that this would not involve releases from Englebright Dam. And I would hate for the Board to have the wrong impression of what that really means. We really need to get to the bottom of this.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: I submit it.

H.O. BROWN: Answer the question.

MR. GRINNELL: Let's see if I can get back to it.

MR. MINASIAN: Do you remember it, because I could repeat it?

MR. GRINNELL: Could you, please?

MR. MINASIAN: Okay. Let's take an operator, you've

given him this schedule and you've told him, I want you to make a decision about whether or not to use a 20-percent or an 80-percent exceedance based upon whether we're going to take the water away from the farmers or we're going to violate the requirement in July through November.

Is it correct that by the time that we get down to a point where we know whether the farmer is going to get any water that most of the water has been used up?

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, Mr. Grinnell has not testified at all about his knowledge of whether or not farmers are or are not going to have water left out of these flows. He hasn't testified about whether or not these flows are going to come from any reservoir or any storage facility on this river at all.

This witness has not been qualified either in direct or in rebuttal as to testifying what farm flows or irrigation flows are going to be required out of this system.

Mr. Brown, I appreciate what Mr. Minasian may be trying to do, but I think this testimony is so beyond the scope of rebuttal. And if he's trying to present this graphic as evidence of this kind of testimony, then this witness is so unqualified to speak to this, it clearly should not be allowed.

H.O. BROWN: Mr. Bezerra.

MR. BEZERRA: Mr. Brown, I'd just like to clarify that Mr. Grinnell gave extensive testimony on direct relating to the water supply impact of the various regime flows and to say he's not qualified to speak as to the water supply impact of these types of flows is inaccurate.

H.O. BROWN: Thank you, Mr. Bezerra.

Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, this witness did not testify about flows farmers need. This witness testified about information he was given to prepare specific modeling, modeling data. And I say to the extent it was provided in direct, then this question should have been asked in direct, to the extent this question has not been addressed, nor has this witness testified to this at all during rebuttal.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: I think the point has been made, but I believe the witness should be able to answer the question. The purpose of rebuttal is to bring back to you information that will help the staff and you craft a decision that is practical, that is implementable, that is operable and that the Board will not be embarrassed and run out of water.

And, effectively, that's why this chart was

brought back, to explain that if the staff and the Board Member picked a particular regime and wanted a guarantee, as the DFG propose, not to exceed a certain temperature on a given day, that you are going to be embarrassed. We're going to run out of water.

Now, that's my question to him. When are you going to be able to make the decision that you were wrong? And when are you going to know that you run out of water, because that operator is the one you have to communicate with and change your decision?

That's the relevance of it. And that's the scope of the rebuttal as I understood it.

H.O. BROWN: Okay. Mr. Cunningham, last time.

MR. CUNNINGHAM: Yes, Mr. Brown, if Mr. Minasian wishes to put on testimony in his own rebuttal about the inability of the system to accomplish all of the goals requested by all the parties in this proceeding, that is his choice. The question here is much more narrowly focused.

These witnesses are not being presented by Mr. Minasian on behalf of his clients, they are presented on behalf of the Yuba County Water Agency. They have already testified in rebuttal. The scope here is specifically cross-examination of that rebuttal, not new testimony, not new issues for the Board, not even

interesting issues for the Board.

If Mr. Minasian wishes to put those on in his own rebuttal, that is fine. My concern is two-fold: He's expanding the scope of cross-examination and he's then also going to expand the scope of the questions that Mr. Lilly is going to have to address, potentially, to deal with the cross-examination questions on redirect.

This is a slippery slope that I think if Mr. Minasian has testimony he wishes to put on, put it on himself in his own rebuttal.

H.O. BROWN: Thank you, Mr. Cunningham.

Last time, Mr. Minasian.

MR. MINASIAN: Nothing further. I'll submit it.

H.O. BROWN: Okay. Mr. Frink, let's huddle.

(Off the record from 10:25 a.m. to 10:26 a.m.)

H.O. BROWN: The total questioning, Mr. Minasian, is outside the scope of the rebuttal.

MR. MINASIAN: Okay. Thank you.

H.O. BROWN: We do have an alternative, I'm going to ask Mr. Frink, I would like to get some of this information in the record:

Mr. Frink, if the question was revised as you suggested it, I would allow it. Make the suggestion and let's see how it goes.

MR. FRINK: Mr. Minasian, my understanding of the

point you were getting at is you were basically asking Mr. Grinnell if it would require a large amount of water to meet the temperature requirements in dry years in the Draft Decision from the dates of April 1 through July 2nd and have an 80-percent confidence level that you were going to meet those decisions, meet those requirements.

Is that your basic question?

MR. MINASIAN: That would be sufficient, Mr. Frink. Obviously, I was tacking on some other operational decision. That's a very constructive suggestion.

H.O. BROWN: All right. Let's let it go at that, Mr. Frink.

And if you want that question answered --

MR. MINASIAN: Yes, thank you.

H.O. BROWN: The witness may answer it.

MR. GRINNELL: Well, a clarification, that's not 80-percent confidence level, it exceeds probability of temperature, but, hopefully, I can answer simply.

These releases are above the capacity of the system to release, number one. Number two is the volumes of water, because this is a dry year, these are substantially greater than even the unimpaired flow of the Yuba watershed in dry years.

So in an attempt to meet these temperatures, meet -- to release this amount of water it takes more than

any water that's available in either the reservoirs or the unimpaired flow within the river. And, therefore, would not be possible.

MR. MINASIAN: Thank you.

Nothing further.

H.O. BROWN: Thank you, Mr. Minasian.

MR. MINASIAN: Thank you, Mr. Brown.

H.O. BROWN: We'll take our morning break now.

(Recess taken from 10:28 a.m. to 10:41 a.m.)

H.O. BROWN: Come back to order.

Mr. Bezerra, you're up.

MR. BEZERRA: Thank you, Mr. Brown. Good morning.

H.O. BROWN: Good morning.

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY BROWN'S VALLEY IRRIGATION DISTRICT

BY MR. BEZERRA

MR. BEZERRA: Good morning, staff.

I just have a few questions. Mr. Bratovich, could you, please, take a look at S-YCWA-104, which is entitled, "Full Citations Relied upon by McKee."

MR. BRATOVICH: Yes, I have that.

MR. BEZERRA: Can you describe the process that you used to develop that exhibit?

MR. BRATOVICH: Yes. S-DFG-13, Page 4, cited eight

references in support of recommended optimal temperatures for each specific life stage. What we did was we examined those references.

And if that -- for an individual reference, if that reference was a laboratory study or a field survey itself, then it was included in this list. If that reference was itself a literature review and literature summary, then we examined the references included in that literature review and that literature summary until we identified relevant specific laboratory studies or field surveys and then they were included in that list.

If, in turn, again, that was identified as another literature review or summary, then it was included in the list, but then we looked at those references and so forth until we made our best effort to develop what is included in the foundation reports.

MR. BEZERRA: So you were attempting to determine the ultimate laboratory or field studies on which those citation references and this testimony were based?

MR. BRATOVICH: Yes.

MR. BEZERRA: And, Mr. Mitchell, I have a few questions for you. Mr. Sanders handed out earlier this morning an exhibit which was marked SYRCL-20, entitled "Chinook Salmon in the California Central Valley: An Assessment." Do you have a copy of that?

MR. MITCHELL: Yes, I do.

MR. BEZERRA: Okay. Can you go to Page 12. And there's a paragraph at the end of Page 12 which runs on to Page 13 and it begins, "For the entire Sacramento River basin."

MR. MITCHELL: Yes.

MR. BEZERRA: Have you had a chance to take a look at that?

MR. MITCHELL: Yes.

MR. BEZERRA: Okay. Can you give me a summary essentially of what you think that paragraph says?

MR. MITCHELL: Yes. The authors here are stating the status of fall-run chinook salmon in the overall Sacramento River basin. And basically the overall spawning escapement has declined in the Sacramento River basin as a whole between the two periods that were examined, 1953 through '66 versus the 1967 through '91.

Also here they're pointing out that despite the overall decrease, the tributaries spawning runs have essentially remained the same or even increased as --

MR. BEZERRA: Okay. And what tributaries are they referring to there?

MR. MITCHELL: The rivers that they're referring to are the American and Feather Rivers, which they say has increased and they state the numbers have changed

relatively little. And they cite Battle Creek and Yuba River.

MR. BEZERRA: And do they mention hatchery production of fall-run chinook salmon on any of these tributaries?

MR. MITCHELL: Yes. The last sentence states that, (Reading):

> "The increases in the major tributaries apparently were due to increased hatchery production, except possibly in the Yuba River."

MR. BEZERRA: And are you aware of any fall-run chinook hatchery on the Yuba River?

MR. MITCHELL: No.

MR. BEZERRA: So the Yuba River is the only one of these cited major tributaries that does not have a fall-run chinook hatchery, correct?

MR. MITCHELL: That's correct.

MR. BEZERRA: So what does this paragraph tell you as a fisheries biologist about the population of fall-run chinook salmon in the Yuba River?

MR. MITCHELL: Well, this goes back to our original conclusions, which these authors have also stated here is that the numbers have been sustained despite the fact that there has been no hatchery. And, therefore, the conclusion we made is that the natural production has been

sustaining those numbers despite declines in overall runs in the Central Valley.

MR. BEZERRA: Thank you very much.

I have no further questions, Mr. Brown.

H.O. BROWN: Thank you, Mr. Bezerra.

Mr. Morris?

MR. MORRIS: I have no questions for this panel. Thank you.

H.O. BROWN: Thank you, Mr. Morris.

Staff?

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CROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY STAFF

MS. LOW: Yeah, I have a few questions. The first questions are for Mr. Mitchell. I have a question relating to YCWA-Exhibit 103. Do you have a copy of that?

MR. MITCHELL: Yes.

MS. LOW: These are the expanded daily numbers of juvenile outmigration of salmon trout at the Hallwood-Cordua fish screen. I was wondering what it meant by, "Expanded daily numbers of chinook salmon," how were those numbers expanded?

MR. MITCHELL: Yeah. Expanded refers to an adjustment to the raw-catch numbers to account for the affect of flow. In other words, the percentage of flow

that's diverted influences the numbers that you catch. And if you assume flow is -- that fish are diverted in proportion to the flow, we basically adjusted the numbers to correct for that.

MS. LOW: So you assumed that fish are diverted in proportion to the flow diverted into the Hallwood-Cordua facility?

MR. MITCHELL: Yes.

MS. LOW: Okay. And, then, so these expanded numbers you're saying would represent fall-run outmigrate abundant during this period?

MR. MITCHELL: Yes. It was corrected. And I -- corrected to obtain a more reliable indicator of abundance.

MS. LOW: Okay. Earlier you testified that these fish represented outmigration of smolt-size juveniles, but not fry outmigration. Would that be correct?

MR. MITCHELL: That's correct.

MS. LOW: Okay. And these data are for the 1981 season. And it appears in this season that the period of smolt outmigration was covered fairly effectively. Would you say that's correct?

MR. MITCHELL: Yes.

MS. LOW: Okay. What about the other years that were included in the regression in YCWA Exhibit 42, do you

know if in those other years the period of outmigration, smolt outmigration was covered by the sampling in those other years, also?

MR. MITCHELL: We believe they were. After looking at the data and looking at the time that the trap was operating, we were looking for the specific indication that numbers were starting at -- the numbers arriving at the trap were starting at low levels indicating the beginning of the outmigration.

If the numbers started out at high levels as soon as the trap began operating, we excluded that year for the reason that basically the trap would have missed the major outmigration period.

In selecting these years we were careful not to include those years, but to include only those years where we see relatively small numbers at the beginning of the season and then an initial increase in the decline essentially.

MS. LOW: In any of these years would you have included a period also of fry outmigration or --

MR. MITCHELL: No. The number -- the size of the fish were measured. And these are larger juveniles within the smolt-size range.

MS. LOW: Right. But in all of the years that are included in this regression that would be true for the

most part?

MR. MITCHELL: Based on size, yes.

MS. LOW: Okay. So in any of these years you would say that the fry outmigration was not represented in these numbers?

MR. MITCHELL: That's correct.

MS. LOW: Okay. But you've only presented data from 1981. There are quite a number of other years here where we don't have any information on either the sampling period or the distribution of the fish captured at the trap; is that correct?

MR. LILLY: I'm going to object that that misstates his prior testimony. He just said he looked at the data for the other years. So for her to say, we don't have information, is incorrect.

H.O. BROWN: Do you want to restate it?

MS. LOW: Is there information in the record on the other years represented in this regression in Exhibit 42?

MR. LILLY: Now I'm going to object. The question is unclear, and maybe Ms. Low can just clarify. By "information," if she's referring to specific data, it's going to be a different answer than if she's referring to Mr. Mitchell's testimony that he's just given on this question.

I object that the question is ambiguous unless

she splits it up between data and other information.

H.O. BROWN: Ms. Low.

MS. LOW: Is similar data in the record similar to what you provided for 1981 in Exhibit 103, is similar information such as this data in the record for the other years represented in YCWA Exhibt 42?

MR. MITCHELL: I'm trying to remember. We submitted several reports and memos in 1992, some of which I believe did have the daily salvage data. I cannot recall exactly which years those were or which reports, but we may have submitted those at an earlier date.

MS. LOW: Okay. Thank you. Just a few questions for Mr. Bratovich. I was looking at your exhibit, YCWA-51.

MR. BRATOVICH: Yes, I have that.

MS. LOW: Okay. And the basic testimony I believe that you made on this exhibit was that you stated that delayed fall-run chinook spawning may result from higher elevated fall temperatures?

MR. BRATOVICH: May I clarify that response somewhat? I don't exactly recollect what I testified to, but to the best of my recollection I believe I testified that initiation of spawning seemed to be related to a decline in water temperatures approximately at 58 to 60 degrees.

MS. LOW: Okay. So in years where you had high fall water temperatures, fall-run spawning may have been delayed in those years until temperatures fell below certain levels?

MR. BRATOVICH: That is correct.

MS. LOW: Okay. So the implication is that delay of spawning may reduce temperature impacts on spawning and incubating eggs; is that correct?

MR. BRATOVICH: It's essentially correct. I would further that response by saying that the fish are selectively choosing when to spawn in accord with the temperatures that they're experiencing, yes.

MS. LOW: Okay. Is it also possible that by delaying the timing of spawning that you also may be delaying the emigration of juveniles in the spring from the Lower Yuba River, that there may be some relationship between delayed spawning in the fall and delayed outmigration of juveniles?

MR. BRATOVICH: If Mr. Mitchell wishes to respond to that. I haven't testified to that specifically. I would say it's possible. However, that the temperatures according to Mr. Grinnell's testimony and exhibits, during the incubation period it may result in a slightly later hatching and emergence period than would occur. And slightly later if it's a two-week delay that, perhaps, it

would equate to something of that nature in emergence timing.

MS. LOW: Okay. So just because spawning is delayed -- may be delayed in the fall, you wouldn't necessarily have no impacts later in the season due to the --

MR. BRATOVICH: It's a difficult question to answer. You wouldn't necessarily delay emergence. It would all be dependent upon what the subsequent thermal regime would be to the time of initiation of the spawning. It's possible that it would delay, emergence from that same group for a few weeks.

MS. LOW: Okay. Thank you.

MR. MORA: A few questions. I'm Ernie Mona.

Mr. Grinnell, charts that you submitted -- you submitted chart Exhibits S-YCWA-34 through 38, am I correct in concluding that those charts are based on a simple comparative analysis or regression analysis between the flow and air temperature or what?

MR. LILLY: Excuse me, which graphs are those? I want to make sure we get them out.

MR. MORA: Number 34 through 38.

MR. GRINNELL: Simple, actually, what we did initially was we did an analysis to examine what factors affect the temperature looking at air temperature flow.

You know the '92 testimony also included other affects like wind, specific solar radiation issues.

So the regression analysis included looking at what potentially would be impact factors and then taken on to developing the regressions which included air temperature, flow, release temperature as the main factors to look at.

MR. MORA: Would a similar analysis of historic recorded flow and water temperature at Marysville produce a result which would support these types of conclusions that you have contained in your tables?

MR. LILLY: I'm going to object that that question is unclear and ambiguous.

MR. MORA: Well, have you done an analysis of air temperature -- I mean of flow temperature and water temperature at Marysville to determine whether or not there was a close relationship between those two factors?

MR. GRINNELL: That was the basis of our whole analysis was to look at the impact of flow and air temperature and release temperature on the temperature at Marysville.

MR. MORA: Well, would such a comparison support your conclusions in Tables Number 34 and 36 I believe it is --

MR. GRINNELL: That --

MR. MORA: -- where it seems to indicate that -- not 34. Let's just go to 36. It seems to indicate that an additional 3400 cfs of flow is required over and above the Board's 500 cfs minimum to maintain a temperature of 56 degrees during January, February, and March, November, and December?

MR. LILLY: Go ahead.

MR. GRINNELL: Let me answer that in two parts. First, this is all a regression analysis, analysis of recorded information. And the analysis was to examine those affects, the affects of flow. And so as we showed in Exhibit YCWA-18, the various factors are included, flow, air temperature, and release temperature in the prediction formulas as to how they would affect the temperature of the river at the Marysville gauge or Daguerre.

That is what was used to develop the information on YCWA-36, except for the fact that this is capped by the release capacity. So the 3500 is not the amount of water that would need to be released in order meet the requirement. When you see the 3500 it's been capped. The actual amount of water would be greater than the 3500.

MR. MORA: Thank you.

MR. FRINK: Yes, Mr. Grinnell, I have a question also about this same exhibit Mr. Mona was looking at. If

you look at Exhibit 36.

MR. GRINNELL: Okay.

MR. FRINK: Let's see, for the months of January, February, and March.

MR. GRINNELL: Yes.

MR. FRINK: Looking in the column that's labeled, "Additional Flow Needed for Temperature Requirements." Now, your exhibit would indicate that in January, February, and March that above the 500 cfs specified in the Draft Decision, that meeting the temperature requirement would require 2978 cfs of water; is that correct?

MR. GRINNELL: No. You have to remember that the difference between the type one and type two operation, the type one operation includes the maintenance of flows that are established for this exhibit, established in September throughout the winter period.

So -- actually, established the October 15th to October 31st time period out through March. So the 2978 through the winter months is not in an operation to reduce temperature -- to meet the temperature standard. It's to maintain the flow as stipulated in the DFG exhibit.

MR. FRINK: So in that respect, the label on the column there, "Additional Flow Needed for Temperature Requirements," is not accurate; is that correct?

MR. GRINNELL: No, it is accurate. You know it's based on a set of criteria. That's why we show both, type one and type two. That's why we show both columns to discern that we're including the additional operational criteria that was addressed in the DFG testimony, which included -- and this is consistent with what we did in YCWA-18, demonstrating the impact in trying to operate for temperature requirements and then having to maintain those flows, because of flow reduction limitations associated with the recommendations of DFG.

MR. FRINK: Okay. Just so I'm clear on this: The 2978 acre-feet at that particular time, in January, February, and March, if all one was concerned about is meeting the temperature requirements, would you need to release 2978 cfs above the 500 cfs specified in the Draft Decision?

MR. GRINNELL: No. And that's reflected in the type two column.

MR. FRINK: Okay. So all the numbers in the type one column are based on the desire to maintain the flow at a level that it was before that date to maintain stable flows; is that correct?

MR. GRINNELL: To meet that requirement, yes.

MR. FRINK: Okay. Thank you. If one were to look at actual water temperatures in a given month and if the

flow were at or below the standard specified in the Draft Decision -- that's a little complicated.

I'll approach it in a different way. If we look at the numbers on the right-hand side of the Exhibit 36, total instream requirement at Marysville gauge and you look under the type two column, now, those numbers are the flow requirements that are needed for a combination of meeting either the minimum flow requirement, or the minimum flow requirement and any additional water that would be needed to comply with the temperature requirements in the Draft Decision; is that correct?

MR. GRINNELL: Yes, up to a cap, the operational release capability cap of 3500 cfs.

MR. FRINK: If one were to look at historic water temperature data for those dates and flow records, and if the temperature requirements were being met at flows substantially lower than what are reflected in the far right-hand column of Exhibit 36, would that leave you to question the validity of your analysis?

MR. GRINNELL: Absolutely not. You have to understand a couple of things: First off: That all of this analysis was based on historic data, I mean it's a regression analysis examining that.

But you have to remember that the components of the regression include air temperature, which is a

variable. So any specific date that you would look at you would also have to examine what air temperature was present at that time, it might have been a cooler time period. And also you have to look at the uncertainty of the prediction itself and how you will have to operate to meet that.

So that there's several things included in here. One is the variability of the physical components, the air temperature, release temperature, flow rate, and the uncertainty of the prediction itself. Those are folded into this.

And so, yes, you could -- throughout the range of all the data that we've used say for any given month, you would find the range of those possibilities that are predicted here by the regression analysis that we did.

MR. FRINK: The more frequently that you would find lower flows present at Marysville and temperatures meeting the requirements specified in the Draft Decision, if that occurred with progressive frequency, would you become less certain in the validity of your model?

MR. LILLY: I'm going to object to the extent that he states this is a model. Mr. Grinnell has said over and over and over again this is a regression analysis. It's not a model. And the difference is scientifically important.

H.O. BROWN: Yes, Mr. Frink, do you want to change your question?

MR. FRINK: Yes, I'll withdraw the question that I asked.

Mr. Grinnell, the flows reflected in S-YCWA-36, are those based entirely on the regression analysis, or was there some modeling that went in to coming up with those numbers?

MR. GRINNELL: These numbers are developed through the regression analysis, the prediction of -- there is -- no, this is strictly water that would be needed to be released to meet the temperature based on the regression analysis, which was for this purely an examination of recorded historical data.

MR. FRINK: Okay. Your regression analysis included evaluation of several factors that might affect water temperature; is that correct?

MR. GRINNELL: That's correct, for Marysville, that's correct.

MR. FRINK: Okay. I believe that's all my questions, thank you.

H.O. BROWN: Thank you, Mr. Frink.

Mr. Lilly, do you have any redirect?

MR. LILLY: Yes, I do.

H.O. BROWN: Okay.

Let's see, Mr. Frink, would you make sure that we have the subject matters down in print from here on out.

MR. FRINK: I will try.

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REDIRECT EXAMINATION OF YUBA COUNTY WATER AGENCY

BY MR. LILLY

MR. LILLY: Mr. Mitchell, I'll start with you, following the same pattern as the other examiners.

During cross-examination Mr. Gee asked you some questions regarding the timing of the migrations of different life stages of chinook salmon. And just so we're clear, I want to make sure we understand this. First of all, regarding chinook salmon fry, when do they migrate out of the Yuba River and then on into the Feather River and then downstream?

MR. MITCHELL: Based on the data from the Department of Fish and Game and also on a general life history pattern, the fall-run chinook migrate primarily in the months of January, February, and March from the Yuba.

MR. LILLY: And that's fry we're talking about, right?

MR. MITCHELL: Fry, yes.

MR. LILLY: Okay. Now, shifting forward a few years to the adult fall-run chinook salmon, during the spring as they're reaching adulthood where are they located, that's

to the extent that we have available information to answer that?

MR. MITCHELL: In the springtime fall-run chinook salmon would be in the ocean.

MR. LILLY: So then some time after the spring they would start their journey up to the Yuba?

MR. MITCHELL: That's correct.

MR. LILLY: Now, Mr. Mitchell, questions were also raised during cross-examination regarding the differences between general fisheries biology and fish physiology. Do you have any training and experience in fish physiology?

MR. MITCHELL: Yes. My course work included laboratory and classroom experiences in fish physiology. Also, in the last ten years I gained a fairly thorough knowledge of the literature on fish physiology especially as it pertains to salmonids.

MR. LILLY: Now, going forward, there was also questioning about the steelhead spawning surveys that you conducted this year. Could you, please, just clarify for the record when those steelhead spawning surveys were conducted by you?

MR. MITCHELL: Yes. Those were -- there were four surveys conducted between the last part of January and the present.

MR. LILLY: Okay. Can you be anymore specific as to

which months they were conducted during?

MR. MITCHELL: Yes, in the latter part of January, March. There was a survey in April. And we had a survey recently in May.

MR. LILLY: Okay. Now, if you can turn to the exhibit that Mr. Sanders introduced to you this morning, which I believe is S-SYRCL-20. He asked you a couple questions regarding comparison of chinook salmon escapement into the Yuba River during the 1953 to 1966 period versus 1992 to 1997. Do you recall that questioning?

MR. MITCHELL: Yes.

MR. LILLY: Were there any major droughts during the 1953 to 1966 period?

MR. MITCHELL: Not to my knowledge.

MR. LILLY: And where there any droughts during the 1992 to 1997 period or immediately before 1992 that would affect the escapement during 1992 through 1997?

MR. MITCHELL: Yes. There was a several year drought, six-year drought prior to 1992.

MR. LILLY: Well, actually, did it extend through 1992 to the best of your recollection?

MR. MITCHELL: To my knowledge, yes, it extended through 1992.

MR. LILLY: Okay. Then Mr. Sanders also asked you

some questions regarding the 1967 to 1991 escapement period. I think this was in his next series of questions.

Just so we're clear, the spawning escapement that occurred in 1967 and '68, even though that was after New Bullards Bar Reservoir had been constructed, were those adult spawners affected by the pre-New Bullards Bar conditions?

MR. MITCHELL: I'm sorry, could you ask the question again?

MR. LILLY: Yeah, I'm sorry. Mr. Sanders asked you questions about the 1967 to 1991 period and my question is:

Is it fair to characterize that entire period as a period when the adult spawning escapement would be under post-New Bullards Bar conditions, or would the early years of adult escapement still be affected by the pre-New Bullards Bar conditions?

MR. MITCHELL: Yes. The first few years would be affected by the pre-New Bullards Bar conditions.

MR. LILLY: And why is that?

MR. MITCHELL: Because the affects on that -- on those particular adults would have occurred prior to the construction of New Bullards Bar.

MR. LILLY: You mean on those adults when they were eggs and juveniles?

MR. MITCHELL: When they were eggs, juveniles, and smolts leaving the river.

MR. LILLY: Okay. So that would have been a couple of years before their actual escapement back into the river?

MR. MITCHELL: That's correct.

MR. LILLY: And now just so we're clear, the 1967 through 1991 period, did that include any major drought periods?

MR. MITCHELL: Yes, it did.

MR. LILLY: Okay. And also, obviously, 1967 through 1991 does not include 1992 to the present. And have the adult escapement numbers in the Yuba River increased in the last few years?

MR. MITCHELL: Yes.

MR. LILLY: Okay. So those, obviously, would not be included in the escapement numbers for '67 through '91?

MR. MITCHELL: That's correct.

MR. LILLY: All right. Mr. Grinnell, I'm going to turn to you. Mr. Grinnell, during cross-examination Mr. Cunningham asked you some questions about S-YCWA-11. Do you have that in front of you?

MR. GRINNELL: Yes, I do.

MR. LILLY: And I have some follow up questions. This exhibit shows a total of over 3 million -- shows that

total of over 3 million acre-feet of water could be required in some years to attempt to implement DFG's proposed temperature requirements. Is that correct?

MR. GRINNELL: That's correct.

MR. LILLY: And just so we're clear, your analysis that led to the development of this table was based on the assumption that DFG's proposed requirements were average daily temperatures?

MR. GRINNELL: That's correct.

MR. LILLY: Okay. Of the 3 million acre-feet, I'll say approximately 3 million acre-feet of water that is shown in the far-right column of this exhibit, how much would have to come from controlled releases of stored water versus just bypasses of unimpaired flows?

MR. GRINNELL: Well, this is dry years. And it's also the water, you will notice that the requirements essentially from April to October are the required releases, and so during that time period of dry years the great majority of this water would have to come from New Bullards Bar as there's minimal inflow compared to these volumes coming from the middle and south.

MR. LILLY: Okay. And is there -- also during this time frame, can you comment on the amount of unimpaired flow that would actually be coming into New Bullards Bar Reservoir from upstream?

MR. GRINNELL: Yeah. Again, it would be minimal compared to these volumes.

MR. LILLY: Now, Mr. Cook asked you some questions about the temperatures of the Middle and South Forks of the Yuba River. Please explain why that water could not be used to attempt to implement lower temperatures in the Lower Yuba River during the summer months.

MR. GRINNELL: Yeah. Again, because these are summer volumes, the inflow from the Middle and South Yuba in the summertime are warmer than the -- certainly the water coming out of New Bullards Bar and higher than the temperature requirements.

So not only would releases from New Bullards Bar have to overcome the temperature affects of the solar radiation heating and conductive heating of the Lower Yuba River, or transit of the Lower Yuba River, but also those releases would have to overcome the impact of the warmer waters flowing in from the South and the Middle.

MR. LILLY: Now, Mr. Cunningham asked you some questions about the first page of Exhibit S-YCWA Exhibt 41. Do you have that in front of you? If you don't, I have a copy right here.

MR. GRINNELL: Yes, I have it.

MR. LILLY: Okay. And I believe that the first page of this exhibit states that some of the data that were

used to estimate the historical temperatures at Daguerre Point Dam was based on a regression analysis. Is that correct?

MR. GRINNELL: Yes, it is.

MR. LILLY: And why did you use a regression analysis to develop these estimates rather than the actual measured data?

MR. GRINNELL: For Daguerre Point Dam, unlike Marysville, the data set is limited in time frame. And so we had to develop a relationship between the Marysville temperature and the Daguerre temperature.

MR. LILLY: And there was extensive questioning of the regression analyses that are in Exhibit S-YCWA-18, which table shows the regression analyses that were actually used to estimate these historical Daguerre Point Dam temperatures.

MR. GRINNELL: It's the second table on Page 17.

MR. LILLY: Okay. Do you have an overhead of that?

MR. GRINNELL: Yes, I do.

MR. LILLY: Why don't you just go ahead and put that up on the projector. Now, I notice that there's a R-square value of .71 for January, but I don't think January is the major month of issue regarding water temperatures. And other than that, it appears that the R-square values are all in the .8 to .9 range.

And I just wanted to ask you: In statistics how good are correlations considered to be when the R-square values are in the range from 0.84 to 0.97?

MR. GRINNELL: Overall, it's very good. And for an analysis like this it's also very, very good.

MR. LILLY: Now, if you can -- you can go ahead and turn that projector off. Just going back to Exhibit S-YCWA-41 and turning to Page 2, were any of the data that were used to estimate the historical temperatures at Marysville based on historical analysis?

MR. GRINNELL: No, this is recorded historical.

MR. LILLY: And why did you use historical rather than regression here?

MR. GRINNELL: Because we had the data.

MR. LILLY: Basically you had more available data?

MR. GRINNELL: Yes.

MR. LILLY: Those are all the questions that I have. Thank you.

H.O. BROWN: Thank you, Mr. Lilly.

Mr. Gee?

MR. GEE: I have no questions, Mr. Brown.

H.O. BROWN: Mr. Sanders?

MR. SANDERS: No questions.

H.O. BROWN: I'm sorry, Mr. Cunningham.

MR. CUNNINGHAM: Sir, I have a couple questions for

Mr. Grinnell.

H.O. BROWN: Okay.

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RECROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY CALIFORNIA DEPARTMENT OF FISH AND GAME

BY MR. CUNNINGHAM

MR. CUNNINGHAM: Mr. Grinnell, in response to some very concise questions from your counsel on redirect you responded as to your regression analysis that you used to prepare Exhibit S-YCWA-41, and specifically to your regression analysis you used to prepare the portions of that first page identified as historic flows.

Mr. Grinnell, how many actual historic flows were used in preparation of S-YCWA-Exhibt 41, Page 1?

MR. GRINNELL: You mean temperatures?

MR. CUNNINGHAM: I mean historic temperatures.

MR. GRINNELL: I don't have that specific number, but we do show that data set in YCWA-Exhibt-18 in the back of the report. So the specific number I can't quote, but it is plotted.

MR. CUNNINGHAM: Well, Mr. Grinnell, to the extent that you have concluded that your regression analysis has a high level of accuracy because of its R value as you've identified in S-YCWA-18, does not the level of accuracy also require at least some comparison with actual historic

flows to establish whether or not your statistical analysis has any validity at all?

MR. GRINNELL: Comparison to historic temperatures, yes.

MR. CUNNINGHAM: I'm sorry, that's correct. I mean isn't it true that statistics without any comparison of the real world can be used to establish just be about anything?

MR. GRINNELL: Well, I mean that's what the R square does. I mean it's a measure of the effect that the variables have on the outcome. For instance, R square you know of a .9 would show that 90 percent of the variation in the outcome is driven by variation in the variables within the regression prediction.

MR. CUNNINGHAM: But as I understand it the "R" in R-square value, again, is only a portion of the statistical analysis methodology itself, it does not reflect an attempt to correlate the numbers you derive from your statistical regression analysis with that of actual or real flows or real temperatures; isn't that true?

MR. GRINNELL: It's the resultant. It's not the -- it's the resultant. It's a measure, statistical measure of how good your regression is based on the data you've got available to work with.

MR. CUNNINGHAM: Mr. Grinnell, if you have -- just looking at this S-YCWA-41, Page 1, I see you have the whole 12 months. And you have identified distribution of historic 1989 to 1999, that's 11 years, I believe, monthly average daily mean flow temperatures at Daguerre Point Dam.

If you have only one measured monthly average daily mean flow at Daguerre Point Dam in one year out of those 11 years, does your regression analysis reflect its level of validity as compared to the real world anywhere in the document that I can see? It only had one year of real historical data.

MR. GRINNELL: Well, that's not correct. We had more than one year. In order to develop the regression and examine how good that regression is, Page B4 of YCWA-18 plots -- shows a plot of the data. And as you can see we had -- let's see, one, two, roughly three-plus years of data to examine the relationship that we used in order to develop those historic temperatures. It's daily information. So, you know, it's hundreds of data points. So it's quite a bit of information.

MR. CUNNINGHAM: Mr. Grinnell, for each of the months identified can you tell me specifically how many data points in the real word you had to compare against -- or to prepare your regression analysis? Now, you may have

had some, as you say from your exhibit, some three-plus years of data.

Do you have three or more years of data for each of the months identified, for all 12 months?

MR. GRINNELL: Okay. I guess I need to ask you to clarify. You mean in order to develop --

MR. CUNNINGHAM: The regression analysis.

MR. GRINNELL: Okay. Well, there are a couple of -- there's two gaps in the early period data, the '74 to '77 data that was used. So I'm just trying to get an idea here.

MR. CUNNINGHAM: We're talking about, Mr. Grinnell, the document I'm looking at, again, says, "Historic Distribution of Historic," paren 1989 to 1999, closed paren, "of daily mean temperature at Daguerre Point Dam."

I presupposed that you used historic data from that period of time in the preparation of your regression analysis offered in this exhibit.

MR. GRINNELL: Yes.

MR. CUNNINGHAM: How many years of actual real-time data, temperature data for each of those months do you have measured at Daguerre Point Dam to prepare your regression analysis?

MR. GRINNELL: I guess I don't understand the question, because you're adding at the end of it, "to

prepare the regression analysis."

MR. CUNNINGHAM: Well, you tell me that: Is some of the information that I see on this Page 1 is synthesized for the regression analysis?

MR. GRINNELL: Yes, that's correct.

MR. CUNNINGHAM: So how much data do you have from the period 1989 -- real data from the period 1989 to 1999 measured at Daguerre Point Dam for each of the months identified in the preparation of the rest of your synthesized data that you then incorporate into this chart?

MR. GRINNELL: For that time period used in the regression analysis, again, it's shown on Page B4 in the lower chart. The data measured at Daguerre to develop the regression analysis is shown and it is for a portion of 1988 -- 1998.

MR. CUNNINGHAM: So how did you conclude -- again, I'm just reading the title of your chart, that, for example, that your regression analysis is accurate for June on this first page --

MR. GRINNELL: Because --

MR. CUNNINGHAM: -- if you have no measured real temperatures at Daguerre Point Dam during 1989 through 1999?

MR. GRINNELL: Well, we have other -- in order to

develop the regression, we have temperature data from other periods in June, just not within that '89 to '99 time period. We have several years of data in order to examine -- to develop and examine our regression analysis to develop those numbers.

MR. CUNNINGHAM: So, essentially, what I can conclude from what you're telling me now is the title of this document doesn't really mean what it says. That this isn't actually historic data from '89 to '99, or data that is synthesized for this period of time through a regression analysis prepared specifically for this period of time.

That you've used a regression analysis to prepare, through other years and other data points, a statistical tool, as it would, to then create these artificial times and temperatures on this page. Is that what you're telling me?

MR. GRINNELL: Well, I wouldn't characterize it incorrect. We have some historic data in this data set. And then as the footnote number one says, that it's supplemented by the estimates from the regression analysis. I think we're trying to be very accurate in the way we portray this information.

MR. CUNNINGHAM: But you're just telling me the regression analysis that you're referring to was not one

that was prepared for these 11 years. Isn't that what you're telling me, it's actually a statistical tool you prepared that uses other years not reflected on these 11 years?

MR. GRINNELL: Well, the idea behind the regression is to relate physical affects. So the physical affects don't know what year it is, so to speak. So that we're able to provide a regression analysis that takes into account those physical affects.

Now, I would think that they would apply in this time period as we use the information in the -- from the data sets from the '70s to look at these, because it's a fairly -- the nice thing about this relationship is that the relationship between the Marysville temperatures, which is the basis for this, and the Daguerre temperatures are fairly straightforward because there's no human intervention, so to speak.

The flows, it's just water flowing from Daguerre to Marysville. You've got the heating effects. So because it's somewhat more simplified than the other affects that we look at for regression analysis on the river we feel quite confident in the data and the statistics that bear that out.

MR. CUNNINGHAM: Well, I guess one last question, Mr. Grinnell, to the extent you're then perhaps using

real-world temperature data from the '70s to synthesize temperature data for the '90s, you presuppose that all the conditions on the river were similar during those two time periods; isn't that correct?

MR. GRINNELL: The relationship is developed partially by using information from the '70s, but the actual prediction for these data uses the 1989 to 1999 Marysville basis, flows, air temperatures. So we are using the information, the recorded information that make up that regression from that 1989 to 1999 time period.

MR. CUNNINGHAM: Yeah. Mr. Grinnell, as I understand the way regression works in this case to calculate these temperature points, you've taken real-world data that you have at Marysville for all the time periods relevant, and you have also prepared a statistical analysis -- I want to say fudge factor, but we'll call it whatever you wish -- that you would then use to correct that Marysville's temperature to produce the synthesized temperature at Daguerre Point Dam --

MR. LILLY: Objection. If he wants to say, "fudge factor," he can say that and I'll object on the grounds that it's ambiguous. But if he says, "You call it whatever you want," the question is ambiguous. He has to call it what he wants and then Mr. Grinnell can answer the question.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I can call it a whole lot of things. I'll rephrase the question if Mr. Lilly has trouble with the use of "fudge factor." Mr. Grinnell understands what I'm talking about and I do believe that he can answer the question.

Mr. Grinnell, I'll reask you the question. The way you obtained these synthesized temperatures at Daguerre Point Dam, to the extent some of these were synthesized, that you use real-world data, actual measurements at Marysville and you manipulated it through the use of the statistical analysis model that you essentially created of a series of numbers or multipliers or divisors that allowed you to correct the temperature at Marysville to obtain a synthesized temperature at Daguerre Point Dam; isn't that correct?

MR. GRINNELL: Well --

MR. CUNNINGHAM: You can call it a regression analysis, Mr. Grinnell, but isn't that correct, that's essentially what you've done?

MR. GRINNELL: I would call it a regression analysis, because that's the basis for a huge volume of scientific analyses and conclusions. So I think it's a pretty darn good way to do it.

MR. CUNNINGHAM: Okay, Mr. Grinnell, to the extent

that you've done it, you had to at least have some real world points at Daguerre Point Dam to compare your regression analysis to establish a minimum level of accuracy or validity; don't you?

MR. GRINNELL: Absolutely. And --

MR. CUNNINGHAM: Okay. Stop, Mr. Grinnell, let's go through this very thoroughly so we understand this. If you use 1970's data, real measured data at Daguerre Point Dam as your comparison point to establish the level of the accuracy of your regression analysis, you presuppose that that actual measured data reflects exactly the same world we're looking at today, that there are no new or different modifying factors; isn't that true?

MR. GRINNELL: No. That's -- we're not purporting that there is nothing different between '70 -- that wasn't the purpose of these exhibits. We're using that information to develop the regression relationship.

MR. CUNNINGHAM: Mr. Grinnell, as a scientist when you prepare a regression relationship you attempt to verify the accuracy or validity of the relationship, don't you?

MR. GRINNELL: Yes.

MR. CUNNINGHAM: And when you do it you look at hopefully as much real-world data at the point you're trying to obtain through your regression analysis as

possible, correct?

MR. GRINNELL: That's correct.

MR. CUNNINGHAM: And you hope that it reflects, or it has no other undisclosed variables associated with it; isn't that true? For example, let me give you a hypothetical:

If the data that you used for the 1970's at Daguerre Dam, the actual measured data at Daguerre Dam reflects, for example, this is a hypothetical, for example, reflects the fact that at that point in time there were large discharges of flows from the Goldfields at warm temperatures during the summer months, or reflects the fact that in the 1970's there were large diversions through pump extractions of waters between Daguerre Point Dam and Marysville, you must somehow acknowledge that those variables existed then, those events existed then and examine whether or not your present set of circumstances is similar, don't you?

I mean, for example, if now those diversions have ceased and the large warm water returns have also ceased, doesn't that put some doubt into the use of the 1970's data to verify your regression analysis?

MR. LILLY: Objection. Assumes facts not in evidence.

MR. CUNNINGHAM: It's a hypothetical, Mr. Brown.

I'm sorry, hypotheticals do that.

MR. LILLY: And if he wants to characterize it as a hypothetical, that's fine. But in the long question it was not clear that it was stated as a hypothetical.

H.O. BROWN: All right. I think it's clear now. Do you still wish to rise, Mr. Minasian?

MR. MINASIAN: No. I heard three hypotheticals.

H.O. BROWN: All right.

MR. MINASIAN: Perhaps, Mr. Cunningham --

H.O. BROWN: It's a hypothetical question, go ahead.

MR. GRINNELL: Hypothetically, if there was some major significant changes in that time period and we didn't take -- then there -- there is the possibility that those effects would affect the accuracy of the regression analysis and the prediction, absolutely.

But we also do have a limited amount of data in the 1998 time period, which also again as I keep saying on before -- of YCWA-18 also shows how our recorded and estimated temperatures compare. So -- and, again, given the fact that there is -- it's a relatively straightforward temperature, physical impact that's going on for the Yuba River between Daguerre and Marysville we felt -- I feel quite confident about that prediction.

And, certainly, quite confident about the way its used here, because we're using this as a comparison. The

whole point of these was to compare the two sets of information. So, absolutely.

MR. CUNNINGHAM: Thank you. Mr. Grinnell. Thank you, witnesses.

Thank you, Mr. Brown.

H.O. BROWN: Mr. Cook.

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RECROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY MR. COOK

MR. COOK: Mr. Grinnell, I believe you were the one that answered Mr. Lilly's question about the temperature flowing into Englebright Dam from Middle Fork and the Oregon Creek. Do you recall that?

MR. GRINNELL: I answered a question that included discussion of those inflows, yes.

MR. COOK: And you indicated in your testimony that the water coming in from the Middle Fork and Oregon Creek would be warmer than the water -- the North Fork as it went into the North Fork into Daguerre Point Dam? Does that make any sense?

MR. GRINNELL: You got me confused now.

MR. COOK: Well, in any event, the water temperature in the Middle Fork and Oregon Creek as it entered the main stem of the Yuba, was it your testimony that that water was a higher temperature than that already in the main

stem?

MR. GRINNELL: Yes. The data that I have reviewed shows for the summertime warmer water coming down the Middle Yuba. I don't have any information about Oregon Creek specifically or have reviewed any specific information on Oregon Creek, just the Middle and South and it's warm.

MR. COOK: The water in Bullards Bar Dam or reservoir comes from the North Fork of the Yuba River?

MR. GRINNELL: And from the diversions of Oregon Creek and the Middle.

MR. COOK: That's true.

MR. GRINNELL: Yes.

MR. COOK: And so you're familiar then with the fact that there is relatively little diversion of water from the North Fork above Bullards Bar Dam?

MR. GRINNELL: There's actually -- well, there's the diversion by OWID out to the Slate Creek and that's tributary to the North Yuba.

MR. COOK: So, in other words, some water coming in from Slate Creek would be reduced?

MR. GRINNELL: That is reduced by those diversions, yes.

MR. COOK: Okay. You're also familiar with the fact that up to a 1,000 cubic feet per second is taken out or

diverted from Oregon Creek and the Middle Fork?

MR. GRINNELL: Yeah, it's a variable diversion, but yes.

MR. COOK: Yes. And by reducing the water in Oregon Creek and the Middle Fork by that amount, would that not have an impact on the temperature of Oregon Creek and the Middle Fork as below the Log Cabin and Hour House Dam?

MR. GRINNELL: It's going to have some effect, yes.

MR. COOK: And what effect would that be?

MR. GRINNELL: Well, in the summertime the diversion -- or a diversion out of the Middle and Yuba and Oregon Creek reducing the remaining flows would mean that those flows, most likely -- I don't have specific analysis -- but common sense says that there would be some additional heating. Of course, it's a lower volume of water that comes down, too, so that has to be taken into account.

MR. COOK: As a result, if no water was diverted from Oregon Creek and the Middle Fork into the Bullards Bar Reservoir, would the temperature coming out of those streams, in your opinion, be reduced from what it is now?

MR. GRINNELL: Yes, it would. However, in -- that water does go to Bullards Bar. And the Bullards Bar water is then used -- when we're talking about temperatures, that water is then used to -- in our analysis, to aid in

the real operation if it was required to meet temperature requirements. That water would be needed and released in an attempt to reduce the temperature to meet the requirements.

MR. COOK: So in other words, you can reduce the temperature in Bullards Bar by diverting water from Oregon Creek and the Middle Fork?

MR. GRINNELL: Well, those provide a supply of water to Bullards Bar.

MR. COOK: That's true. And didn't you say that that would decrease the temperature of the water flowing into Bullards Bar from Oregon Creek and the Middle Fork?

MR. GRINNELL: No, I don't believe I said that. It would provide water to Bullards Bar.

MR. COOK: Would that raise the temperature in Bullards Bar Reservoir?

MR. GRINNELL: It depends on the time. That water in -- it depends on the time of the year. And, again, the temperature -- there's a temperature profile at Bullards Bar, there's a cool pool and then there's warmer upper waters.

MR. COOK: Bullards Bar is filled primarily with water from Oregon Creek, the Middle Fork, and the North Fork?

MR. GRINNELL: That's correct.

MR. COOK: And you have a cold pool in Bullards Bar. Is that on a year-round basis?

MR. GRINNELL: Yes.

MR. COOK: And what water is left in the Middle Fork and Oregon Creek, however, raises the temperature at Englebright. Is that correct?

MR. GRINNELL: In the summertime, generally, yes.

MR. COOK: You had an overhead a few minutes ago, I'm sorry I didn't get the title of it. It was entitled something like the Yuba River temperature at Daguerre Point Dam measured at the Marysville gauge.

MR. GRINNELL: I had this overhead, "Yuba River at Daguerre Point Dam versus Yuba River temperature -- actually, "Yuba River Temperature at Marysville Gauge."

MR. COOK: You said versus?

MR. GRINNELL: It's not versus, it's the relationship.

MR. COOK: And I hope I'm not totally redundant here, I was writing some when Mr. Cunningham asked you some questions, but you're familiar with the fact that the Marysville gauge is some four to five miles downstream from Daguerre Point Dam?

MR. GRINNELL: Four to five miles -- I believe the Marysville is at River Mile 5.8, I think. And Daguerre is at -- here we go, 11, so yeah.

MR. COOK: Four to five miles below?

MR. GRINNELL: Five or six, sir. Five to six miles.

MR. COOK: Well --

MR. GRINNELL: Five miles.

MR. COOK: Are you familiar with the fact that water passing over the crest of Daguerre Point Dam sometimes is reduced to the point that such water is virtually eliminated?

MR. LILLY: I'm objecting now. We're on recross after redirect. And I object. This goes beyond the scope of the redirect.

H.O. BROWN: Mr. Cook.

MR. COOK: The testimony I thought was rather specific about the temperature at the Marysville gauge being used with a regression analysis to determine the temperature of Daguerre Point Dam. And to get to the temperature some four to five miles downstream from Daguerre Point Dam it's necessary to determine what has changed between the dam, what is different between the dam and the gauge that is used to measure temperature at the dam.

And I believe it's proper to explore what happens temperature-wise between Daguerre Point Dam and the gauge that's being used. That's my point.

H.O. BROWN: Thank you, Mr. Cook.

Mr. Frink, what do your notes say?

MR. FRINK: Mr. Grinnell did not discuss the flow over Daguerre Point Dam in the redirect from Mr. Lilly. The points that Mr. Cook's is making are relevant information, but they involve subjects that were not addressed on redirect.

MR. COOK: I believe testifying about the temperature at the Marysville gauge and relating that to four to five miles upstream to the Daguerre Point Dam was testified to on his redirect. And I believe that what happens to the water between Daguerre Point Dam and the Marysville gauge tests that testimony that was presented. And I ask, again, if I can explore that issue?

H.O. BROWN: Mr. Lilly?

MR. LILLY: No further comment.

H.O. BROWN: Mr. Frink, any comments?

MR. FRINK: I believe that if he were going to explore that subject he could have done so on his initial cross-examination of the rebuttal statements from Mr. Grinnell. I don't think that the redirect brought out anything new on the points that Mr. Cook is getting into now.

H.O. BROWN: I agree, Mr. Cook. I sustain the objection.

MR. COOK: Thank you. That's all I have.

H.O. BROWN: All right. Mr. Minasian?

MR. MINASIAN: Nothing, Mr. Brown.

H.O. BROWN: Mr. Bezerra?

MR. BEZERRA: We have no further questions, Mr. Brown.

H.O. BROWN: Thank you.

Mr. Morris?

MR. MORRIS: No questions, Mr. Brown.

H.O. BROWN: Staff?

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RECROSS-EXAMINATION OF YUBA COUNTY WATER AGENCY

BY STAFF

MS. LOW: I just have a couple questions on this temperature issue for Mr. Grinnell.

You used apparently in your development of the historical temperatures in Exhibit 41 the 1989 through 1999, you actually used data from 1975, '76, and '77; is that correct?

MR. GRINNELL: To develop the regression relationship, yes.

MS. LOW: Okay. Were there no other water temperature data available since this time period for those sites?

MR. GRINNELL: The only data, the actual recorded data that we had was the USGS information from that '74 to

'78 general time period and some recordings that the Yuba County Water Agency has been doing starting essentially in '98. So that's the extent of the information that we had, that we could find.

MS. LOW: Okay. Were the '98 data available or used at all in the regression analysis?

MR. GRINNELL: Yes. That's also part of the data set that was used.

MS. LOW: It was?

MR. GRINNELL: Yes.

MS. LOW: From '98 to the present --

MR. GRINNELL: It's shown --

MS. LOW: I see where it is, in Exhibit 18?

MR. GRINNELL: Yes.

MS. LOW: Table -- Page B4?

MR. GRINNELL: That's correct.

MS. LOW: Okay. Yeah, I see that. There's probably a few months' worth of data --

MR. GRINNELL: Yes.

MS. LOW: -- from 98/99 period?

MR. GRINNELL: Yes.

MS. LOW: Okay. I'm wondering if -- what the conditions were in 1976 and '77. Those were two fairly severe drought years. And I'm wondering if the reservoir storage conditions at New Bullards Bar would have affected

measured water temperatures at Marysville or Daguerre Point Dam?

MR. GRINNELL: Certainly, it would affect it. But, again, we're trying to establish a relationship between those two points. So, for instance, for 76/77 it was dry, flows were low. So we would be looking at data sets in the upper temperature ranges. But those are -- you know, those are cumulative and effects that are present at both locations. So, again, we're trying to relate between those two locations and they include all of the upstream affects.

MS. LOW: Okay.

MR. GRINNELL: So it's just the physical relationship that we're trying to establish.

MS. LOW: So the fact that those were dry years and may have had elevated water temperatures at both sites would not have affected the --

MR. GRINNELL: It just basically gives us data in that upper range --

MS. LOW: Okay.

MR. GRINNELL: -- to work with.

MS. LOW: Okay. Okay. Okay. But there were no other reliable water temperature data available other than what you used here --

MR. GRINNELL: No.

MS. LOW: -- on the river?

MR. GRINNELL: No.

MS. LOW: Okay. Thank you.

MR. FRINK: Staff doesn't have any other questions.

H.O. BROWN: Okay. Do you have any exhibits that you wish to add for this panel that we haven't put in already?

MR. LILLY: Yes, I do. I do have about four or five follow up questions on Mr. Cunningham's questions that I would like to ask at this point.

H.O. BROWN: I think we're all through here, Mr. Lilly.

Mr. Frink?

MR. FRINK: It's at the discretion of the Chair, but we've had direct, cross, redirect, recross, rebuttal, cross, redirect, recross.

H.O. BROWN: Yes. We're all through, Mr. Lilly.

MR. LILLY: Well, my problem is that Mr. Cunningham's recent questions have raised some issues that are currently not resolved in the record. And I would like an opportunity to ask questions about those.

H.O. BROWN: Well, have we gone for a while on this one, Mr. Frink, the written summary at the conclusion?

MR. FRINK: I assume if the parties wish to submit legal briefs that they can address any issues that they

believe are touched on by the factual record.

H.O. BROWN: All right. Cover those in your legal brief.

MR. LILLY: Okay. Well, obviously, a legal brief can't offer no new evidence, but if that's the Hearing Officer's ruling, I won't pursue any more questioning.

H.O. BROWN: Yes, that's the ruling.

MR. LILLY: Okay. At this point we would like to offer several new exhibits into evidence and those would be S-YCWA-31 through 51 and S-YCWA-101 through 104.

H.O. BROWN: All right. 31 through 51 and 101 through 104, are there any objections?

MR. CUNNINGHAM: I'll take the lead on objections, if I might.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I'd like to object to the Yuba County Water Agency's Exhibits 44, 46, 47, 48, 49, 50, 101, 102, and 104. If you would like, I will go through them individually.

H.O. BROWN: Well, in a minute. All right. We have exceptions to 44, 46, 47, 48, 49, 50, 101, 102 and 104; is that correct?

MR. CUNNINGHAM: Yes, sir.

H.O. BROWN: Anyone else have any objections? All right. Then all the other exhibits as proposed, with

those exceptions, will be admitted into evidence.

Let's go with Number 44, Mr. Cunningham. What's the objection there?

MR. CUNNINGHAM: I'll make Mr. Lilly's standard objection, Mr. Brown. It's hearsay. These were Mr. Bratovich's opinions of what somebody else said, or his interpretation of what somebody else said. Classic hearsay objection, Mr. Brown.

H.O. BROWN: All right. Response, Mr. Lilly?

MR. LILLY: We agree with Mr. Cunningham that these are hearsay. Obviously, they were offered for the purpose of illustrating the defects in the Department of Fish and Game's witnesses' reliance on hearsay, so I believe these exhibits should be given the same treatment that the Department of Fish and Game's hearsay evidence was given.

H.O. BROWN: All right. Mr. Cunningham, is that the same concern on any of the other Exhibits 46, 47, and 48?

MR. CUNNINGHAM: It's the same on 47.

H.O. BROWN: Pardon?

MR. CUNNINGHAM: I'm sorry. It's the same objection on 47. It's a part of the objections on many of the other things. This is the standard objection that Mr. Lilly has also been making to the extent that it's hearsay. I understand hearsay is admissible. In this proceeding it would be given whatever weight --

H.O. BROWN: Which of these exhibits are you objecting to with the hearsay?

MR. CUNNINGHAM: Specifically as to hearsay 47 -- I'm sorry, 44, 46, 47, 48, 49, 50, and 101.

H.O. BROWN: All right. Mr. Cunningham is objecting on hearsay for 44, 46, 47, 48, 49, 50, and 101.

MR. LILLY: Yes. Mr. Brown, I have to amend my prior response. Actually, I do not believe these are hearsay -- well, I better go through in order. Except for -- let me go through them in order. There may be different statements --

H.O. BROWN: Let's take the hearsay ones first.

MR. LILLY: Yes.

H.O. BROWN: Then we can get rid of those.

MR. LILLY: Regarding 44, 47, 48, 49, those actually just were exhibits to illustrate Mr. Bratovich's testimony. He had reviewed these reports, but this is his testimony regarding those reports. So since these are actually statements from a witness who is here, I disagree with the argument that those are hearsay.

Now, the other ones are either quotations or copies --

H.O. BROWN: Okay. Wait a minute. Let's take those first. Okay.

MR. LILLY: That's fine. Excuse me.

H.O. BROWN: Mr. Cunningham, any response in 44, 47, 48, 49 as testimony regarding those reports?

MR. CUNNINGHAM: Mr. Brown, to the extent Mr. Bratovich testified these documents say on them, "a reference," and then a conclusion as to what the reference said as to what fish were being discussed, what temperature ranges were being discussed, what geographic locations were being discussed. To the extent these are saying what Mr. Bratovich attempted to say that the study, for example, of Mr. Bell cited by S-DFG-13 on Page 4, this is -- the first one on Exhibit 44, dealt with spring-run chinook salmon and concluded the temperature range for migration was 38 to 56 and so forth. I'm sorry, we do not have the document itself here. This is Mr. Bratovich's statement as to what that document says. That's classic hearsay.

H.O. BROWN: Okay.

MR. CUNNINGHAM: Whether I should have objected to Mr. Bratovich's testimony, I'll move to object now and move to have all of his testimony as to this stricken, if that's appropriate. But I do think at least as to these context it is classic hearsay. This is saying what somebody else said.

H.O. BROWN: All right.

Mr. Lilly.

MR. LILLY: And I disagree. We are getting into legal details here. Hearsay is defined as an out-of-court statement. And these documents here are not out-of-court statements, but they are Mr. Bratovich's summary of the literature used. So I stand by my statement that these are not hearsay.

H.O. BROWN: Mr. Frink.

MR. FRINK: It appears to me that they're Mr. Bratovich's summary of out-of-court statements and that they would be hearsay, but they're nonetheless admissible under the applicable provisions of the Board's regulations and the Administrative Procedures Act.

H.O. BROWN: Okay. We'll go with that. We will admit them as hearsay and they're admitted into evidence. So that is 44, 47, 48 and 50 --

MR. CUNNINGHAM: Mr. Brown, if I might. I had an additional objection on 48.

MR. FRINK: 49, too.

MR. CUNNINGHAM: May I make my additional objection as to 48?

H.O. BROWN: All right. I'll permit that.

MR. CUNNINGHAM: This is, again, as you can see it's another one of the summaries Mr. Bratovich has prepared. I would object as that inaccurately reflects the testimony of this witness.

The witness clarified on the record in response to cross-examination questions from myself that the bottom line on Exhibit 48, the Cech and Myrick study, did not reflect the maximum food conversion efficiency of 66 degrees Fahrenheit. However, this document itself says maximum growth rates for food conversion efficiency --

THE COURT REPORTER: Mr. Cunningham, you're going to have to slow down when you're reading.

MR. CUNNINGHAM: I'm sorry. I do believe that this document inaccurately reflects the testimony of the witness.

H.O. BROWN: Inaccurately reflects the testimony of the witness here?

MR. CUNNINGHAM: Yes.

MR. FRINK: Mr. Brown, if I might?

H.O. BROWN: Yes.

MR. FRINK: There are numerous clarifications that many witnesses have made regarding statements in the exhibits, and I think the Board would consider the record as a whole, both the exhibit and the clarifications that the witnesses have made regarding the exhibits.

MR. CUNNINGHAM: With that, Mr. Brown, I'll submit it.

H.O. BROWN: All right. On that basis, Mr. Frink, we will admit 48 into evidence. That leaves 46 and 50.

MR. CUNNINGHAM: Yes, 46 and 50, Mr. Brown. 46, 50, and --

MR. LILLY: And we can get through those very quickly, Mr. Brown. I agree these have quotations from reports and are hearsay and should be admitted subject to the Board's rules on hearsay.

H.O. BROWN: All right. 46 and 50 are admitted on the hearsay rule.

MR. CUNNINGHAM: Thank you, sir.

H.O. BROWN: Then we're up to 101.

MR. CUNNINGHAM: My objection as to that is hearsay. Again, this is a reference to a piece of the report, but the author of the report was not presented here, again, understanding that the Court may admit hearsay. But I would also like to object to 101 in that it lacks sufficient foundation to be admitted as an exhibit in that all we have for this exhibit are the front page, which identifies the study and three charts or graphs.

I will concede that Dr. Rich was questioned as to the use of this exhibit, but she did not provide sufficient foundation herself to establish the validity of the documents prepared and presented.

H.O. BROWN: All right.

Mr. Lilly?

MR. LILLY: And I disagree. Ms. Rich did testify

and confirm that this was a report that she had actually relied on in developing her testimony. And, in fact, had talked to the authors and had a lengthy discussion about the curves and specifically confirmed that there had been no dispute about the data points. So I believe that there was adequate foundation established for that.

Also, regarding 101 and 102, I don't believe that --

H.O. BROWN: Let's stay with 101 for the moment.

MR. LILLY: Okay. Regarding 101 on the hearsay objection, to the extent that this is simply offering data rather than statements, I don't believe that the hearsay objection has merit.

H.O. BROWN: Okay.

Mr. Cunningham, any response?

MR. CUNNINGHAM: Mr. Brown, I'm sorry. To the extent that the document provides data points, or opinions, or conclusions, to the extent it's provided as an out-of-hearings document for the truth of the matter asserted it is classic hearsay.

H.O. BROWN: Thank you.

Mr. Frink.

MR. FRINK: It is hearsay. Dr. Rich discussed it in her testimony. I believe sufficient foundation was provided and it is admissible.

H.O. BROWN: Okay. On that basis it's admitted, Mr. Frink.

How about 102 now?

MR. LILLY: No further comment. My comments regarding the hearsay on 101 apply to 102 and I won't repeat them.

H.O. BROWN: All right. Then the same running will apply to them, if that's all right with you, Mr. Cunningham.

MR. CUNNINGHAM: That's fine, your Honor.

H.O. BROWN: Okay. Then 104.

MR. CUNNINGHAM: 104, a lack of foundation. This document is identified as the full citations relied upon by McKee, that's the title at the top of the document or exhibit. Mr. Bratovich provided this document in both cross-examination and in redirect has provided additional discussion of this document, but at no time did he indicate how he concluded that Ms. McKee relied upon these citations. I'm sorry.

Did he ask Ms. McKee did she rely on these citations? He has assumed that. The assumption is not itself on the record, or if it is -- I'm sorry, it is on the record, but the assumption does not reflect what this says.

This does not say: I assume she read all of

these, or I assume she cited all of these. Mr. Brown, I routinely cite a court case, but I don't necessarily cite all the cases that that court itself looked at in earlier decisions. This does not reflect the full citations relied upon by Ms. McKee and there's no evidence to the extent present before this court to lay the foundation that these were the documents that she relied upon.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Lilly.

MR. LILLY: Mr. Bratovich testified how he assembled the listings here of the 141 reports that are listed here. It's offered for that purpose. It's not hearsay. These are simply the titles to the reports, they're not out-of-court statements.

And as far as Mr. Cunningham's comments regarding the title, that goes to the weight of the evidence, not to its admissibility. Mr. Bratovich has explained how he complied that and what he meant by that statement. If Mr. Cunningham wants to recharacterize the title he can do that in his closing brief. But the record is clear on what the impact, or what the importance of this exhibit is for this hearing.

H.O. BROWN: What about the foundation?

MR. LILLY: And the foundation was established by Mr. Bratovich during his testimony. He explained how he

started with the eight reports cited in S-DFG-13, which was Ms. McKee's testimony, and how he went through and looked through those reports and then the reports cited in those reports and then the reports cited in those reports.

And all this is is a listing of the reports that he determined were basically in that chain of analysis. We're not offering it for anything beyond that, but it does show the reports that he relied on in his review.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Again, the title of the document says, "Full Citations Relied upon by McKee." There's no foundation that she relied upon these 141 documents. Either that or if they want to submit that she did rely on all of these, it really does go to her credibility and I would gladly accept that.

But I don't think that Mr. Bratovich's foundation established what this document was as far as Ms. McKee. He did an interesting literary analysis. Whether it's relevant or not, I can make an objection that this is also irrelevant. And also a recognizable objection in front of this Board, not every document that this Board sees necessarily must be accepted as a relevant exhibit.

What this was used to establish, I believe, was an attempt to impeach or question the credibility of Ms. McKee and the sources she relied upon. This says that

she relied upon 140-some citations, but nobody asked Ms. McKee if she did. Again, it's a lack of foundation.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Frink.

MR. FRINK: I would agree that there is not a foundation that Ms. McKee relied upon each of the 141 documents that are listed in Exhibit 104. And without the statement by her that she relied upon those, I thing the title is misleading and I think that the list of 141 studies is of questionable relevance.

MR. LILLY: Mr. Brown, if that's the problem we can address it very simply. I don't agree with these arguments, but we offer all of Exhibit S-104, except for the title line. That can be stricken from the exhibit. The rest of the exhibit clearly illustrates Mr. Bratovich's testimony. And I think that that would remove any objection as to whether or not Ms. McKee did or did not rely on these. So if we can just do it that way, we can just take care of it.

H.O. BROWN: Is that satisfactory, Mr. Cunningham?

MR. CUNNINGHAM: Mr. Brown, I don't know what to say. It solves my foundational problem and leaves me with one of relevance. I'm sorry, what relevance does this document then have if all it is is just 141 citations?

These are not citations that Mr. Bratovich

himself relied on. These are not citations that he used in forming an opinion. These are not citations that Mr. Mitchell relied upon. And they're not part of what he used to form his opinion. Exactly what relevance does this document have now with that deletion? I'd argue, none.

H.O. BROWN: Relevance?

MR. LILLY: Yes, it clearly is relevant. It was used to illustrate Mr. Bratovich's testimony and to give the detail of exactly what he did to determine whether or not DFG's optimal and preferred temperature ranges for these different life stages were, in fact, supported by the literature that was cited in those exhibits. So it's clearly relevant to illustrate his testimony and the detail of the analysis that he went into.

H.O. BROWN: Thank you.

Mr. Frink, anything to add?

MR. FRINK: I would have a brief question, it might go to the issue of relevance.

Mr. Bratovich, did you examine each of these documents that are listed in Exhibit 104? Was each of those documents a basis for statements that you made?

MR. BRATOVICH: The vast majority of them. Approximately 30 of these documents I was unable to obtain.

MR. FRINK: Mr. Brown, I would question the relevance of a listing of exhibits. We don't know that Ms. McKee relied on them and we do not know which ones Mr. Bratovich had relied on. And, frankly, I'm not sure what use it would be in addressing the issues in the hearing record.

H.O. BROWN: Are you talking about all of Exhibit 104, or portions thereof?

MR. FRINK: Well, without spending an undue amount of time, Mr. Bratovich indicated that he examined most of them, but probably didn't examine 30 of them. Without going through each one and seeing what conclusions he drew from which documents, I really do think that it is irrelevant to submit a list of 141 documents.

MR. LILLY: I disagree with Mr. Frink. I mean it's ironic that suddenly we're applying technical rules of evidence when at other times in this hearing the rule is basically the Board will consider a broad range of evidence and is not going to apply the technical rules of relevance that the court applies.

The point is on this exhibit it shows the process that Mr. Bratovich went through, rather than simply accepting some summary statements in literature summaries, that he went through a detailed analysis of all of the backup for those to determine whether or not the simple

summary statements in those literature summaries were valid or invalid.

And the fact that some of these documents were unpublished documents that he was not able to obtain does not make the document inadmissible. It shows that in the limited time available, his analysis was not complete. But it certainly does not detract from his analysis. And, therefore, it is still subject to admissibility under the court's -- excuse me, under the Board's rules.

H.O. BROWN: Thank you,

Mr. Morris?

MR. MORRIS: I believe the list is admissible on the Board's rule. I think it goes to show, at least to some extent, the credibility of DFG's witnesses -- witness, I should say. And I think that, you know, the Board's staff can use it to the extent that they wish. But I think not admitting it would deprive Mr. Lilly of something that ought to be in the record.

H.O. BROWN: Thank you, Mr. Morris.

I agree with Mr. Morris, but I also have the concerns that have been expressed here. And those concerns are in the record, but I would admit Exhibit 104 on those conditions.

That concludes this panel?

MR. LILLY: I guess so. There's nothing more we can

do with this panel.

MR. FRINK: Excuse me, Mr. Brown, Mr. Mona had a question regarding Exhibit 19-B, that would be S-YCWA Exhibt 19-B and S-YCWA Exhibt 29.

Mr. Mona, were you clear as to whether those are in the record yet?

MR. MORA: Well, does he want them admitted into the record?

MR. LILLY: I'm glad Mr. Mona is paying close attention, of course, he does have the computer printout in front of him. 19-B we offer at this time, because that was testified to by Mr. Grinnell. 29 and 30, we are waiting for Mr. Robertson's testimony, so those we are not offering at this time.

H.O. BROWN: All right. So you're offering 19-B?

MR. LILLY: Yes.

H.O. BROWN: Are there any objections to 19-B then? So admitted.

All right. Now, does this conclude the panel?

MR. LILLY: We have nothing further for this panel. Thank you.

H.O. BROWN: All right. Thank you, gentlemen, for your patience and your input into the process.

Let's see, when we come back after lunch we have -- do you have a second panel?

MR. LILLY: Yes. We have two more witnesses. They will both be quite short, Stewart Robertson and Don Wilson. Mr. Minasian had asked me about scheduling, because he has some out-of-town witnesses who we may want to have go first. And we will, certainly, refer to your ruling on that, but we were going to try to coordinate schedules during the lunch break and then make a proposal to you.

H.O. BROWN: All right. When we get back it will be either you or Mr. Minasian then that will be up then?

MR. LILLY: Yes.

H.O. BROWN: All right.

MR. MINASIAN: And as a courtesy to everyone I have the exhibits. I'll put them out on the table so you can have them before lunch.

H.O. BROWN: All right, the exhibits are on the table. And we'll be back here at 20 after 1:00.

(Luncheon recess.)

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TUESDAY, MAY 16, 2000, 1:20 P.M.

SACRAMENTO, CALIFORNIA

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H.O. BROWN: Mr. Minasian.

MR. MINASIAN: Mr. Brown, may I ask that Dr. Ernie Brannon be sworn, he has not previously appeared.

If you'd stand, Ernie.

H.O. BROWN: Do you promise to tell the truth during these proceedings?

THE WITNESS: I do.

MR. SANDERS: Before Mr. Minasian begins, I neglected to move my Exhibit 20 into the record before lunch and I would like to do that at this time.

H.O. BROWN: All right. Go ahead.

MR. SANDERS: With your permission, I'd like to move Exhibit S-SYRCL-20 into the record.

H.O. BROWN: 20?

MR. SANDERS: Yes.

H.O. BROWN: All right. Any objections to that?

MR. LILLY: I just have the objection that it's hearsay. And, therefore, is should be subject to being admitted into the record with the limitations on the use of hearsay evidence.

MR. SANDERS: That is fine with me.

H.O. BROWN: Okay. So admitted.

Proceed, Mr. Minasian.

MR. MINASIAN: Thank you. I believe, Board Member Brown, you're acquainted with Steve Cramer, the other witness in the panel who has previously --

H.O. BROWN: Welcome, Mr. Cramer.

MR. MINASIAN: I'm going to take both witnesses as a panel. And if I could ask for the leave of everyone to cross-examine Steve before we cross-examine Dr. Brannon, it would be greatly appreciated. Steve has a scheduling problem, hopefully, we'll finish both of them.

H.O. BROWN: Okay.

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REBUTTAL TESTIMONY OF SOUTH YUBA WATER AGENCY

BY MR. MINASIAN

MR. MINASIAN: Mr. Cramer, were you given a copy of the testimony of John Nelson and Julie Brown on behalf of DFG and asked to focus upon the issue of whether or not the temperature criteria recommended in that testimony for spring-run and fall-run on the Yuba River in the vicinity of Daguerre and Marysville was the appropriate temperature?

MR. CRAMER: I was given a copy.

MR. MINASIAN: And were you able to develop an opinion on that subject and a rational for that opinion that you're able to give us today?

MR. CRAMER: I was. Do you want me to go ahead?

MR. MINASIAN: Yes, if you will. What is your opinion?

MR. CRAMER: Well, I brought several slides that will illustrate some of the points that I want to make. What I have tried to do in the way that I would respond to the proposal for the temperature targets and what they are intended to accomplish is look at what kind of temperatures and flows we actually have with other chinook populations across the West Coast.

And I have drawn examples from many studies which I was the leader of, others which others were, but I have had the opportunity to study populations of chinook pretty much up and down the West Coast. And they make very interesting comparisons and there's strong consistencies between populations that you can see that tell what would happen if we were to try to change things in the Yuba River. Is it all right if I speak without the microphone?

H.O. BROWN: I think she can hear.

MR. CRAMER: Okay. The first point, I see in the testimony it appears that the targets that Cal Fish and Game is proposing would place spring and fall chinook in the same place in the Yuba River. That is, they were cited as spring chinook spawning throughout the Yuba River where fall chinook are also spawning.

And to start with, I want to be sure that we have this premise straight: Wherever throughout the range that spring and fall chinook occur in the same stream they are temporally isolated, they are spatially isolated from each other.

Spring chinook always spawn upstream in a cooler temperature regime than fall chinook. Now, when I say, "always," and I'm taking about these other examples, I'm referring to under natural conditions. There are situations where you find them on top of each other, those situations are where passage has been blocked usually by a dam.

I've listed a number of examples on the West Coast that demonstrate this, where you have both spring and fall-run in the same river. I'm going to give some additional example data on the Rogue River, which I lead studies on for a dozen years. I will also -- well, that's principally where I'll pull the information I want to give you an example of.

You could look this up for yourself and see this to be a fact. It's true throughout the San Joaquin Basin when you look at the historical data on where they were before the dams went in place. It's true in the Sacramento Basin. It's true in Butte Creek. Butte Creek is the one basin that you do have naturally spawning and

reproducing spring chinook and fall chinook now without a dam to prevent upstream migration.

You also still have them in the Sacramento, but they are in the situation where they're forced on top of one another by a dam. That being Shasta and Kenway. In the Klamath basin you have both runs, spring chinook were higher. I studied the Rogue Basin, I'll talk about it. Continue to proceed north, the Umpqua Basin, spring chinook are much higher in the basin.

The Snake River Basin, which my company has prepared a number of reports, I have worked with a lot of the rivers up in the Snake River Basin. Spring chinook are always well above fall chinook distribution. In the Yakima River where we're working presently, spring chinook are above fall chinook. In the Deschutes River, which runs into the Columbia from the Oregon side, a very strong separation of where the spring and the fall chinook are.

Then we recently finished a major report in the Puget Sound. One of the big basins up there, I'm using an example here is the Skagit, it has both spring even also has summer. Summers come in the middle between where falls and springs are.

Now the question is: Why are they all separated? If they are separated there must be a reason. And here temperature turns out to be the dominant reason why they

are distinct. Temperature turns out to be a driving force of the life history event, not necessarily just growth rate. And I know there's been testimony provided on temperatures for growth rate.

And I would like to strongly suggest we step away and focus only on growth rate, because temperatures trigger life history events. Spring chinook and fall chinook are different life histories. And those differences are triggered by changing temperatures.

Here is one of the key temperature relationships that triggers where you have spring and fall chinook. And I'll explain how this works. But what this -- this data actually comes out of the Transaction of the American Fisheries Society, an article by Beacham and Murray published in 1990.

They took temperature data from a large number of studies and plotted the results of all these various constant temperatures at which eggs were incubated. And for chinook -- they did all five salmon species found on the West Coast, but for chinook what you see is that survival rate of these eggs is at its highest point from about 4 degrees Centigrade to about 13 or so degrees Centigrade.

If we were to convert those, just to give you a point of reference in Fahrenheit, 10 degrees is 50, 20

degrees is 68. So 15 degrees is right about -- should be right about 60.

57 is the recommended temperature. 57 or 56 variously are the recommended temperatures to sustain the highest level of egg survival in chinook. And that, in fact, this data would bear that to be true. That as you get temperatures above 57 you start to decline in survival. It's not a 100-percent mortality, but you start to lose some survival, similarly, in cold temperatures you do.

Now, next what I'm going to show you is that throughout their range from -- I'll just talk from Oregon and California, you will find that spawning time typically occurs in the fall when temperatures drop below the 57 degrees, because as those temperatures are coming -- actually, I should point my finger in the other direction. As temperatures begin to decline in the fall, they would be higher in dropping, as they decline and on average hit that point where they are less than --

H.O. BROWN: Decline or increase in the fall?

MR. CRAMER: Temperatures drop in the fall.

H.O. BROWN: Okay.

MR. CRAMER: This scale is backwards for me to show you -- maybe I shouldn't try and draw on there. Temperatures drop in the fall. And as temperatures drop

in the fall, when the temperatures drop below this point of 13 degrees C is about when spawning begins. You'll see in the Feather and in the Yuba River that spawning generally does not occur before temperatures typically drop below that and that's constraining.

It constrains when you could have an earlier spawning. And remember spring chinook spawn earlier than fall chinook. The native runs in -- as indexed by Deer and Mill Creeks would spawn principally in September with a little bit in late August, a little bit in early October, but principally a September spawning.

That spawning segment does not exist in the Feather River Basin, including the Yuba. The ones that are now termed to be spring chinook principally are spawning as temperatures drop below 13 degrees C, typically in October.

Now, I led field studies by the Oregon Department of Fish and Wildlife for 12 years on the Rogue River, which has both spring and fall chinook. It is contained in a chinook ESU, that is under the Evolutionary Significant Unit terminology that National Marine Fisheries Service uses to judge their endangered species groupings and that would include the Klamath.

It includes chinook that turn south and intermingle with Sacramento, Central Valley stock chinook

in the ocean. They're caught in the same place, very much it's a co-occur in ocean catches.

This gives a spawning distribution that we measured over 1974 to '81. A significant event in the Rogue River occurred in 1977 when a major upstream dam was completed and plugged. So '74 through '77 constitute pre-impoundment data when it was a natural flow and temperature regime. And so -- extending into '81 you would still be working with returns that were produced in the pre-impoundment. So it was our data set from pre-impoundment fish.

So what you see is that at about kilometer 258 was the peak of spawning for spring chinook. And then for fall chinook, the dark line, the peak of spawning was about kilometer 180. And here's an important point: There were no fall chinook at all spawning above two -- kilometer 220. It's purely spring chinook. There's no fall chinook.

There are no spring chinook spawning below kilometer 190. There's a slight area where a few overlap and there's not very many fish in that area, kind of a middle area, it's kind of a no-man's land. But spring chinook and fall chinook are very distinct and separate in their distributions and that's retained year after year after year.

Here are the temperature profiles that corresponds to different areas on the Rogue River, I'll move that up. The lower profile is at kilometer 248, which corresponds to the most dense, in terms of spawners per kilometer, spawning area for spring chinook. So the bottom curve maybe we would say in a natural state is somewhat representative of the optimum for spring chinook.

The middle curve here represents the lower limits still of spring chinook spawning. It is above fall chinook spawning. And the lowest curve is at the lower end of fall chinook spawning. They do spawn all the way to the ocean, I have done surveys down the lower end. This is at kilometer 48 and there are spawners well below that, not as dense as they are up higher.

So I would assume the upper-most temperature curve is above optimal for chinook. The middle one here is still spring chinook, it is not fall chinook. So fall chinook would lie between these two curves. And the kind of temperature that would produce a life history, that turns out to be fall chinook. And what you will notice is in the middle of summer, that means the temperatures are up in the neighborhood of 20 degrees C in July and August, and importantly you look at when the temperature drops below 12 to 13 degrees C.

And you can see in the areas that are down where

fall chinook are occurring, that is not happening until October. In the spring chinook area, with this bottom curve, it happens usually sometimes in late August, but through September. So that's how you get that earlier spawning.

If these fall chinook -- if fall chinook from over here were to spawn in September in the same place they do spawn, most of the eggs would die. The temperatures would be too warm. So it's the incubation temperatures that they experience that determine which race could survive.

Now, for: What do you get in the Sierra Nevada east side tributaries? Cal Fish and Game, 1998, this is their status review of spring chinook in the Sacramento Basin. And they produced this composite of temperature regimes at different elevations taken from USGS stations in the Sierra Nevada.

And as we found to be true in the Snake River, Rogue River, wherever you look at it, temperature regime is very much related to elevation. These stack -- the uppermost line here is for the lowest elevation, it represents the warmest temperatures; and the lowest line is the uppermost elevation representing the coolest temperature.

MR. FRINK: Excuse me, Mr. Cramer. I'm wondering in

order so that the record is clear, if you could identify both the exhibit number and the page number of that exhibit that you're referring to as you go through this.

MR. CRAMER: Sure. This one is SY-5-4, I'm on the fourth figure now. Okay, so what we see here is that, again, the line that I've drawn across here is, actually, it looks like to me like it's kind of a drawn in by eye, it's not precisely measured on the scale, but that crossed line would probably be about 58. It corresponds to where a temperature at which mortality of eggs would begin if eggs were spawned at that time.

And what you see out here in the fall is as you come through the summer lows, that the dark filled-in triangles are still above it in September. Those dark filled-in triangles are 2- to 3,000 feet elevation, 2- to 3,000 feet which is well above the elevation of the Yuba River below Englebright.

And, of course, you do see later spawning. We see the spawning below Daguerre Point typically in November. And this lowest curve would show that -- I'm sorry, that uppermost curve would show that as well. When you're at elevation 1- to 2,000 -- I'm sorry, zero to 1,000 feet, that uppermost curve is still too warm in October, drops below in November, that's when you see spawning.

You do have to go up quite a ways to be in true spring-chinook territory where spawning would be typically in September. And you can see here the only one that dips into September you'd have to be at the -- you're at 3- to 4,000 would be the areas where you start to get into those kinds of temperatures, naturally, in this climate and flow regime.

What if we artificially change things and decide that we would want those temperatures at lower elevations because we want spring chinook in the Yuba River? The point of this slide is to show you where the spring -- the fall chinook that are there are spawning. And to make the point, they're spawning in the entirety of the Yuba River in large abundance.

This data by Jones and Stokes from their surveys from '91 to '99 --

MR. MINASIAN: And you're referring to 5-6?

MR. CRAMER: I'm sorry. Yes, I am -- 5-5.

MR. MINASIAN: 5-5.

MR. CRAMER: 5-5, catch me on that if I miss it. Yeah. Typically the spawning surveys going back historically were done in two reaches, Parks Bar which would be the Highway 20 bridge down and Daguerre Point, below Daguerre Point down in the lower half of the river. However, there's additional allowances that have been made

for up in the area that's called Rose Bar that continues up almost to Englebright.

And that area typically was not surveyed. So Cal Fish and Game was typically making the assumption that another 15.5 percent of spawners existed there. What the data show in the years where there actually were surveys done there, it never got down to 15.5 percent, in fact, in some years over a third.

Both in '94, again, in '96 over a third of the spawners were up in that upper area extending all the way to the dam, these fish are spawning in late October. In other words, spawning temperatures are not of a nature to support earlier spawning than that. And this is under high production. The fish are being produced there year after year after year.

Now, as I come to this stream from the Yuba River from many other places, the one thing that stands out strongly about the Yuba River is that it is naturally producing without hatchery supplementation, large numbers of chinook. It is a success story. Up and down the West Coast the Yuba River for fall chinook is a success story.

Now, we're proposing to radically change those temperatures, something will -- if we change the temperatures colder, what would have to happen -- well, what would happen is spring chinook might begin to become

a more favored life history, but it would be traded at the expense of fall chinook.

And I want to make the point that the fall chinook are doing very well. And you have a goal to double the fall chinook in the Central Valley. And here we compare, here's Yuba River fall chinook. My point in looking at this graph and compared with several other basins, the spawning abundance is fairly stable.

I mean it varies a bunch, but compared to other streams around that are mostly hatchery supplemented, the Yuba stands alone as being a large run of fall chinook without supplementation. It is more stable in the numbers that it produces. It ranges about five fold, from low to high. Most of these other will range from 10 to 20 to 30 fold from low to high.

Here's San Joaquin which has the Merced hatchery in it. This is Klamath, which has both Trinity and Iron Gate and other hatcheries in it. The Trinity River has a hatchery variation which is over 10 fold.

Another example, this becomes -- 5-7. These instead of being actual total spawner counts are indices of spawner abundance. Peak spawner count is maintained in the Eel River. You can see radical fluctuation there.

Moving further north, the Rogue River. The Rogue River has some very large abundances in some year and

there is no hatchery supplementation in the Rogue River. You can see that these things vary over 30 fold in abundance from high to low within the last 15 years.

MR. MINASIAN: You're referring to Figure 5-7?

MR. CRAMER: 5-7. Now, another event that would become a problem -- I don't know if you need to ask me another question, but I wanted to transition to another point that was made in the Cal Fish and Game testimony which was that the late -- that the cooler temperatures created by releasing more flow would not reduce -- would not cause later outmigration and create a survival problem as these fish pass through the Delta.

And so I came back to emphasize how extensive the data are that confirm this is chinook's typical life history and it will happen. If you cool temperatures you will cause fish to rear longer, go out later; if you warm them you'll cause them to complete their rearing earlier and move out earlier.

And the main point then to look towards, which I'll reach here, is that once they go through the Delta they are at high risk in a low-flow year, because they will pass the time when the temperature is undesirable for their survival.

This was in my original testimony. So this is Figure 5 of my first -- of my Exhibit 2, this would be

South Yuba Exhibit 2, Page 19. I had given you this from the South Umpqua River. I gave one example because it was in the published literature. This is a peer-reviewed journal article.

It shows that the outmigration date of these chinook was later, a higher jullian day in colder spring temperatures. And as temperatures got warmer, outmigration was earlier. So the fish were using temperature as a queue to identify appropriate migration time.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, if I might, I appreciate your testimony, Mr. Cramer. But I'm puzzled, Mr. Brown, how the use of an earlier Yuba County Water Agency's exhibit and additional testimony on that same exhibit is somehow rebuttal here. That information has already been provided to the Board. And Mr. Cramer did testify and produce that material at an earlier point in time on his present direct presentation --

MR. MINASIAN: Yeah, I think it was just to orient and if you want we wouldn't offer that as an exhibit.

H.O. BROWN: All right.

MR. MINASIAN: Mr. Cramer, would you continue in regard to rebuttal of the assertion that was made by the Department of Fish and Game that a later emigration date

of juvenile fall-run or spring-run would not expose them to greater mortality in either the Sacramento or the upper reaches of the Delta, do you have an opinion as to whether or not that is correct?

MR. CRAMER: I do have an opinion. And my strong opinion is that in low-flow years, in particular, where temperatures do reach highs early in the Delta, you will have serious mortality of fish that are queued to delay their migration into May if there would have naturally been stimuli to cause them to move earlier. And I'm going to show that there typically is stimuli to cause them to move earlier in those years.

Okay. Now, this is taken from Rogue River data. And this is, again, studies that I led. In fact, this is from a report that I wrote back in 1995. Here we have ten years of data on the Rogue River. And outmigration past Savage Rapids Dam at kilometer 223, so these are subyearling migrant -- these, in fact, are spring chinook but they migrate as subyearlings in the summer.

Percentage of migration that was complete by mid July had a very high correlation, was statistically significant. I didn't print the R value and all that material here, you can find all the statistics of this in the report.

But, nevertheless, as water temperatures were

warmer in the spring and these temperatures are taken April to May, they're average temperatures for April and May, warmer temperatures in the spring resulted in a much higher proportion migrating early.

Now, you've seen testimony from Jones and Stokes by Bill Mitchell showing that this -- a similar relationship is true in the Yuba River. And I know that that relationship has been questioned, because unfortunately the trap which captured the fish didn't have a marked recapture test to validate the efficiency of the trap and it didn't capture fry.

So I thought, okay, we've got data in the Sacramento River itself. This is -- if I could -- wherever we find data on juvenile chinook outmigration, we will find that relationship. And so yesterday I took the data that are available from trawl, Chipps trawl in the Sacramento, Bay-Delta, Chipps Island there, this is the U.S. Fish and Wildlife data and plotted the percentage of smolts that were captured during the month of April, when you -- they did April, May trawl catches. And what you look at here is -- in fact, this is April, May, June trawl catches. It should have June --

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Excuse me, again, Mr. Cramer.

Mr. Brown, I'm trying to figure out exactly what

this is rebutting. To my knowledge in looking at the direct testimony of the Department of Fish and Game, we did not present any testimony as to passage of chinook smolt and the timing of such passage at Chipps Island or any other place in the Delta, nor did we ever suggest in our testimony that.

This is rebuttal to, perhaps, the direct testimony of the Yuba County Water Agency or others, that might be interesting, but at present I think we're outside the scope for what is appropriate rebuttal.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Gee.

MR. GEE: I just consulted my biologist who testified on direct. This is not part of our direct testimony. So I'm wondering what exactly this is rebutting. Thank you.

H.O. BROWN: Thank you, Mr. Gee.

Mr. Lilly.

MR. LILLY: Yes, Mr. Brown, at the end of the -- when the evidence was put on in direct in response to a question from Mr. Cook you specifically ruled that rebuttal testimony would be allowed to rebut the testimony that was brought out through cross-examination.

And this testimony directly rebuts the cross-examination by both Fish and Game and Mr. Gee and

the State Board staff of Mr. Mitchell's testimony. So this is appropriate rebuttal under your ruling from earlier in this hearing.

H.O. BROWN: Mr. Minasian, where are you headed with this?

MR. MINASIAN: Basically, I remember the testimony crisply of John Nelson that he was not convinced that a later migration time from the Yuba River would expose the juveniles to any greater risk. It seems to me if we're going to adopt a management plan you want this sort of information that exists from 1978 to 1995.

H.O. BROWN: All right.

Mr. Cunningham, any final word?

MR. CUNNINGHAM: Mr. Nelson was my witness, your Honor, and I don't recall him testifying to that. I do believe he indicated that, yes, there are some additional increases in risks, but there's not necessarily a one-on-one correlation of late migration and a timely demise. So, again, I'm trying to puzzle out what this is rebuttal of.

I'm sorry, did I also understand that this is an attempt to somehow provide supporting testimony for cross-examination of Mr. Mitchell? Since when is that the appropriate subject for rebuttal in this context?

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Frink.

MR. FRINK: Mr. Brown, I'm a little unclear on who covered what subjects at what times of the hearing. If the statement Mr. Nelson referred to was made as a part of the Department of Fish and Game's presentation, then rebuttal of that statement would be appropriate.

If it was a statement that Mr. Minasian was able to get Mr. Nelson to make in order that now Mr. Minasian can present a witness on that subject, it would be not be appropriate.

I wonder if Mr. Minasian could clarify exactly what it was Mr. Nelson said and if it was in response to a question from Mr. Minasian, or if he recalls it being part of the Department of Fish and Game's presentation.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: I do recall it on cross-examination, but my recollection was that it was also part of the direct description of the management plan, which is that we're going to maintain these temperatures so we double the -- so we get more fish.

Now, when he says we're going to get more fish and there's evidence that they're not going to get more fish, they're going to get less fish, am I precluded from presenting that? I'm sorry to ask a question of the staff, but --

H.O. BROWN: Mr. Lilly.

MR. LILLY: My notes also reflect that Craig Fleming from Fish and Wildlife testified on this topic as well regarding the effect of delays and outmigration on the survival of fish on the Delta. And we have heard it from others and I think it is appropriate for Mr. Cramer.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Well, I guess in part, just to finish this up since I was the person who started this objection, again, Mr. Brown, I'm looking at our direct testimony. And we may have been asked questions in cross-examination, but we never testified on direct testimony about outmigration, temperatures for outmigration.

That has been a major element of the Yuba County Water Agency's case in their case-in-chief, complaining about the subject. There were lots of questions as to cross-examination, but again I can't see this.

I think the questions even asked of the Fish and Wildlife Service people were only asked on cross-examination. I don't recall anyone testifying directly about this issue other than Yuba County Water Agency and South Yuba as well.

MR. MINASIAN: Well, let's just -- let me just read you from John Nelson and Julie Brown's testimony. The

pages are not numbered. Let me get the -- three, listen to this,

(Reading):

"The temperatures indicated in our original management plan," reference is made to Page 42, "was 57 degrees Fahrenheit. And that is in agreement with recent research by the U.S. Fish and Wildlife Service," parentheses, "affects of water temperature on Sacramento River fall and winter chinook salmon," CDFG Number 10, "in which they recommend 56 degrees to protect winter and fall-run chinook salmon. And that information is applicable here."

Now, this is U.S. Fish and Wildlife Service's data and study in regard to recommendations in regard to water temperature. Now, I submit it.

H.O. BROWN: I concur, Mr. Cunningham, I think this is important to have on the record. And I think there's enough relationship here within your panel's testimony, I'm going to allow it.

Proceed.

MR. MINASIAN: Did the U.S. Fish and Wildlife Service between 1978 and 1995 routinely do trawls at Chipps Island and report the results, Mr. Cramer?

MR. CRAMER: They did.

MR. MINASIAN: And is this diagram a result of their results for the month of April in various years in which the temperature varied at Freeport?

MR. CRAMER: Yes. This depicts the percentage of smolts that were captured during April out of the total that were captured during April, May, and June.

MR. MINASIAN: All right.

MR. CRAMER: Combined.

MR. MINASIAN: And what does this chart tell you in regard to the migration time of smolts as measured at that point based on those trawl catches?

MR. CRAMER: The primary point is in those years where temperatures are -- in the case of this particular temperature station, which is Freeport, when temperatures at Freeport began to exceed about 14 degrees C during the month of April, that is the -- I'm sorry, this is March and April temperatures combined.

So these spring temperatures, March and April, when those temperatures got that warm, fish moved earlier as temperature increased. Warmer years, earlier movement. So that's what we see inside the Sacramento Delta.

Now, those very same -- some of that same data was used to develop this -- actually, it was not. These are coded-wire tagged estimates, but again U.S. Fish and Wildlife data, and this was part of my -- just a

reference, I'm going to give you another additional data, but as a point of reference this is Exhibit 2, Page 25, Figure 7 --

MR. MINASIAN: Don't do that, Mr. Cramer. Mr. Cunningham will waste our time.

MR. CRAMER: Okay.

MR. MINASIAN: So we'll withdraw that.

MR. CRAMER: Let me present a new one.

MR. MINASIAN: Yeah.

MR. CRAMER: In 19- -- this is data based on coded-wire tagged recoveries of chinook throughout the Sacramento River. This is a report and analysis that I did in 1991 for the Department of Water Resources, and used a technique called cohort analysis of coded-wire tags to try to identify what was influencing survival from the entire set of chinook released in the Sacramento Basin.

I divided those fish into location of release. I constrained some of the groups by time of release so I could compare, in essence, apples to apples. And here are some of the results by multiple regression where we looked at survival to age two, which would be until they're in the ocean, right before ocean harvest starts. So all the fish to be harvested are included in this and all fish that survived the first winter in the ocean.

That survival now regressed on environmental

variables. And a tremendous consistency shows here in these data. Once we get -- in the estuary -- first start with the estuary. Again, the May-June period, that's typically when the juveniles were released, we see that the most important controlling variables were the grams of the fish, how much did it weigh?

And it's a positive coefficient. So more weight means more survival. And upwelling in the ocean, more upwelling, more survival, positive coefficient. But we see a big difference in all points upstream from that. If we release them at Sacramento, we get good, highly significant R-squared values.

And all of these significance levels I'm reporting to you are significant -- well, except sometimes the constant is not. A constant is just the intercept. It doesn't make much difference. You can throw it out if it's not significant. But, again, at Sacramento you get grams of fish that has a six-percent significance value.

Temperature has 1.4 significance value and it's negative. Water temperatures -- and this temperature, number one, is taken at Freeport. And it's taken one week within the time of release. So the temperature experienced at the time of release determined its survival.

And we can move to Battle Creek in the upper part

of the basin, we can move to Red Bluff, a number of groups got released down from there, or we can move down to Knights Landing, you see consistently the best multiple regression equation to explain all of the variation in these things is consistently the same: It's river temperature and it's the weight of the fish.

Now, let me suggest that these two things are the constraining factors that determine what run timing will work, because imagine this: Weight is dependent upon the amount of time they have to rear.

If they can stay around and rear bigger, their survival goes up. But as they wait water temperatures go up and survival goes down. So they're in a race to get as big as they can and get out while temperatures are cool.

In essence, we can think of it as a race. They don't know that they're racing, but that is the thing that determines survival. So you have this constant pushing of selection factors from both sides, one to grow big, one to get out while the temperatures still allow you to survive.

MR. FRINK: Mr. Cramer, the exhibit that you're referring to would be Figure 5-12?

MR. CRAMER: Yes, 5-12.

MR. FRINK: South Yuba 5-12?

MR. CRAMER: Yes, sorry about that. I don't see a number on this, but --

MR. MINASIAN: It's South Yuba 5-13. That's 1980 through --

MR. CRAMER: Yeah.

MR. MINASIAN: Freeport temperature.

MR. CRAMER: Temperatures at Freeport, just to confirm: Are the temperatures going up through time? And so these are actual temperatures at Freeport over a 11-year period from 1980 through 1990. And what you see is -- let's see, right where I put my pen here would be essentially April 1.

And from April 1 through June 30 temperatures are increasing rapidly that entire time. So later migration means warmer temperature. Warmer temperature means less survival, but fish like to grow to an optimum size, because bigger size means better survival. And what we see is that the optimum based upon when you see typical outmigration is predominantly in May.

Now, I want to make the point that the worse place that the fish have to go through is not in the home stream, it is in the Delta. The data from U.S. Fish and Wildlife Service shows that.

This is my Figure 14, but it is also the same cohort analysis. This is my report, again, from 1991 done for DWR where we looked at all these groups of coded-wire tags. One of the analyses had this set of releases in

1990 that were of the ideal design, where they were the same size, same time, released in a variety of locations.

So it was a carefully designed experiment and what we see is the middle bar here indicates the mean value, and the two outsides represent the 95-percent confidence intervals on the survival to age two for chinook.

And if you release them at Feather River hatchery, there's your value. The value gets a little bit better if you release them at Discovery Park in Sacramento, so they're trucked downstream a little bit. Substantial jump when you truck them to the estuary, much greater gain in survival.

The U.S. Fish and Wildlife Service has in their report shown year after year, wherever they do these kinds of paired tests that the highest mortality rate per mile as those juveniles migrate is down here below Sacramento as they move into the estuary.

So you can do wonders upstream, you will -- if you have the wrong timing coming through the bottom end, it all disappears, because the biggest constraining factor, the biggest bottleneck is temperatures that they go through as they go out the Delta.

So timing as they go out the Delta is critical and you can't develop a disconnection between their queues

in the river and the time that they -- what they will face when they go through the Delta.

MR. MINASIAN: Do you have an opinion as to whether or not a temperature regime in which an attempt is made to maintain 56 degrees at Daguerre Point will change adversely the population characteristics of the fall-run on the Yuba River?

MR. CRAMER: If we change to 56 in the spring on the years where 56 would have been substantially exceeded, those juveniles would have been triggered to move earlier, they will now hold longer because they're experiencing colder temperatures. They have no idea what's going on downstream. They only know what's going on where they are.

So if we artificially mismatch temperatures in the Yuba to those downstream, it would result in higher mortality of those that pass through the Delta. I don't believe that that will happen in high-flow years, because the temperatures are -- I don't -- I think pretty much you don't get too much above 56 degrees in high-flow years in the Yuba River.

The time of greatest risk is exactly when mortality is more severe and that's going to be your low flow warm water years.

MR. MINASIAN: Okay. Would you offer an opinion, if

you have one, in regard to the prospect of maintaining or developing a spring-run on the Yuba River in the areas where the fall-run are currently spawning? And now we're talking about the period of August September, October, and November.

MR. CRAMER: Right, I would. I need to make this really clear --

MR. MINASIAN: First of all, are there true spring-run?

MR. CRAMER: Let me combine that into the same question, because I think it's all part of the same thing. I know that from Cal Fish and Game's testimony that they wanted to preserve spring-run chinook, that they were, in fact, listed. The implication was drawn, if not explicitly stated, that these spring-run in the Yuba River were those that are listed. So I want to tie the genetics in with this. Maybe what I should do is do that first.

MR. SANDERS: Mr. Brown, I'm going to object to any testimony about genetics. First of all, it's outside the scope of direct. Nobody, and I repeat "nobody" presented any evidence about the genetics of these fish on direct examination.

Secondly, it's prejudicial surprise evidence. If South Yuba wanted to introduce genetic evidence, they should have included such in their witness list and in

their direct testimony, because in that case I would have known that they were going to present such evidence and I would have had the opportunity to hired a geneticist of my own, or at the very least to have -- to have cross-examined the NMFS witnesses on genetics, since they were the people who listed the fish. They did a great deal of genetic analysis in the listing decision.

But because that was not an issue raised by anyone in their hearing notice, I had no idea that genetics was going to be an issue in this hearing and I did not cross-examine the witnesses on that.

And, finally, the APA Government Code specifically allows the Hearing Officer to exclude evidence when its probative value is outweighed by the amount of time it would take to present it.

We're now in I think the 11th day, the afternoon of the 11th day of the hearing. And if we start getting into the genetic makeup of the fisheries, whether we have a true spring-run in the Yuba River, we will be here for several days. And personally, I want to go home tomorrow. So I object.

H.O. BROWN: Thank you, Mr. Sanders. I'd like to go home this afternoon.

Yes, Mr. Lilly.

MR. LILLY: I believe that there was testimony in

response to cross-examination questions by me that was the key for -- the Department of Fish and Game did testify regarding whether or not there was a separate spring-run and fall-run in the Yuba River and did also discuss the genetic studies that had been done on that.

So I believe this is properly presented.

H.O. BROWN: Mr. Minasian.

MR. MINASIAN: That's the basis. The testimony concludes that there are spring-run as listed by the U.S. Fish and Wildlife Service -- by NMFS, rather. And the testimony of U.S. Fish and Wildlife Service was to the effect that there are listed spring-run which have to be a separate genetic population from fall-run.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, using one of my witnesses name in vein, Ms. McKee did not testify in her direct testimony about any genetic indicators, markers, or identification of the spring-run chinook on the Yuba River.

She did answer questions in cross-examination by others, including Mr. Minasian and Mr. Lilly about that issue, but only in a very limited sense. Further, Mr. Brown, to the extent the Fish and Game Department presented evidence that spring-run was a species of concern on the Yuba River, it is because they are listed

by both the State and Federal Government.

I'm unsure where we're going, but I would agree with other counsel to the extent we're now going to discuss whether or not that is genetically justifiable is far outside the scope of this proceeding in either rebuttal or in direct.

MR. MINASIAN: That is the purpose of the testimony -- excuse me.

MR. CUNNINGHAM: The rebuttal -- I'm trying to figure out what this is now being offered as rebuttal to. Everybody keeps using Ms. McKee as the witness at issue. I'm sorry, her direct testimony did not state that there was a genetically distinguishable or identifiable spring-run species of chinook salmon on the Yuba River.

She identified that Yuba River spring-run salmon have been identified both by NMFS and Fish and Wildlife Service and by the State through an Endangered Species Listing Act. And if we're now going to challenge the science behind that, then I agree we're going to spend weeks on this.

MR. MINASIAN: Well, we don't have to spend weeks. I can go around --

H.O. BROWN: Mr. Bezerra.

MR. BEZERRA: Mr. Brown, I would just like to point out that we heard from the Department of Fish and Game,

SYRCL, National Marine Fisheries that it is necessary to go beyond the scope of flow temperature requirements because the spring-run chinook salmon has been listed as a threaten species since the 1992 Hearing.

I think it's entirely appropriate that we be allowed to rebut that -- excuse me, that South Yuba is allowed to rebut that evidence by presenting evidence that spring-run may or may not exist on the Yuba. If we're going to consider the listing of the spring-run, then we should be able to challenge whether or not they actually exist on the river.

MR. SANDERS: Mr. Brown.

H.O. BROWN: Let's see, wait a minute.

Mr. Frink, you want to add something to this before we hear anything further?

MR. FRINK: I can attempt to. I believe the National Marie Fisheries Service and the Department of Fish and Game both presented evidence that there are both spring-run and fall-run chinook in the Yuba River. And if Mr. Cramer believes they are not separate species, then his opinion to that effect and the basis for that opinion I think is admissible.

I would share the concerns of some of the attorneys who have spoken though about moving off in a new direction of detailed genetic analysis of the different

species of fish.

Mr. Minasian stated something to the effect about the purpose for which he was offering the evidence and I'd be interested in hearing that.

MR. MINASIAN: Yes. The offer of proof will be as follows:

That --

H.O. BROWN: I'm also interested in not carrying this thing out much longer.

MR. MINASIAN: Yeah.

H.O. BROWN: How much time do you need, Mr. Minasian, we're going to try to squeeze --

MR. MINASIAN: I really appreciate it. I think I can finish with Mr. Cramer in three minutes.

H.O. BROWN: All right. I'll allow you to proceed.

MR. MINASIAN: And I'm talking about his whole testimony.

Mr. Cramer, is South Yuba Exhibit 6, which has on its face a baseline study, a copy of a summary of work being done by Dennis Hedgecock at Bodega Bay Laboratory?

MR. CRAMER: It is.

MR. MINASIAN: And as a result of that work which is in the course of being prepared for publication is there any indication that there are any genetic differences between the earlier spawners on the Yuba River or other

parts of the Feather River and what we call spring-run on Butte Creek, Clear Creek, and other creeks where they're genetically different?

MR. CRAMER: Mr. Hedgecock concludes from his analysis of data on chinook salmon collected from the Feather River, both during what would be called spring-run and from the fall-run that there is no distinguishable genetic difference between those two.

However, there is very strong distinction of those from Butte Creek spring chinook, there's also strong distinction from Deer Creek and Mill Creek chinook. And so runs of -- there are definite groupings of chinook similarity ancestral lineage that emerge from data of chinook salmon of the Central Valley.

But within the Feather River, that Hedgecock's works concurs with earlier work that was done with Michondrial DNA. Both of them saying that the chinook in the Feather River are all of one lineage that is most closely related to fall-run. It does not look anything like the native spring chinook if you use Deer, Mill, or Butte as your template.

MR. MINASIAN: So to return, what is your opinion of what the management plan would cause in regard to population size of the fall-run if we adopted the temperature and flow requirements that are recommended by

the Department of Fish and Game?

MR. CRAMER: You asked: What would be the effect of trying to adopt temperatures to produce spring chinook --

MR. MINASIAN: Upon the fall.

MR. CRAMER: -- upon the fall chinook? You cannot have both spring and fall chinook in the same area without them spawning together and obliterating that genetic distinction that separates them.

And they will choose where they spawn by the temperatures that prevail. As long as the temperatures are attractive for spawning further upstream, what we specifically have seen in the Rogue River after the dam went in, fall chinook, if given warmer temperatures in the fall, will continue moving upstream until they find the appropriate temperatures for spawning.

And that's exactly what they have done on the Yuba, they go all the way to the top. They go fill all the Yuba River. So spring chinook are going to spawn out there somewhere, they're got to spawn in the same territory that the fall chinook do. You're going to have spring and fall chinook spawning in the same area.

There will be overlap and there will be an obliteration of the genetic difference between the two. And sooner or later selection, natural selection is going to choose the appropriate life history that survives the

best, because it will out compete the other life histories. Now, that's going to take generations to occur, but the intermixing will occur immediately because they will spawn in the same spot.

MR. MINASIAN: But genetically, at least Mr. Hedgecock has not found a genetic difference between the earlier spawners and the late spawners?

MR. CRAMER: That's correct. In his sampling he took samples of sport-caught fish in June, those are not what you call typical fall chinook, they're sport caught in June in the Feather River, that would be the typical Feather River spring-run.

He also included fish that would spawn in the first week of October. That is a typical spring-run in the Feather River And those have no difference at all from fish spawned in the fall, in the heart of the fall-run in the Feather River. He concluded and he states it in large bold print, "There are no spring-run chinook in the Feather River."

MR. MINASIAN: He's continuing his work, is he not?

MR. CRAMER: He's continuing. He suggested more samples be taken, because a lot of people would like that. And so there will be further testing of what he did.

MR. MINASIAN: Now, Mr. Cramer, turning to the gabion, the famous South Yuba-Brophy Gabion, there was

testimony by the Department of Fish and Game that they believe small fish were still somehow making their way through the interstices of the rock into the pond behind the gabion.

And did you check to see whether or not your nets, your Fyke traps basically utilized in 1993 would have caught small-sized chinook or steelhead?

MR. CRAMER: I did. Our nets very effectively caught very small fish. We did, in fact, catch two steelhead fry, which are substantially smaller than what chinook fry would be. We captured one at 26 millimeters. I have never caught a juvenile chinook that small. And the other was 33 millimeters.

Typically we do not see juvenile chinook in the Sacramento Basin under about 32 millimeters. So our nets very well retained them and was designed intently to do that. If a bunch of chinook fry, which were obviously present in the Feather River -- I mean in the Yuba River, if a bunch of those fry had gone through the gabion, we would have captured them in our Fyke nets that sampled all of the diverted water.

MR. MINASIAN: Good. Let me turn to you, Mr. Brannon.

Dr. Brannon, you have about nine pages in your curriculum vitae, which is labeled as Exhibit 4.0, South

Yuba 4.0, of articles and publications. Some of those publications have been peer reviewed, have they not?

DR. BRANNON: Yes, they have.

MR. MINASIAN: And they've appeared in national and international professional journals?

DR. BRANNON: Professional journals, yes.

MR. MINASIAN: And you've been a professor of fisheries at the University of Washington from 1975 up through about 1988, were you not?

DR. BRANNON: Yes, '73.

MR. MINASIAN: '73 through '88. And since '88 what have you been doing?

DR. BRANNON: I've been the director of the Institute at University of Idaho looking at salmon issues associated with recovery in the Plum River and in the general Pacific Northwest Region.

MR. MINASIAN: And you're actually the director of the research institute for the University of Idaho regarding salmon and other species of fish; are you not?

DR. BRANNON: Yes.

MR. MINASIAN: And you've done that for about 12 years?

DR. BRANNON: Yes.

MR. MINASIAN: Were you asked to review the question of whether or not temperature as envisioned on the Yuba

River by a standard of 56 degrees on a year-round basis with, perhaps, some exception would be a good management tool? And were you able to form an opinion in regard to whether or not that would be a good management tool?

DR. BRANNON: Yes, I was.

MR. MINASIAN: Okay. What is your opinion?

DR. BRANNON: My opinion was that as a strategy that would fail.

MR. MINASIAN: Okay. And would you like to explain to us why the strategy would fail?

DR. BRANNON: Yes. I prepared some overheads, which I'm prepared to present.

MR. MINASIAN: I know that you teach classes of students, would you try to move as quickly as you can through it watching Member Brown's eyes because some of this he will have already gotten.

DR. BRANNON: Yes. We always do that, Counselor.

MR. MINASIAN: All right.

DR. BRANNON: The concern that we should have with regards to any fisheries management program is: How does it address the biological needs of the species we're trying to enhance or preserve?

And that means that we've got to take serious measures to preserve the attributes of those populations, the population attributes of those populations. And I've

listed some of these here. These are attributes associated with the population in the Yuba, or any other stream: Adult-size, spawning time, fecundity, egg diameter, and so forth as you can see in the list.

MR. MINASIAN: That's Exhibit 4.1?

DR. BRANNON: Yes.

MR. MINASIAN: Is there any of those attributes that temperature doesn't help determine?

DR. BRANNON: Well, Dr. Rich was able to say -- or said that chinook salmon and all fish -- most all fish are poikilotherms meaning they depend on the environmental temperature to preserve their body temperature.

H.O. BROWN: Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, I'm going to object in that this is improper rebuttal.

MR. MINASIAN: We're not rebutting -- I'm sorry.

MR. CUNNINGHAM: I'm sorry, this witness is referring to Dr. Rich's testimony. This is rebuttal of rebuttal testimony. And as such I think is beyond the scope of this proceeding.

I'm going to be faced with people rebutting rebuttal testimony. And I'm going to object most strenuously to this attempt to somehow get around the restraints that this Board has already put in place on rebuttal testimony.

MR. MINASIAN: I'd offer we're not going to rebut the testimony of Ms. Rich. Dr. Brannon is going to talk about why the management strategy proposed by DFG in the Draft Decision, low temperatures on roughly a year-round basis will not work.

MR. CUNNINGHAM: Mr. Brown, I'm sorry the last statements I heard this witness make were in reference to how he agreed and how he disagreed with Dr. Alice Rich. And I'm sorry, Dr. Alice Rich was presented here as a rebuttal witness not as part of our direct case.

H.O. BROWN: He has a point, Mr. Minasian.

MR. MINASIAN: Well, Ms. Rich has occupied the field in regard to the fact that chinook are poikilotherms, that's what he was saying, he was agreeing with her.

DR. BRANNON: We can eliminate that statement.

H.O. BROWN: Can you shorten this up?

MR. MINASIAN: Yeah. Well, I'm trying.

H.O. BROWN: How much time are you going to need on this rebuttal testimony here?

MR. MINASIAN: Well, I think this is valuable material and we have an estimate of about 17 minutes, if we're not interrupted.

MR. LILLY: Mr. Brown, may I comment on this? I am very, very concerned about you or staff trying to hurry this presentation on. This is direct rebuttal to DFG's

temperature recommendations.

And I know we're in our tenth day and I know tempers are getting short and all that, but Fish and Game spent a very long time with their new witness in rebuttal testimony. And it's simply not appropriate to try to rush through the other parties' presentations of their rebuttal testimony.

H.O. BROWN: I appreciate your counsel to me, Mr. Lilly, but I think I would go ahead and determine what's appropriate and what's not appropriate, if that's all right.

MR. LILLY: Are you asking me a question?

H.O. BROWN: No. It's a statement, Mr. Lilly.

Mr. Frink, do you have an opinion on this?

MR. FRINK: I think insofar as the witness is testifying in rebuttal to the Department of Fish and Game's management strategy that testimony is appropriate. And Mr. Minasian indicated that it wasn't going to require too long in any event so I'd be interested in hearing it.

H.O. BROWN: I concur.

Proceed, Mr. Minasian.

MR. MINASIAN: Thank you.

Could you tell us the importance of temperature in regard to these various life-stage issues?

DR. BRANNON: Yes. And in answer to your previous

question, everyone of these components has a major temperature influence. For example, adult return time, if you look at chinook salmon classification, spring-run, summer-run, fall-run, late fall-run, and winter-run those are classifications we associate with the time of arrival in the stream. And those characteristics are totally determined by mean incubation temperature, or habitat tolerance of the area they're spawning in.

And if we look further, the fall chinook -- or pardon me, the spring chinook, summer chinook, and so forth, their spawning times are totally related to the mean incubation temperature of their respected spawning reach, irregardless of where we're looking at them from California to the Lower Yukon River.

The characteristics that we can look at in terms of spawning time and this is --

MR. MINASIAN: 4.5?

DR. BRANNON: -- Exhibit 4.5, if we take that region, the Central Region of the chinook range, like the Columbia River and we project the spawning date against mean incubation temperature, you can see those fish that spawn in August have to spawn in an area something around 2 to 2.5 degrees Centigrade to match their life history strategy.

And those that spawn late in the year, like in

November, will be spawning at temperatures around 6 degrees, or 7 degrees mean incubation temperature through the winter, because that's their life history strategy.

Now, we can ask why are they doing that from the standpoint of life history strategy and they do that because of the rate of incubation, or the development rate of the prodigy in the gravel incubating at those temperatures will influence when the adult comes back and spawn. And they do that because emergence is targeted for the optimum emergence timing in the spring to give them good survival thereafter.

MR. MINASIAN: Doctor, let me interrupt you. Do they have a sensor? We keep talking about queues. Is it a queue that causes them to do things, or is it the fact that they tend to survive if they do do a certain life history?

DR. BRANNON: Well, this is -- this is -- based on natural selection and so this is the survival optimum for their emergence pattern. And they translate that into genetic characteristics. You can't talk about life history without talking about genetics. You can't talk about management strategy without talking about genetics.

So the reason that adults spawn based on mean incubation temperature is that fry have to come out in the spring at a certain time. And up on the Columbia it's

sometime between March and April. Down here it's sometime between February and April as their optimum emergence timing.

So the adult salmon has to calculate as to when they can spawn based on that mean incubation temperature to lay their eggs. And in the Yuba River they have to spawn as they do sometime in September/October, November/December to hit the optimum emergence time in the spring.

MR. MINASIAN: What would determine that emergence time? Would it be the survivability through the Sacramento River and the Delta?

DR. BRANNON: It's the whole freshwater phase, emergence timing, feeding thereafter, optimum feed, predation intensity, migratory route success, all of those things will dictate emergence timing success.

MR. MINASIAN: So when we change temperature, do we change all those other factors, or do those factors remain pretty much the same?

DR. BRANNON: No. The factors will remain the same, but you put the individual in a different synchronous environment, you put it out of synchrony with its present strategy. Now, this is an exhibit that wasn't in your list.

MR. MINASIAN: Okay.

DR. BRANNON: It was based on material that was presented with regards to the temperature and accumulative spawning that was --

MR. MINASIAN: This is Exhibit 51 of the Yuba County Water Agency, I believe.

DR. BRANNON: Okay. Now, taking that information from the several years they presented, I developed this on the plane coming down here, so it's not totally precise but only meant to be a general point of view.

This is the general curve that you have of emergence timing in the Sacramento. With that deviation on top there shows you have a 20-day window or so where you move forward or back depending on environmental circumstances in the system.

Now, that is the kind of curve that you've got. That also represents, 95 days later, the emergence curve. And emergence is based on optimum survival. That's why these adults spawn here as to give their prodigy optimum survival in the late winter and spring in that Yuba River system and the Sacramento.

Now, if that temperature was limiting to the spawning season, in the spawning season you would expect to see a normal distribution, which we have now. If -- it was better for those fish to emerge earlier, but they were being constrained by spawning temperature, you'd expect to

see a skewed curve and that curve would be like that.

MR. MINASIAN: And you do not see a skewed curve?

DR. BRANNON: You don't see that. And what that says to me as a naive person to the system --

MR. MINASIAN: Out of California.

DR. BRANNON: Out of California, is that when you have a normal distribution of fry emergence, that is suggestive that you have got the right emergence timing for the fry to have optimum survival.

Now, to rush on here --

MR. MINASIAN: Do not rush. Basically, do you, therefore, believe that the changing of the temperature, that is maintaining a 57-degree temperature during the periods of August, September rather than the historic temperature which tend to drop off, would change the spawning time over a period of generations?

DR. BRANNON: Yes.

MR. MINASIAN: Okay. And what will that do in regard to the population's ability to survive on the Yuba River, in your opinion? And let's deal first of all with spring-run versus fall-run.

DR. BRANNON: Well, your spring-run is going to suffer because of redd superimposition.

MR. MINASIAN: Okay. And what does that mean?

DR. BRANNON: That means you'll have a follow-up

spawner spawning on top of the favored site of the previous spawner.

MR. MINASIAN: Why is that a bad thing?

DR. BRANNON: Because that picks up the previous eggs and you'll potentially have low production potentially from that early spawning run. And that can be so strong that it can really distort the survival success.

It can totally eliminate the first part of the run, even happens amongst your fall spawning population, is that the earlier spawners are somewhat selected against by subsequent spawners.

MR. MINASIAN: Okay. Now, would the colder temperature in the period of December, January, February impact ones once they have emerged from the gravels?

DR. BRANNON: Well, I thought the winter temperature was going to be about the same.

MR. MINASIAN: Okay. In dry years you understand that it's proposed to maintain a temperature of 57 degrees -- of 57 degrees during the winter months as well?

DR. BRANNON: Oh, I'm sorry. I wasn't aware of that -- to the extent of that. That would really distort the growth pattern and it would upset their synchrony with the timing going out of the system, both in their feeding habitat as well as their migratory habitat.

MR. MINASIAN: Do Figures 4.9 and 4.0 reflect this

observation and experience on your part in other areas?

DR. BRANNON: 4.9 is the growth pattern of chinook fed maximum ration at different temperatures. And not knowing what food productivity on the Yuba River has --

MR. MINASIAN: Were you a bit surprised that there wasn't more data in regard like to rotating screw trap data for the season long and also food production data in regard to the Yuba River?

DR. BRANNON: Well, I think it must exist, because you can't manage fish without it. So someone has that kind of information I would think.

MR. MINASIAN: Okay. Uh-huh. Go ahead.

DR. BRANNON: The growth pattern then shows that these lower temperatures decrease the scope of growth. And with a decreased scope of growth, that means a potential for growth, they will tend to reside longer, remain longer. Those who stay in the Yuba, will remain longer in the Yuba before they go out.

MR. MINASIAN: So if in a dry year we maintain a temperature of 56 degrees or lower at Daguerre Point, we would tend to depress the growth rates in the months of March and April of these juveniles that might have otherwise gone out?

DR. BRANNON: Well, March temperature is already below 56. So if you raise them, then you accelerate

growth.

MR. MINASIAN: Okay.

DR. BRANNON: And that puts them in a different asynchronous position.

MR. MINASIAN: What does 4.10 tell us in regard to the relationship of temperature to growth and the ability to survive?

DR. BRANNON: Temperature -- this figure is a model that shows why young salmon will up and migrate downstream, not spring chinook so much, but spring chinook do the same thing. But the fall chinook certainly follow a strategy of displacement downstream as they grow.

And this is a model that shows their disbursal index is related to how well they're satisfying their scope for growth. If they're not satisfying it and it's down like .1, if you divide scope for growth into real growth they're having in a system, if it's too low for them to reach their migratory size and migrate into the marine environment at the right time, they'll get up and move with the strategy of: Going someplace else will be better than this.

MR. MINASIAN: Uh-huh.

DR. BRANNON: If you maintain a good feeding habitat there, or by natural circumstances a good feeding habitat is maintained those fish will remain there until they

reach their dispersal index that's disfavorable to remain there. And then they'll up and migrate out.

MR. MINASIAN: Okay. Is there a diagram 4.11 that describes how this optimum is found?

DR. BRANNON: Well, this is a model we're developing for chinook salmon that describes how temperature influences life history traits.

MR. MINASIAN: It is 4.16, is it not?

DR. BRANNON: Yes. Pardon me.

MR. MINASIAN: That's all right. That's all right. Go ahead.

DR. BRANNON: And this demonstrates that mean incubation temperature will dictate whether you have a spring, summer, fall, or late fall, or winter chinook. And rearing temperature will dictate whether you got a zero-migrant or an ocean-type, or an age-one migrant, or age-two migrant which is a stream-type life history pattern. So what I'm showing here: Temperature is absolutely the key that dictates population structure.

MR. MINASIAN: Is there any argument that could be made, in your view, that a uniformed temperature does not exceed 57 degrees depending on the wintertime, perhaps taking it below that, in any way will result in more adult fish returning for a healthier population on the Yuba River?

DR. BRANNON: Well, as has -- as others have testified to, the fall chinook population is pretty healthy.

MR. MINASIAN: Okay.

DR. BRANNON: The management strategy that I would advise any manager is: Don't mess with it.

MR. MINASIAN: Okay.

DR. BRANNON: Don't change it, because any change is liable to reflect a decrease in survival success. And even if you're able to get spring-type spawners there, which you don't have in the system, spawning time says they're not springs, it says they're late summers.

MR. MINASIAN: Okay.

DR. BRANNON: But that's a local terminology, so let's accept that local terminology. But in terms of biological requirements of the species, you don't have spring chinook in the Yuba system.

You can't have them spawning on top of one another. Biologically, it's impossible with the exception of when you have a hatchery putting them out and mixing with the local population.

MR. MINASIAN: What would be your fears if we adopted this management plan and came back ten years from now, what would be your fears of what we would see?

DR. BRANNON: You would have a mixed population of

whatever exists there would be accentuated. It would have a different emergence timing, because the earlier spawners that would be allowed to spawn there would tend to emerge earlier. If you spawn at the 1st of April -- pardon me, 1st of September, you're coming out in November.

MR. MINASIAN: Okay.

DR. BRANNON: And November emergence patterns doesn't look too successful from the standpoint of the mean incubation curve right now.

MR. MINASIAN: That's why the peak is where it is?

DR. BRANNON: That's right.

MR. MINASIAN: Thank you. These witnesses are ready for cross-examination.

H.O. BROWN: Thank you. I think we'll take our afternoon break now.

(Recess taken from 2:38 p.m. to 2:48 p.m.)

H.O. BROWN: Come back to order. You all set for cross, Mr. Minasian?

MR. MINASIAN: Yes, Mr. Brown. And again I would appreciate it if people could cross Mr. Cramer first, because he needs to get back to Portland tomorrow.

H.O. BROWN: All right.

Mr. Gee.

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CROSS-EXAMINATION OF SOUTH YUBA WATER AGENCY
BY U.S. DEPARTMENT OF INTERIOR, FISH
AND WILDLIFE SERVICE
BY MR. GEE

MR. GEE: Mr. Cramer, Mr. Brannon, my name is Edmund Gee. I'm an attorney with the U.S. Department of the Interior. And I'll take Mr. Minasian's advice and start with Mr. Cramer first. I have a few questions, Mr. Cramer.

You stated -- or you began your testimony by saying -- and I believe it's Exhibit 5-1. And you stated that where spring and fall chinook --

THE COURT REPORTER: Okay. Slow down.

MR. GEE: I'm sorry, Ma'am Reporter.

(Reading):

"Wherever spring and fall chinook occur in the same river basin, the two races are spatially and temporally isolated from each other."

From that statement are you suggesting that it is impossible to manage both spring and fall-run chinook in the same river?

MR. CRAMER: No, not at all. In fact, all of those runs -- all of those rivers that I listed are rivers that do have spring and fall chinook in the same river. So

there would be a location at which you would expect to find spring chinook and a separate different location where you would find the fall chinook spawning in all those rivers where both races occur.

MR. GEE: You also mentioned that the Yuba is a success. By saying that are you saying that we don't need to improve the situation on the Yuba River?

MR. CRAMER: You chose the word "need." And I would agree with that, yeah, I don't think you need to. Is it possible that you could? Always as resource managers we're trying to think of ways to make a system better.

Temperature is a very dangerous element to play with, because it influences so many aspects of coldblooded animals, almost everything living in an aquatic environment is key to temperature. So I would not change the temperature in the Yuba River for the benefit of chinook, which are doing very well. In fact, anonymously well compared to other naturally reproducing chinook populations from southern Oregon all the way down through California.

MR. GEE: You mentioned the spring chinook; is that correct?

MR. CRAMER: I just now when I was speaking it was fall-run chinook.

MR. GEE: In reference to Exhibit 5-8, there's a

graph there and there's a relationship between migration and average spring temperatures.

MR. CRAMER: I'm trying to find the correct one. Okay, I have it.

MR. GEE: As I read that graph, you can correct me if I'm wrong, it says the higher the temperature the earlier the migration date; is that correct?

MR. CRAMER: Correct. The jullian date -- jullian date 122 is May 1st, so that would be at the bottom of the graph. And I'd have to look at my calendar to figure out what jullian date 200 is at the top. So from 22 you'd add another 30, to 52, would give you June 1st, just trying to give you an idea of what those dates are.

MR. GEE: Right. And the lower the temperature the later the outmigration; is that correct?

MR. CRAMER: Correct, lower temperature later outmigration.

MR. GEE: Is there any link between outmigration -- the information you have here, is there a link between the outmigration information and escapement?

MR. CRAMER: In this particular stream and in this particular study the answer is, no. This study was done in the South Umpqua. And the date of series, as you can see, is only a few years long. And I didn't have all the adult data to go with it.

It's well established in the Rogue River where I did a number of years' of study, but in this particular study they did not have the time series of data to take all those differences out.

MR. GEE: In your opinion, are sustained high flows necessary for the success of returning adults two-and-a-half years later?

MR. CRAMER: Sustained high flows is a real relative measure, so I don't know exactly how to constrain that. Relative -- can you give me an example or --

MR. GEE: I can't.

MR. CRAMER: -- put some boundaries on that?

MR. GEE: As a general question: Could you offer any testimony to that question, generally speaking?

MR. MINASIAN: Could I ask for a clarification? Do you mean abundant water conditions are correlated to high return rates two or three years later?

MR. GEE: That's correct.

MR. CRAMER: Yeah. Yeah, particularly in the Sacramento Basin, Sacramento and San Joaquin basins. Higher flow years tend to correlate with better survival.

MR. GEE: Thank you. And, Mr. Brannon, I have a few questions for you. I believe you mentioned that temperature was a major queue on all life history areas of salmon; is that correct?

DR. BRANNON: Yes.

MR. GEE: But there are other queues such as flow. Is flow one of those other queues as well?

DR. BRANNON: Flow is important.

MR. GEE: And would day link also important?

DR. BRANNON: Day link is what times the outmigration frame, times spawning behavior. That's what the genetics of the individual chinook salmon would queue to, timing wise would be a function of the photo-period and temperature.

MR. GEE: And turbidity is another queue as well; is that correct?

DR. BRANNON: Not that I know of.

MR. GEE: Okay. Mr. Brannon, you also mentioned that the Yuba fall-run population is healthy. And what do you base that statement on?

DR. BRANNON: In terms of the numbers of adults returning, the river is not that long and by the migratory pattern of the juveniles leaving the system.

MR. GEE: So I get by that statement that outmigration is not the only measure of success, that escapement is also an important --

DR. BRANNON: Ultimately escapement is the criteria that one uses.

MR. GEE: I believe you concluded, or one of your

concluding statements was that nothing should be changed in the management of the fall-run population; is that correct?

DR. BRANNON: That's right.

MR. GEE: By making that statement are you suggesting, or is it your opinion that there's no way to improve the fall-run population in the Yuba River?

DR. BRANNON: No. I'm just saying if I'm going to manage the natural population, I wouldn't toy with temperature. You can double the population by other means.

MR. GEE: Mr. Brannon, Mr. Cramer, thank you very much.

H.O. BROWN: Thank you, Mr. Gee.

Mr. Cunningham.

MR. CUNNINGHAM: Sir, thank you.

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CROSS-EXAMINATION OF SOUTH YUBA WATER AGENCY

BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME

BY MR. CUNNINGHAM

MR. CUNNINGHAM: Mr. Cramer, Dr. Brannon, Mr. Minasian, I'll try to also ask my questions of Mr. Cramer first.

Mr. Cramer, is it your testimony today that there are no spring-run chinook salmon in the Yuba River?

MR. CRAMER: Yes. And I need to, obviously, clarify what I mean by "spring-run chinook." In an endangered species sense, we have definitions of populations. The National Marine Fisheries Service has adopted one called the "Evolutionary Significant Unit," and has listed spring-run chinook in the Central Valley as threatened.

I have been involved in at least a dozen status reviews for endangered species and contributed extensively to those. A primary decision point that agencies use for determining how you divide ESU's is genetics.

The information that have recently emerged on genetics, which were not valuable to NMFS which they were obviously not aware of at the time they made their decision for the Yuba, now indicate clearly that the Yuba chinook salmon do not fit -- I should back up.

Feather River chinook salmon fit a fall-run life history. They are not -- they don't belong to the ancestral lineage that has ESU designation under the Endangered Species Act for spring-run chinook.

MR. CUNNINGHAM: Are you prepared today to tell this Board that it can then choose to disregard the critical habitat identification propounded by the National Marine Fisheries Service for spring-run salmon in California, specifically, that portion which finds that the Yuba River is designated as critical habitat?

MR. MINASIAN: Are we talking -- is the question asking for a legal conclusion or a biological conclusion?

MR. CUNNINGHAM: Biological.

MR. MINASIAN: Thank you.

MR. CRAMER: Legally the question is clear: I can't tell them what to do, no. Biologically, that is true. The Yuba River is not, in its currentsite, critical to the continued existence of spring-run chinook as defined by the ESU that is listed by National Marine Fisheries Service.

MR. CUNNINGHAM: Now, Mr. Cramer, let me pose how you arrived at that conclusion: You offered as support for that conclusion a study apparently done by someone else. Is it a Dr. Hancock?

MR. MINASIAN: Hedgecock.

MR. CUNNINGHAM: Hedgecock; is that what I understand?

MR. CRAMER: That's correct.

MR. CUNNINGHAM: Did you offer a copy of the study itself as an exhibit to the Board today?

MR. CRAMER: I believe it was given to the Board, or the handout that he used at the Bodega Bay Marine Lab.

MR. CUNNINGHAM: Well, my problem is that Dr. Hedgecock is not here, Mr. Cramer. And I must cross-examine only that person who is here. So my

question for you is:

Have you had a chance to read and are you prepared to testify as to the complete substance and contexts of Dr. Hedgecock's study? Did you participate in that study?

MR. CRAMER: I have discussed its outcomes with him. He should do the testifying for his study.

MR. CUNNINGHAM: Did you personally participate in the preparation of any of the elements of this study?

MR. CRAMER: I did not.

MR. CUNNINGHAM: Did you participate in any of the analysis of this study?

MR. CRAMER: I did not.

MR. CUNNINGHAM: Are you aware of the fact that his study also identified -- even in the information you provide us -- only two efforts to sample what were supposedly spring-run salmon and only on the Feather River in the testimony that you provided?

MR. CRAMER: I am aware of that.

MR. CUNNINGHAM: Do I see anywhere in any of the information you provided to me today that there's testimony about spring-run chinook on the Yuba River?

MR. CRAMER: That are genetically sampled, no.

MR. CUNNINGHAM: Well, Mr. Cramer, you're telling me that genetics is what's going to drive this question,

aren't you?

MR. CRAMER: Yes, I am. Let me explain why I say that. California Department of Fish and Game has repeatedly over the years acknowledged that spring-run are desirable, yet, nonexistent in the Yuba River. First report Cal Fish and Game came out in 1966 saying that spring-run chinook, as they were originally known in the Yuba River, are now extinct on the American River at that time.

Subsequently, I have during the time that I did the analysis of all of our coded-wire tag groups in the Sacramento Basin, I went in the offices and files of Fred Myer, who was then the district fish biologist for Fish and Game, looked at all of the numbers of surveys that they had done.

They were unable to find -- I have with me if we need to put in the evidence, a memo that he wrote to the file in 1980 saying that they sent scuba divers out there to find spring-run chinook holding, they did not find any.

They had found spring-run carcasses. They were adipose clipped confirming that they were spring-run from the Feather River hatchery. And then he concluded that there was not spring-run present in the Yuba River, but he recommended that spring-run be planted there to start a run. And you can find those things trickling through the

record. The --

MR. CUNNINGHAM: Mr. Cramer, let's move on, I'm sorry. I'm trying to keep this short, because I realize your own time is critical. To the extent that you attempt to testify to Dr. Hedgecock's study, are you aware of the fact that when he distinguished the Deer Creek and Mill Creek spring-run chinook in his own genetic typing that he used a total of ten markers to discern that these were genetically distinct spring-run species, or subspecies? Are you aware of that fact?

MR. CRAMER: He gives a number of markers he used in the -- on the writeup.

MR. CUNNINGHAM: So you don't even know of your own personal knowledge anything about the details of this study other than this writeup that's also kind of attached kind of at the back of the slides, is that my understanding?

MR. CRAMER: No. As I had mentioned to you before, I talked to him extensively when he gave his presentation at the marine lab. And also I know Dr. Hedgecock is the primary analyst of chinook genetics data in the Sacramento Basin, that he is currently doing additional samples as requested by the fisheries agencies. They are the ones that are depending on him to do the analysis. He's eminently qualified, more so than I, to talk about those

things. And that --

MR. CUNNINGHAM: But he's not -- Mr. Cramer, he's not here. My questions are to you --

MR. CRAMER: Okay.

MR. CUNNINGHAM: -- not to Dr. Hedgecock's qualifications, but to you. Do you know the details of his study to be able to identify how many micro-satellite DNA markers he used to identify the Mill Creek, the Deer Creek, and the Butte Creek spring-run chinook subspecies or race?

MR. CRAMER: They're reported in his handout.

MR. CUNNINGHAM: Do you know how many DNA markers he used to identify what he thought may or may not have been spring-run chinook salmon in the Feather River?

MR. CRAMER: They're in his handout.

MR. CUNNINGHAM: Are you aware of the fact that Dr. Hedgecock has been repeating part of his study, because the number of markers he used in an attempt to identify Feather River spring-run stocks were fewer than those that he had used to identify Mull Creek, Deer Creek, and Butte Creek spring-run stocks?

MR. CRAMER: I'm aware that he's gathering more samples and doing additional analyses.

MR. CUNNINGHAM: Are you aware also of the fact that when he made his report as to the Feather River he

identified those as specifically preliminary in nature and that they were to be followed up with additional sampling because he considered the sampling sizes too small and too inconclusive?

MR. CRAMER: No, I'm not familiar that he called them "too inconclusive." He did say they were small and that they should be followed up.

MR. CUNNINGHAM: So based upon a study that has done only a small number of samples from alleged Feather River spring-run chinook salmon and which used fewer markers than had been used to identify other spring-run strains in the Central Valley, you have concluded that there are no spring-run chinook salmon in the Yuba River? Is that my understanding?

MR. MINASIAN: I think it misstates the testimony. He said that there's been none found at this point.

MR. CRAMER: I would go further to say that, no, that is definitely not how I concluded there are no spring-run. I did cite to you other --

MR. CUNNINGHAM: I will accept that you also cited to me a study done by Fred Myer from almost 25 years ago, or a conclusion Mr. Fred Myer arrived at years ago.

MR. CRAMER: I also -- your own spring chinook status review, Cal Fish and Game, cites the data which has been distributed elsewhere by Dr. Jennifer Nelson who has

also done Michondrial DNA analysis on chinook salmon in the Central Valley and found that Feather River spring chinook were, indeed, not a typical spring chinook in the sense of the Deer and Mill wild runs.

That they were, in her words, an introgressed population of spring and fall chinook mixed. That was concurred -- that's somewhat similar to the kinds of conclusions that Dr. Hedgecock is coming up with using -- instead of Michondrial DNA he is using a micro-satellite DNA.

MR. CUNNINGHAM: Mr. Cramer, are you proposing then that this Board and the State in general should regulate the flows on the Lower Yuba River with no efforts made to provide for any flows to protect a spring-run chinook salmon on the Lower Yuba River?

MR. CRAMER: Very much so. And I say that because of the other data that I gave you that the spawning time and temperature regimes does not support spring-run chinook.

The temperature regime in the fall, and we can go through some of those, show clearly that temperatures exceed 13 degrees C frequently prior to early October. So early October is about the earliest you can continually support spawning chinook in the Yuba River. Spring-run chinook would spawn primarily in September, but extending

clearly to as early as August.

MR. CUNNINGHAM: Mr. Cramer, if the limiting issue is temperature, and I believe both you and Dr. Brannon have talked about temperature as a limiting issue on, among other things, in migration and spawning of chinook salmon, and the system below Englebright Dam is regulated in a fashion which reduces the fall temperatures in any fashion from one degree or more, will that produce a change in the ability of fall chinook salmon to spawn and be successful?

MR. CRAMER: Let's see, I was anticipating a slightly different question. So now I have to restructure what you said there. You've asked if temperatures were changed would it influence fall chinook salmon?

MR. CUNNINGHAM: Reduced, not changed, reduced in temperature from that which is currently present, if they were reduced by one degree or more would it change or would it affect fall-run chinook salmon in the Lower Yuba River?

MR. CRAMER: Well, it certainly would. The balance of how the total outcome plays itself out is somewhat uncertain. But, in general, as you reduce temperatures at the spawning time -- now, it depends on what time of the year you're going to change those temperatures, because every time it corresponds with a different part of the

life history, so you get a very different result.

But if we're talking about the fall, which is right now what determines the reason why you have fall chinook and not spring chinook is if you cool the temperatures in fall you could move to earlier spawning. And over time natural selection would favor that so that earlier spawning would become predominant.

In the interim, you would have lower survival because you have the genetic material adapted for the time that spawning exists now. So you have an interim reduced survival; over time when final selection is complete you would have increase fitness to adapt to that specific life history.

MR. CUNNINGHAM: Mr. Cramer, you predispose that there are not other salmon, other chinook salmon be it a spring-run or a fall-run that are in the system prepared to spawn at an earlier time than the late October period you currently pose as the present time for fall-run chinook spawning; isn't that true?

MR. CRAMER: No, it's not. I can tell you that there are --

MR. CUNNINGHAM: Mr. Cramer, fine, let me explore your answer. Mr. Cramer, if I reduce the temperature by two degrees in the fall from what is currently out there on average in October of every year, will that accelerate

in time the fall-run chinook spawning event?

MR. MINASIAN: Let me understand the hypothetical so it's complete. You're not changing any temperatures in September and on October 1 we should look at those graphs in 51 of the Yuba County Water Agency imagine them two degrees less maximum temperature per day, or mean temperature per day?

MR. CUNNINGHAM: Mr. Brown, I tried to ask a rather simple and straightforward question. I thought the hypothetical was understandable. May I perhaps ask if the witness understood it sufficiently rather than to ask Mr. Minasian's question?

H.O. BROWN: That's fine. I wasn't sure myself.

MR. CRAMER: Yeah, I can kind of chose that answer; however, I chose to construct the circumstances is the challenge. Temperature influences spawning time. Temperature influences survival. So we can play that same question out many ways, deciding on how we change the temperatures.

MR. CUNNINGHAM: Well, Mr. Cramer, you earlier testified in your direct rebuttal that reducing temperatures in the Yuba River as proposed by the Department of Fish and Game's temperature regime was going to be harmful to fall-run chinook salmon. That was your word, "harmful," "detrimental to fall-run chinook salmon."

I'd like to explore exactly how it's going to be harmful or detrimental to fall-run chinook salmon. Now, if I reduce those temperatures, and let's pretend it's a hypothetical. Let's just go to the Department of Fish and Game's proposed temperature regime, 56 degrees at Daguerre Point Dam, that's in September, that's in October, how is that harmful to fall-run chinook salmon?

MR. CRAMER: I would be interested in the context that my words were chosen, they did have a context, because it makes all the difference what the context is. So let me put some context around that.

If -- the fall-run chinook now is adapted to spawn, and you could see it by different spawning times in the upper part of the Yuba River from the Lower Yuba River, adapted to spawn at a time which is optimal for the given temperature regime that they face.

If you reduce the temperatures two degrees, over time you will have selection factors change. You will gradually change that time of spawning. We have seen it happen over 25 years on the Rogue River where we changed the temperatures. There is actual evidence, we have watched this happen a few times.

You would see a change in the spawning time. In the interim, there would be reduced survival, because they're no longer optimal. After many generations when

they get there finally, they would be back to optimal, they would be surviving just fine.

MR. CUNNINGHAM: Okay. That's the issue I'm trying to explore. You conclude that in the interim during this period of adaptation there will be some impact, a negative impact --

MR. CRAMER: Right --

MR. CUNNINGHAM: -- on the chinook salmon. My question to you is: Is that necessarily so without predisposing that the fish are only prepared to spawn and only capable of spawning at the present time? Does that ignore the possibility that there are already salmon in the system who are capable of spawning at earlier points of time than the present perfect temperature, or optimal temperature?

MR. CRAMER: No. In fact, it absolutely counts on it. It is dependent upon having some genetic material available to move to that earlier spawning time for that selection of it to take place. It would be earlier spawning fish that would -- a few that would make that.

Their offspring would have a bell-shaped curve in their spawning time. Some of their offspring would spawn later, some earlier. And what you have to do is just -- over time if you're going to change this temperature regime you would only take a portion of that bell-shaped

curve that is adapted. Those would be the survivors.

But spawning time is very much an inherited trait. You can take early spawn fish, middle spawn fish, and late spawn fish, do an experiment where you crossbreed them, and early spawning fish will produce predominantly early spawning fish in the next generation; late spawners will produce late spawners in the next generation.

And that experience has been repeated in many places. And we can estimate the proportion of inheritants on spawning time that is due to -- or the proportionate of the trait that is due to the inheritants versus the environmental variability. So it is inherited. You do have to have the material there to make the change.

I am aware that there are presently fish that have spawned in the Yuba River during the spring period. I'm also keenly aware, as is all other biologists in the area that work with the hatchery, that the hatchery trucks spring-run chinook, so called spring-run chinook from the Feather River to the Delta.

There's extensive data which also is included in the 1991 report that I did that stray to all parts of the Sacramento Basin is very much promoted by trucking fish to the Delta and removing their key that tells them how to get home. So you have stray spring-run chinook in -- those are Feather River hatchery fish in the Yuba. And

that's been documented by actual recoveries.

MR. CUNNINGHAM: Okay. Now, stop right here. Do you know of your own personal knowledge of any study that has identified early spawning chinook salmon, salmon that spawn in September on the Yuba River as being those trucked fish from the Feather River hatchery? Do you know of any study?

MR. CRAMER: Yes, I do.

MR. CUNNINGHAM: Which study?

MR. CRAMER: Same memo by Fred Myer identifies four coded-wire tagged fish from the -- from the Feather River hatchery that were recovered --

MR. CUNNINGHAM: This is a 1980 memo?

MR. CRAMER: That's right, 1980.

MR. CUNNINGHAM: Do you know of anything else that identifies those present fish, the fish in the system today as being such trucked fish? Because it's my understanding that the Department of Fish and Game and others do not truck spring-run chinook down to the Delta every season, every year.

If I were to go out and find a salmon spawning in the system in 1999 in September in the Lower Yuba River, do you know of anything that will help me identify that that is actually a strayed spring-run salmon from the Feather River hatchery?

MR. CRAMER: Well, the only way you would do it is by actual -- by having tagged -- have marked fish that you would examine.

MR. CUNNINGHAM: Do you even know how often those fish have been trucked from the Feather River hatchery to the Delat, spring-run? Every year?

MR. CRAMER: I have looked at the data. No, I don't -- I'd have to look at the data, but I don't have that memorized.

MR. CUNNINGHAM: All right. Mr. Cramer, to the extent spring-run historically inhabited different habitat both -- may I say geographically or spatially and that was the way to differentiate and to perpetuate the stocks, how do you propose to deal with those spring-run salmon when they are now forced to inhabit habitats that no longer allow them to obtain spatial separation from other stocks?

MR. CRAMER: That's exactly where they went extinct.

MR. CUNNINGHAM: So your proposal is that if there is spring-run in any system in California below a dam where they no longer can spatially obtain their historical habitat they should be allowed to go extinct?

MR. CRAMER: If spring-run with an unique evolutionary lineage exists they should be protected, absolutely.

MR. CUNNINGHAM: But to the extent that they exist

in any system that has a dam or obstruction in the habitat --

MR. CRAMER: There's numerous examples of such places throughout --

MR. CUNNINGHAM: And your conclusion is to the extent that they then overlap with fall-run chinook salmon management efforts should not be made to maintain the distinction and they should be allowed to be extirpated?

MR. CRAMER: No, that's not at all my recommendation.

MR. CUNNINGHAM: Okay. I'd like to explore just a couple of exhibits that you also provided for us. An interesting one, your conclusion that there's lots of fall-run chinook salmon in the Yuba River, because -- and you gave us some examples on your South Yuba Exhibit 5-6.

MR. CRAMER: Yes.

MR. CUNNINGHAM: It's 5-6 and 5-7. I guess these are to be read together as a total of Yuba River plus five other examples of similar drainages. Is that what I'm supposed to understand?

MR. CRAMER: These are all the drainages -- I quit going north as soon as you get beyond the Rogue, you start getting the fish that turn north and migrate up off of Alaska. These are all chinook stocks that migrate off of California and Southern Oregon.

MR. CUNNINGHAM: And from these graphics I am suppose to conclude that because I see lots of apparent bars on the Yuba River chart on 5-6, that it's been relatively successful; while the others in the subsequent graphics have been less successful? Is that what I'm supposed to conclude?

MR. CRAMER: That would be at all of the others, except the Rogue. I'm not sure about the Eel. All those on the front page are all supplemented. Only the Yuba is not. San Joaquin, Klamath, and Trinity all have hatcheries. The Rogue does not have a fall chinook hatchery. And I'm not certain of the Eel.

Those are just data that are used -- these are the streams that are used in the principle management choices about harvest off of the California and Southern Oregon coasts.

MR. CUNNINGHAM: You're asking us to do something else with them. You're asking us to look at these and conclude that the Yuba River is relatively healthy and the others reflect something less, or at least appear less healthy?

MR. CRAMER: That's true.

MR. CUNNINGHAM: But, yet, what we have here are systems that are not even comparable. You tell me that the San Joaquin has hatcheries, and I guess they're the

ones at Merced and Mokelumne. And the Klamath has a hatchery, it's probably the Trinity River hatchery. The Trinity has a hatchery probably at Lewiston. I was under the impression that Rogue River had a hatchery up at the dam above Medford.

MR. CRAMER: Spring chinook hatchery, yeah.

MR. CUNNINGHAM: But how am I suppose to make any sense of this when what I'm comparing appears to me to be apples and oranges? Is there anything here that reflects another system with no hatchery and the dam? Is the Eel River no hatchery but a dam?

MR. CRAMER: The Klamath -- oh, the Rogue River is no hatchery and a dam.

MR. CUNNINGHAM: Well, I thought there was a rather significant dam above Medford on the Rogue River.

MR. CRAMER: I said that's a no hatchery and a dam.

MR. CUNNINGHAM: Okay.

MR. CRAMER: It does have a dam.

MR. CUNNINGHAM: So the Rogue River in Oregon is the most comparable system to the Yuba River, in your opinion? Is that what I understand?

MR. CRAMER: No, that's not accurate. You asked about a hatchery and a dam. You didn't ask which was most comparable.

MR. CUNNINGHAM: Well, I guess I'm trying to

understand: You're asking us to look at this and arrive at some kind of comparative conclusion. And I usually like to compare apples and apples and oranges and oranges.

But I look at this and the Yuba River consists of a system that has about 23 or 24 miles of unimpaired flows, no hatchery, that the flows are impaired by a dam.

The San Joaquin River system to the tune called the San Joaquin River, runs considerably longer, has a major dam, and also has several hatcheries.

The Klamath runs considerably further in distance, has a dam in place, and has at least one hatchery that contributes on the tributary. The Trinity has a dam in place, about 80 river miles -- 90 river miles above the mouth, it has a hatchery in place.

So I guess which apple is the apple in your examples that I'm suppose to compare with the apple of the Yuba River?

MR. CRAMER: You have the opportunity within the area of where chinook salmon have the life history to move offshore and stay off California and Southern Oregon and you could take all of them, the Yuba stands out as the best. That's why there's no apples to compare to.

MR. CUNNINGHAM: Is there some reason that you didn't include another system that has, unfortunately, a hatchery but also has essentially 20 to 25 miles of

unimpaired flows with a dam called the American River? Is the American River not also a comparable example to the fact that you used the San Joaquin or Klamath?

MR. CRAMER: Good point. Good point. I purposely did not put in the Sacramento main stem, nor the Feather River main stem, nor the American River, nor Battle Creek, because those are predominantly hatchery fish spawning right there below the hatchery.

Those are all streams where the hatcheries are closed at certain times to only allow entry into the hatchery of the fish they want to spawn and all the remainder are forced to spawn in the river below.

MR. CUNNINGHAM: Are you telling me then that all chinook salmon that spawn in the American River are hatchery fish?

MR. CRAMER: I am not.

MR. CUNNINGHAM: Are you telling me that all the chinook salmon that spawn in the Feather River are hatchery fish?

MR. CRAMER: I am not.

MR. CUNNINGHAM: Or the Sacramento?

MR. CRAMER: I am not.

MR. CUNNINGHAM: Or Battle Creek?

MR. CRAMER: I am not.

MR. CUNNINGHAM: In fact, isn't it true in fact that

there are significant populations of instream native chinook spawning on all of those systems?

MR. CRAMER: It is true.

MR. CUNNINGHAM: Okay. I'm just trying to figure out what I'm looking at?

MR. CRAMER: Roughly one-third by my estimate are native. So two-thirds of the runs in those are driven by hatchery.

MR. CUNNINGHAM: Dr. Brannon, couple of real quick questions. You have talked about the management of chinook salmon on the Feather River, I believe specifically fall-run chinook salmon on the Feather River -- or on the Yuba River under the possible proposed temperature regime of the Department of Fish and Game; is that correct?

DR. BRANNON: Yes.

MR. CUNNINGHAM: And in your evaluation of the Department's proposed temperature regime did you take into consideration the fact that the Lower Yuba River also has a recognized population of steelhead trout?

DR. BRANNON: I did not consider steelhead in my examination.

MR. CUNNINGHAM: And is it my understanding that you also then followed Mr. Cramer's conclusion that there were no spring-run chinook salmon in the system, so that the

only species of concern for your management scenarios was the fall-run chinook salmon?

DR. BRANNON: I agreed that that was the case. I did it independently.

MR. CUNNINGHAM: Dr. Brannon, have you ever been asked to prepare a management scenario when you have more than one species of concern on a watershed undergoing management?

DR. BRANNON: No.

MR. CUNNINGHAM: Mr. Brown, about five seconds?

H.O. BROWN: Okay.

MR. CUNNINGHAM: One last question. Excuse me, Mr. Cramer, if I go back to a piece where we kind of went through it and you testified and we moved on.

Fred Myer's coded-wire survey of Yuba River fish that you indicated identified some possible spring-run. Is that what I understood you said it did?

MR. MINASIAN: Would you like, we have an overhead of that? Didn't we bring Fred Myer's report --

MR. CRAMER: I don't have an overhead.

MR. CUNNINGHAM: That's all right. Are you familiar with the memo sufficiently to understand when the coded-wire tags were actually collected for those fish that were identified in Mr. Myer's memorandum?

MR. CRAMER: No. To my recollection the thing just

says, that they collected four spring-run coded-wire tags from the Yuba River. And that was one of the purposes of going out there to do the surveys with the scuba drivers to locate spring chinook holding below Englebright Dam.

MR. CUNNINGHAM: If I were to tell you that those four coded-wire tags were collected during a fall-run survey, does that sound like that's probably what they were? That this wasn't a survive specifically designed to identify spring-run chinook salmon on the Yuba River?

MR. CRAMER: I would have expected that to be so, because that is typically the only way they get spotted. Even in the recent accounts, in testimony provided by Cal Fish and Game it's been that somebody observed redds or carcasses and surmised that something previously had spawned. So, yes, I would expect that is the way you will recover them, because spring chinook -- there's no survey for spring chinook.

MR. CUNNINGHAM: In your recollection of the memorandum, does it talk about whether or not those four coded-wire tags were in fish that had apparently spawned or not, do you recall?

MR. CRAMER: It did not mention that to my recollection.

MR. CUNNINGHAM: Okay. Thank you both.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Sanders.

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CROSS-EXAMINATION OF SOUTH YUBA WATER AGENCY

BY SOUTH YUBA RIVER CITIZEN'S LEAGUE

BY MR. SANDERS

MR. SANDERS: Good afternoon, gentlemen. And I'd like to welcome Dr. Brannon to our little party here. I will start, of course, with Mr. Cramer.

Now, when we talk about temperature you do understand that the proposed temperature criteria is a maximum temperature, not a constant temperature; is that correct?

MR. CRAMER: Yeah, I understand that.

MR. SANDERS: Okay. Now, in your professional opinion, is there any maximum temperature that should not be exceeded on the Yuba River? You testified that 56, in your opinion, wasn't a good maximum. What should be the maximum?

MR. CRAMER: Depends on exactly how you express it. There's the instantaneous maximum, the daily average maximum. And I can -- it would be in the neighborhood of the lower 70s, 74. I personally sampled major runs of fall chinook entering the Rogue River when the water temperatures were 74 and they did quite well, but they only had to pass through it briefly.

MR. SANDERS: Okay. Good enough. Let's go to the study that you presented here on micro-satellite DNA. This was just based on one study; is that correct?

MR. CRAMER: Yes.

MR. SANDERS: And was the study peer reviewed?

MR. CRAMER: The study is undergoing that process of peer review.

MR. SANDERS: Has not yet been peer reviewed?

MR. CRAMER: Yeah. It may have, but I'm not familiar with what that peer review has done, so I'd have to say, no.

MR. SANDERS: And it's not been published yet?

MR. CRAMER: Correct.

MR. SANDERS: Okay. Are you familiar with the NMFS proposed and final listing rules that were published in the Federal register?

MR. CRAMER: I am.

MR. SANDERS: And did the final rule discuss studies of DNA and conclude that there is a distinct spring-run on the Feather River?

MR. CRAMER: I'm not sure that it did. I can't recall what it talked about about the DNA in the Feather River.

MR. SANDERS: Okay. Do you recall the final rule discussing DNA studies?

MR. CRAMER: It would have referred to those. The final rule included more than just the Central Valley.

MR. SANDERS: Well, okay. Did the final rule discuss specifically the Central Valley?

MR. CRAMER: To list the Central Valley it would have discussed the Central Valley.

MR. SANDERS: Right again. Okay. And in that listing determination NMFS -- did NMFS address concerns raised in response to the proposed rule? That's the question.

MR. CRAMER: In a final listing they always respond to the objections raised during the comment period.

MR. SANDERS: Okay. Good.

MR. CRAMER: Wait, just to clarify here for a moment. If you're going to ask me questions about what the final rule says, I need a copy of it to read and refer to here.

MR. SANDERS: I'm sorry. I actually don't have a copy of it right in hand, so we'll just go with the best of your recollection. And if you do not recall, please, say you don't recall and we will move right on. This isn't meant to trick you.

Okay. Now, do you recall that there was some discussion of genetics in the final rule that was responding to objections raised to the proposed rule?

MR. CRAMER: No, I can't say that I specifically recall the final rule.

MR. SANDERS: Okay.

MR. CRAMER: The final rule, I didn't study the final rule, I read who got listed. I had a copy of the final rule, but to know the details inside of it I would have had it.

MR. SANDERS: All right. Now, to the best of your recollection, did NMFS rely on peer-reviewed studies when they determined that Central Valley spring-run chinook salmon are threatened?

MR. CRAMER: I'm sorry, my mind lofted away there for a moment. You asked --

MR. SANDERS: To the best of your recollection, did NMFS rely on peer-reviewed studies when they determined that Central Valley spring-run chinook salmon are a threatened species?

MR. CRAMER: They would rely on the best available data commercially or peer reviewed. So they would rely on whichever data they received from the fisheries agencies and from comments.

MR. SANDERS: Okay. I'm turning to Page 5-6. Now, your testimony, if I recall correctly, you indicated that the significance of these graphs was not just that there are more fish in the Yuba, but also that it doesn't show

the same sort of year-to-year variability that these other rivers do.

Is that an accurate description of your testimony?

MR. CRAMER: It does not show the same year-to-year variability. And it shows many thousands of fish. So that large numbers cannot be the extent of variability that the others --

MR. SANDERS: And both of those you consider to be important factors?

MR. CRAMER: Correct.

MR. SANDERS: Okay. Are any of these other three streams San Joaquin, Klamath, Trinity are any of those considered part of Central Valley ESU?

MR. CRAMER: San Joaquin is, but not spring chinook because there are none there. So it's part of the Central Valley -- it would have been part of the Central Valley fall chinook if they had listed it. They did identify that it belonged together for the fall chinook, which is the comparison being made.

MR. SANDERS: Okay. Right, these are fall chinook data. Now, you testified that you didn't include similar graphs for the Sacramento River or the American River. Now, have you seen such graphs, or do you have such graphs?

MR. CRAMER: Yes.

MR. SANDERS: Now, do those graphs look more like the Yuba River or more like the San Joaquin River? Again, I realize it's kind of --

MR. CRAMER: I would say they look more like the Yuba River. They're variable, depending on which one you're looking at, but they were predominantly hatchery fish.

MR. SANDERS: Okay. But --

MR. CRAMER: And the hatchery fish, of course, depend on factors independent of stream temperature for their rearing, they're reared in the hatchery.

MR. SANDERS: Okay. Fair enough. But now here's my problem: You present us with four graphs and the Yuba River looks markedly different from the other three. And then you testified that one reason for the difference is that there's no hatchery on the Yuba. Is that correct?

MR. CRAMER: No. No, I didn't. The reason for the difference does not have to do with the fact there's no hatchery. I say that's an additional plus for the strength of the Yuba and that's because it's not dependent upon a hatchery.

MR. SANDERS: Okay. But these other three that have hatcheries have much worse looking graphs. I mean I'm not a fisheries expert, but they look worse to me.

MR. CRAMER: Yeah.

MR. SANDERS: Again, I'm not a fisheries expert but why shouldn't I conclude that the way to save the fish is to get rid of the hatcheries?

MR. CRAMER: I won't -- I assume that's a facetious question.

MR. SANDERS: I will withdraw the question.

H.O. BROWN: Thank you.

MR. SANDERS: I'm going to go to Page 12. This is a study done by you. And it's a called -- you called it a, "Coded-wire Tagged Cohort Analysis." These are fall chinooks; is that correct?

MR. CRAMER: Correct, these are all fall chinook.

MR. SANDERS: And they are hatchery fish?

MR. CRAMER: Correct, they are all hatchery fish. So that all the -- the variables that influence these fish would only be during their migration as they leave the river.

MR. SANDERS: Okay. And there's -- but has any similar study been done on the Yuba River?

MR. CRAMER: There were releases of coded-wire tagged chinook from the Yuba River from fish captured at Hallwood-Cordua screens in I think 1980 and 1981. And I have analyzed those as well.

The trouble -- see each of these has a concise

release time, so you can look at the temperature within one week of that time. The Yuba fish were, of course, released over the season as they were captured and tagged at Hallwood-Cordua screens. So they do not correspond to a point in time that they started.

MR. SANDERS: Okay. Okay. Let me see, just what is the Endangered Species Act status of the fall-run, do you know?

MR. CRAMER: Their listing was not warranted.

MR. SANDERS: But does NMFS consider them a candidate species, are you aware of that?

MR. CRAMER: They probably do. They seldom just say, "not warranted," and let it sit. I'm not certain though.

MR. SANDERS: Okay. So they were proposed to be listed as threatened; is that correct?

MR. CRAMER: They have been proposed. And that proposal through the intensive review that NMFS gives it it was determined unnecessary.

MR. SANDERS: Right. Okay. Now, Dr. Brannon, have you personally studied the Yuba River salmon?

DR. BRANNON: Just data. I have not been on the river.

MR. SANDERS: Okay. Are you aware if there are any dams blocking upstream passage of spring-run on the Yuba

River?

DR. BRANNON: Yes.

MR. SANDERS: Do you know the location of Englebright Dam?

DR. BRANNON: Approximately.

MR. SANDERS: Okay. Do you know the location of Daguerre Dam in relation to Englebright Dam?

DR. BRANNON: Yes.

MR. SANDERS: Okay. Did you review the DFG management proposal?

DR. BRANNON: Yes.

MR. SANDERS: So you understand that 56 degrees is intended to be a maximum temperature, not a constant?

DR. BRANNON: Yes.

MR. SANDERS: Okay. Did I hear you correctly when you -- that you testified that it is impossible to have a spring-run on the Yuba River?

DR. BRANNON: Yes.

MR. SANDERS: And are you familiar with the final rule listing Central Valley spring-run chinook salmon?

DR. BRANNON: Not specifically.

MR. SANDERS: Okay. But does it surprise you that the National Marine Fisheries Service considers that -- or believes that there is a spring run on the Yuba River?

DR. BRANNON: No, it doesn't surprise me.

MR. SANDERS: But you don't think that they are correct?

DR. BRANNON: That's right.

MR. SANDERS: Okay. To your knowledge, has anyone challenged the listing of the Central Valley spring-run chinook salmon in court?

DR. BRANNON: I'm not aware of that.

MR. SANDERS: Okay. I believe that's it. Thank you very much.

H.O. BROWN: Thank you, Mr. Sanders.

Mr. Cook.

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CROSS-EXAMINATION OF SOUTH YUBA WATER AGENCY

BY MR. COOK

MR. COOK: Mr. Cramer, in your opinion there are no spring-run salmon on the Yuba River; that is correct, isn't it?

MR. CRAMER: Yeah, that is correct. And the spring-run I'm talking about again are those that belong to the evolutionary significant unit that has been proposed for endangered species protection.

There could be such a thing as a spring-running fish that fits our typical concept of a fish that runs in the early spring, comes in bright in the Yuba River, because you would find that as a normal variant within the

genetic code that exists among the chinook in the Yuba River.

MR. COOK: I think you also testified that spring-run and fall-run do not coincide in their locations of spawning; is that correct?

MR. CRAMER: Wherever they naturally occur and that they do coincide only where a dam blocks the spring-run and forces it to spawn with the fall-run.

MR. COOK: Now, I realize that there is a disagreement as to the existence of spring-run salmon protected by the Endangered Species Act on the Yuba River. I mean you understand that, don't you?

MR. CRAMER: Yes.

MR. COOK: So let's assume for a moment that there are spring-run salmon spawning on the Yuba River.

MR. CRAMER: Okay.

MR. COOK: And, therefore -- oh, and that the spring-run and the fall-run really need two separate locations to spawn, correct?

MR. CRAMER: Correct.

MR. COOK: And at the present time the Englebright Dam blocks off the historical habitat of the spring-run salmon; is that correct?

MR. CRAMER: Correct.

MR. COOK: So that leads to the question of: In

your opinion, would removal of Englebright Dam -- or would it be helpful to the spring-run if Englebright Dam did not prevent the spring-run from migration to their natural habitat in the headwaters of the Yuba?

MR. CRAMER: There's other obstacles above Englebright, but if you removed all obstacles and you had a genetics source to restart those with, then, certainly, all other considerations aside, no assigning values to anything else, that would be favorable to the spring chinook.

MR. COOK: So assuming for purposes of opinion at this point, hypothetically, assuming then that there was no Englebright Dam, that that as an obstacle being removed would be helpful to encourage increasing the numbers of spring-run in the Yuba River, that, again, assuming that the spring-run are there?

MR. CRAMER: A removal of the barrier could accomplish that. A number of proposals are being forwarded around the West Coast to reestablish runs above dams and many of those don't require removal of the dam. But some kind of means of transporting fish around the dam, getting them down to the basin where they historically spawn. Yeah, that would be necessary to establish a true spring-run in the Feather River, in the Yuba River, either one.

MR. COOK: And, in fact, in your opinion, that would encourage the expansion, growth, and survival of the spring-run if they exist in the Yuba?

MR. CRAMER: Yes, it would. But there are -- don't take it too simply. There's lot of problems you would have to solve with the fish in an area where they're not now. Usually when you go back up there you've got unscreened diversions and who knows what else to deal with. Yeah, in principle that concept works.

MR. COOK: Well, now, assuming then that the spring-run were able to migrate to their natural habitat at the headwaters of the Yuba River, what impact would that have on fall-run in the Lower Yuba River?

MR. MINASIAN: In your hypothetical do you want him to assume that we don't have the water available from Englebright?

MR. COOK: That we have the natural flow of water down the South Fork if Englebright wasn't there. I don't think --

MR. CRAMER: Well --

MR. COOK: If I may respond. I don't believe that the Englebright provides substantial amounts of water for the Lower Yuba River, unless I'm incorrect on that.

MR. CRAMER: And I couldn't testify on how much water it provides, but let's see the original question

was?

MR. COOK: Well, let me try it again. I'm really not talking about water --

MR. CRAMER: You're talking about fish access to spawning --

MR. COOK: I'm talking about assuming that there's no Englebright and assuming that the spring-run can go to their natural habitat --

MR. CRAMER: Right.

MR. COOK: -- in the headwaters.

MR. CRAMER: Right.

MR. COOK: What impact would all that have on the fall-run in the Lower Yuba?

MR. CRAMER: If you maintained the present temperature regime, it would have no impact. If you didn't maintain the same temperature regime, whatever changes you made would have an impact on the fall-run as well.

There has been a change in the temperature regime in the Yuba River since the building of New Bullards Bar and both flow and temperatures have changed. And those changes are desirable changes for chinook salmon. And the fall-run appear to be doing well, there's got to be a reason why they're doing well.

So at any rate, just removing dams and hoping

fish will go back into place would, perhaps, give you a spring-run if you have got a founding source, but it would likely impact the fall-run. So it depends on how you do it. It depends on how you do it.

MR. COOK: All right. So you say then that Bullards Bar Dam has had a favorable impact on the fall-run in the Lower Yuba; is that correct?

MR. CRAMER: That is my best determination from looking at the temperature profile that has caused a change and looking at the escapements of fall chinook on the Yuba River.

MR. COOK: And one of the impacts on the Bullards Bar Dam causing a favorable result would be that water is taken from a lower area of the reservoir and, therefore, is colder; is that correct?

MR. CRAMER: I'm not totally familiar with all of the operations at New Bullards Bar, but the end result has been the peak temperatures in the spring are slightly warmer and in the mid-summer are cooler.

MR. COOK: And you consider the cooler water, therefore, out of Bullards Bar is a favorable impact on the fall-run salmon in the Lower Yuba?

MR. CRAMER: I think also the warmer temperatures in the spring have been favorable.

MR. COOK: What about the colder temperatures in the

fall?

MR. CRAMER: I think my recollection of the temperature profiles is they pretty much come together in the fall. I don't know what it's done to fall temperatures. That would be a critical -- that's what we've been testifying to already, that if you change the fall temperatures around you will influence what run of chinook you have there. I think that my recollection of looking at those temperature profiles, the fall temperature timing did not change much with New Bullards Bar. When I say fall temperature regime, I'm talking about in October.

MR. COOK: Is one of the favorable impacts of Bullards Bar the increased flow in the Lower Yuba River?

MR. CRAMER: I would -- yeah, I think so. The temperature -- the flows have gone up historically from where they were. When I say, "historically," I'm talking about before you had that storage available.

MR. COOK: So you agree then that increased flow is favorable to the fall-run salmon in the Lower Yuba?

MR. CRAMER: To the extent that -- I didn't testify to all of this, but there is a flow which is optimal. In terms of given the morphology of the stream and the temperature that you want to have at a particular area, flow influences both the temperature as they turn out

downstream and it influences the velocity and depth at a particular area.

So there is, given the physical characteristics of the stream, a flow that is optimal for a different life history. That's what the instream incremental flow methodology is all about. Those things that happen on the Yuba indicate what flows would produce best physical characteristics excepting temperature, temperature you look at separately.

MR. COOK: Just so I understand, I believe you testified that Bullards Bar Dam created favorable impacts on the Lower Yuba River fall-run salmon. And those favorable impacts would probably result -- I can't think of anything else they would result from -- they would probably result from an increased flow and a reduction in temperature, because of withdrawing water from the lower portion of the reservoir.

Now, would you agree with that?

MR. CRAMER: I think that that is likely. Here's an important thing that you have to picture in all this, there is a temperature that is too warm for chinook and they don't exist. And there's a temperature that's optimal for growth alone. And then there's temperature changes that create different life history adaptations.

What I am saying is that from the temperatures

and flow that preceded New Bullards Bar compared to those that now exist, it appears that that change has been good for fall chinook. They're very productive in the Lower Yuba River.

I'm not saying you can continue to change for ever and everything always gets better. I'm simply saying that that change from where it was to where it is now, our test of how good it's doing now is how much fish its got and now it's very good.

MR. COOK: I'm not really asking about the future and I'm not talking about what changes should be made now. I'm merely asking for an explanation of your comment that it's better because of the reduced temperatures and the increased flow as a result of Bullards Bar construction.

MR. CRAMER: Compared to what existed right before that?

MR. COOK: Yes, before Bullards Bar and subsequent to Bullards Bar, the temperature and the increased flows have been beneficial to the lower river -- or Lower Yuba fall-run salmon.

MR. CRAMER: Right. Okay.

MR. COOK: Okay. Dr. Brannon, I tried to write down a couple things you said, correct me if I didn't get it correct, you concluded that the fall-run of salmon on the Yuba was healthy?

DR. BRANNON: Yes.

MR. COOK: And did you base that on historic fall-run salmon on the Yuba River? That is historic going back, say, to the 19- -- to the turn of the century?

DR. BRANNON: No.

MR. COOK: What did you base that on?

DR. BRANNON: Just on return numbers of 11- to 30,000 for that length of river compared to the Columbia River that had, at a maximum, probably 4 million chinook salmon that has many thousands of miles of spawning ground.

So chinook salmon are limited by rearing area and they show a pattern of distribution to maximize their rearing potential. And so when you look at that relatively short run of river and its productivity, it looks like it's fairly healthy compared to the other chinook salmon habitats.

MR. COOK: You did mention that the river is not very long and the short run of the river --

DR. BRANNON: Yes.

MR. COOK: -- just now, are you familiar with the location of Englebright Dam?

DR. BRANNON: Yes, on the map.

MR. COOK: On the map?

DR. BRANNON: Yeah.

MR. COOK: You have not personally --

DR. BRANNON: No, I have not.

MR. COOK: And so are you saying -- are you testifying that the fall-run habitat ends at Bullards Bar -- I mean at Englebright Dam?

DR. BRANNON: The present habitat apparently does, because that's the uppermost area that it can reach.

MR. COOK: Do you know if Englebright Dam where not there, if there would be any fall-run habitat above the location of the present Englebright Dam?

DR. BRANNON: No, I don't know. You see if you change the incubation habitat by one degree Centigrade you change emergence from three to four weeks. So two degrees is going to change a fall chinook into an early summer chinook.

And if you remove the dam, I can't say what impact that would have on temperature. So whether it is habitat above it with the dam removed, I can't say. You know from the standpoint of a biologist we always want more river for the fish to utilize, so that may be helpful. But I don't know what it would do in terms of its impact on the present fall chinook.

MR. COOK: I think you talked about the Columbia and the characteristics of the riverbed?

DR. BRANNON: Right.

MR. COOK: And I think you considered that characteristics of the river itself as having an impact on habitat for chinook salmon?

DR. BRANNON: Sure, it is.

MR. COOK: You haven't study -- I won't throw it at you, in any event, you haven't studied it above Englebright, have you?

DR. BRANNON: Of course not, no. But temperature is by far the most critical element that dictates population structure. And I could imagine a situation where if the temperature was altered sufficiently that NMFS would come along and say, we're going to list those fish because you've changed the population structure now and the population structure we're meaning to save is no longer there, or is threatened.

MR. COOK: Well, but you don't know what impact the removal of Englebright Dam would have to temperature?

DR. BRANNON: No, sir.

MR. COOK: And, of course, Englebright Dam was built, what, 60 years ago, perhaps?

DR. BRANNON: Sure.

MR. COOK: Before that I believe that there was historical salmon, chinook in that portion of the river. So really Englebright Dam changed things. And did that change for the better, or for the worse, or do you know?

DR. BRANNON: Well, I don't know because I don't know what the historical run was.

MR. COOK: And you said I think earlier that nothing should be changed. Did you mean that, or did you relate that to --

DR. BRANNON: I mean in terms of temperature, I would not toy with the temperature.

MR. COOK: What about Mr. Cramer's testimony about changing the temperature on Bullards Bar having a beneficial impact on the fall-run chinook in the Lower Yuba, you disagree with that?

DR. BRANNON: No, I can't disagree with that. I'm just saying that I would not change the present temperature.

MR. COOK: But the present temperature has created a healthy fish --

DR. BRANNON: Sure, yeah. And if we lowered it even down lower to 42 degrees or 36 degrees we'd wipe them out. So I mean there's only so far that you can go to improve a situation.

MR. COOK: And do you know if Bullards Bar Dam increased or decreased the temperature of the Lower Yuba?

DR. BRANNON: Looking at the historical record that I'm aware of, it must have lowered it because your temperature was higher, in the 60s.

MR. COOK: Where was that temperature measured?

DR. BRANNON: Marysville, I believe. I'm not sure

MR. COOK: You know that Marysville is many miles --

DR. BRANNON: Right.

MR. COOK: -- below Bullards Bar Dam?

DR. BRANNON: Right.

MR. COOK: And that it has a number of tributaries coming into it below Bullards Bar Dam as well as water coming in from the Yuba Goldfields, do you know that?

DR. BRANNON: I'm not familiar with the watershed from that standpoint.

MR. COOK: I think that's all I had. Thank you very much.

H.O. BROWN: Mr. Lilly.

We'll go until about 4:45 this evening.

MR. MINASIAN: Thank you for your consideration. We appreciate it.

MR. LILLY: I'm only going to take about five minutes.

H.O. BROWN: Okay. We'll try to get you -- what time does your airplane leave?

MR. CRAMER: Just before 6:00.

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CROSS-EXAMINATION OF SOUTH YUBA WATER AGENCY

BY YUBA COUNTY WATER AGENCY

BY MR. LILLY

MR. LILLY: Mr. Cramer, I'll start with you. I think you were testifying about the Department -- various Department of Fish and Game documents that indicated that there was no natural spring-run remaining in the Yuba River. And you mentioned Mr. Myer's memo from 1990; is that correct?

MR. CRAMER: That's correct.

MR. LILLY: And I think you were cut off when you started talking about other Department of Fish and Game information on this issue. Can you just elaborate on the other Department of Fish and Game information on this issue?

MR. CRAMER: I will briefly, because you'd have to go through a lot of record to look at it. Another example is Mills and Fisher, 1994. They have what we call the book of numbers, it's all the run sizes throughout the Sacramento and San Joaquin basins. And they make an allusion to spring-run chinook in the Feather River.

They're saying apparently that that run is no longer in existence, that it's now an introgressed mixture of spring and fall chinook. There are other memos to the

file in the Cal Fish and Game's district files that talk about runs being all digressed. I reviewed all those memos and I couldn't cite all the specific ones.

MR. LILLY: Just for the uninitiated here, what does introgressed mean?

MR. CRAMER: I'm sorry. Introgressed is usually a term used in genetics to mean that two unlike entities, in this case, two races of chinook have spawned together and they now have exchanged material. That is the genetic material from one has introgressed into the other and so that they are no longer unique. They are a composite.

MR. LILLY: Correct me if I'm wrong, but in simpler terms is this what we think of as hybridization of the two runs?

MR. CRAMER: Yes. That would be a similar kind of term.

MR. LILLY: Okay. And so these DFG documents are indicating that the fall -- the historical spring-run and the fall-run in the Feather River and the Yuba River have introgressed; is that correct?

MR. CRAMER: That's correct.

MR. LILLY: Now, another question for the uninitiated; I realize you deal with this stuff every day, but sometimes you have to realize that some of us don't understand these things as well as you do. What are

coded-wire tags?

MR. CRAMER: Coded-wire tags are a tiny piece of metal, perhaps, a quarter of an inch long, about the diameter of a pin. It's implanted in the cranium, in the head of the salmon or steelhead when it's a juvenile.

And then usually a fin is clipped that identifies for you when you recapture that fish as an adult that that fish has in its head a tag. And those tags can only be recovered from dead fish. So usually they're recovered from hatcheries, or they're recovered from harvested fish, or from carcass surveys.

You then find the fin clip, you have to cut off the head and use magnetic detectors to figure out if that -- where in the head that tag is you recovered it from. It generally identifies a specific group of fish from which that fish originated.

MR. LILLY: So there's different -- basically, I won't say computerized, but different magnetic-type information in each coded-wire tag so you can identify where the fish come from?

MR. CRAMER: It is coded, not with magnetism, but a magnetism detector helps you identify -- there's metal in the head of that fish. But at any rate, it's coded with codes that go down the side of the piece of metal itself.

MR. LILLY: So if you could look at the coded-wire

tag you can figure out where the fish came from?

MR. CRAMER: That is true.

MR. LILLY: Okay. Now, does the Department of Fish and Game or anyone else put coded-wire tags into fish that spawn in the wild?

MR. CRAMER: They do and they have coded-wire tag Yuba River fall chinook from the 1980 and 1981 groups by capturing fish at the Hallwood-Cordua screens and tagging those fish. And --

MR. LILLY: Okay. Excuse me, go ahead.

MR. CRAMER: I was just going to say I have some treatment of that data in the report that I prepared for Department of Water Resources in 1991. And I probably have some memos to the file, because I remember Randy Brown asked me to do further analysis later.

MR. LILLY: Now, when those fish were coded-wire tagged, would there be a different code put into them so you could tell that they were the ones that had been marked from the Hallwood-Cordua screen?

MR. CRAMER: Yes, you could.

MR. LILLY: All right. Now, going to Mr. Myer's survey when he collected some of these coded-wire tagged fish that had reached -- spring-run that had initiated their lives at the Feather River hatchery, I think you said that they were collected during the fall-run survey;

is that correct?

MR. CRAMER: No. That was Mr. Cunningham that said that.

MR. LILLY: Oh, okay. Where were they collected?

MR. CRAMER: And I said I don't know and I assume that they were probably collected with the fall-run survey, because those are the only surveys that are done.

MR. LILLY: And does this highlight the fact that the spring-run and the fall-run in the Yuba River are, in fact, spawning in the same general area and at the same times of the year?

MR. CRAMER: It says they're spawning in the -- anything spawning in the Yuba River is spawning at the same place as fall chinook, they spawn throughout.

MR. LILLY: Okay. So basically --

MR. CRAMER: At the same time, it doesn't confirm when they spawn. They could have spawned earlier and they probably did.

MR. LILLY: All right. And just so we're clear on this: But there's no doubt that the four fish that Mr. Myer collected, the coded wires from the adult carcasses had originated as juveniles in the Feather River hatchery as spring-run?

MR. CRAMER: Correct.

MR. LILLY: Okay. Professor Brannon, I'm going to

turn to you with a few questions. You've had to blitz through a lot of material in a short time and I know you're used to giving lectures for 45 or 50 minutes to your students --

DR. BRANNON: 53 minutes.

MR. LILLY: And you probably have it timed so it just comes out right, but I just wanted to ask you to go over a couple of your conclusions in a little more detail, because I'm not sure they were all entirely clear to all of us who are not your students and do not go to your classes every week.

Just to summarize, and we'll start with the spring, what would be the affects on the chinook salmon in the Yuba River if the Department of Fish and Game's proposal for a 56-degree temperature requirement were implemented? And we'll start what would be the affects during the spring on the life stages that are present in the spring of chinook salmon in the Yuba River?

DR. BRANNON: Now, are you saying the spring of the year, or the spring population?

MR. LILLY: Spring of the year. I thought I would ask it separately for different types of years, because from your testimony it appears that there are different types of affects during different times of the year.

DR. BRANNON: Yeah. It depends on the magnitude of

the temperature change.

MR. LILLY: Okay.

DR. BRANNON: So you will -- you will -- you will place the population presently there in an asynchronous situation, so it's not going to match its emergence conditions that has evolved to maximize its survival. So that's going to be displaced.

And the distance that would be displaced would be by the magnitude of the temperature. So you will change that. That means that the genetic structure of the adult population will not be appropriate any longer for that regime and that will have to go through natural selection and take generations to do, maybe 30 years, depending again on how much you have to move it.

It will change the emergence timing. So it going to be out of synchrony with the food situation that is evolved to adapt to. It may change its migratory opportunities, because it could delay the outmigration timing and that could make it asynchronous with the rest of the cycle it has to match up with.

It will have a potential change in their distribution pattern. The young fish that normally displace because of, probably in my opinion, it would be because of habitat limitations, they would remain in the Yuba River a little longer. They wouldn't take advantage,

perhaps, of the Lower Sacramento.

It may be temperatures are very favorable for good growth in the Sacramento, better than the Yuba at that time. And so if they're delayed going there, that means that they wouldn't be taking advantage of that temperature as readily. That would make them a little bit smaller and a little bit later in outmigration.

MR. LILLY: Okay. And then presumably if they're later in the outmigration they then would experience different temperatures due to the delay in the Lower Sacramento River; is that correct?

DR. BRANNON: Yeah.

MR. LILLY: Okay. Now, let's just go forward to -- we'll fast forward to two-and-a-half years later to the adults coming back in the fall. What would be the effects of DFG's proposed 56-degree temperature requirement if that temperature requirement were imposed in September and October and we'll say -- in September and October on the adult spawning patterns?

DR. BRANNON: Well, looking at your peak spawning occurs in the system around the end of October, first part of November on the average -- in some years it will occur as soon as the 20th, perhaps, of October in the lower reaches, the upper reaches are a little earlier than that, so if there's no change prior to that time there will be

no effect.

MR. LILLY: Okay. What if temperatures are reduced in the September and early October period, then what would the effect be?

DR. BRANNON: Then that will be an impact on the adult populations' spawning time.

MR. LILLY: Okay. Please, describe how that impact will occur.

DR. BRANNON: When ripe fish, or fish that are approaching maturation confront their natal stream temperature and it's cooler, what that tells them is they are late. They should have been there spawning. It tends to accelerate spawning.

If they hit that and it's warm that says, I'm too early, I shouldn't be here and they will delay spawning. So that will impact their spawning time. In the long-term effect in natural selection, it would alter their spawning time and move it earlier.

MR. LILLY: Okay. And then going through the -- now to the eggs, what would be the effect on the eggs be if the spawning time of their parents had been moved earlier in the fall?

DR. BRANNON: Well, I think what we're talking about is the same kind of answer that I gave you on the first question, it really overlaps.

MR. LILLY: Okay. Basically the change in the emergence of the eggs could affect their synchronous?

DR. BRANNON: Yeah. And in time, they will adapt to that. That would be the new temperature issue.

MR. LILLY: Okay. But during the adaptation period there could be an adverse effect on the population; is that correct?

DR. BRANNON: That's correct. And when people talk about the spring-run and fall-run that's local nomenclature, there is no spring-run in the Yuba River. Spring-runs spawn in the end of July and August. If they're spawning so close to the fall chinook, they can't be spring chinook. Now, if you call them a spring-run, that's fine, but biologically they're not.

MR. LILLY: All right. Thank you, Professor Brannon and Mr. Cramer. I have no further questions.

H.O. BROWN: We're going to take a five-minute break.

(Recess taken from 4:14 p.m. to 4:19 p.m.)

H.O. BROWN: All right, come back to order.

Mr. Bezerra, I believe you're up.

MR. BEZERRA: Mr. Brown, we have no questions for these witnesses.

H.O. BROWN: All right.

Mr. Morris.

MR. MORRIS: We could have probably skipped the break, I have no questions.

H.O. BROWN: Staff?

MR. FRINK: Yes, sir, we do have some questions.

H.O. BROWN: Go ahead.

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CROSS-EXAMINATION OF SOUTH YUBA WATER AGENCY

BY STAFF

MR. FRINK: Mr. Cramer, earlier this afternoon I believe you mentioned your concerns regarding the nondesirability of meeting the temperature recommendations of the Department of Fish and Game. I wanted to clarify what your opinion is as a biologist regarding the numbers that are proposed in the Draft Water Rights Decision.

My understanding was you had a concern about the year-round recommendation if the Department of Fish and Game to maintain a water temperature of 56 degrees; is that correct?

MR. CRAMER: Yes, it is.

MR. FRINK: In your opinion, would a mean daily water temperature of 56 degrees at Daguerre Point Dam between October 15th and March 31st be harmful to chinook salmon?

MR. MINASIAN: May I hand him a copy of this so he can refer to it?

MR. FRINK: Sure.

MR. CRAMER: So you're talking over the winter after the typical spawning time, I recall that presently that temperature exceeded below Daguerre Point Dam --

MR. FRINK: At Daguerre Point Dam.

MR. CRAMER: Okay. You're talking about the standard at Daguerre Point?

MR. FRINK: Yes.

MR. CRAMER: Not at Marysville?

MR. FRINK: Right.

MR. CRAMER: That starting October --

MR. FRINK: October 15th through March 31st, would it be harmful to chinook salmon to have a mean daily water temperature that doesn't exceed 56 degrees?

MR. CRAMER: Does not exceed at Daguerre Point Dam, no, that seems fairly well within reason.

MR. FRINK: Okay.

MR. CRAMER: Yeah, I think that fits fairly well to the existing fall chinook population.

MR. FRINK: Okay. Would a maximum mean daily water temperature of 60 degrees at Daguerre Point Dam between April 1 and May 31st be harmful to chinook salmon, in your opinion?

MR. CRAMER: That's chancy. The question -- the reason -- it's good temperature for chinook. The

chanciness comes in the low-flow years, because it would typically be quite a bit warmer than that. And if you have that standard applying to all conditions, the challenge is that that is not giving the fish the right signal for when to leave. They leave at a time that's not optimal for their survival.

MR. FRINK: Okay.

MR. CRAMER: So everything has to be in synchrony. 50 would be great if it's in synchrony with good survival conditions through the Delta.

MR. FRINK: Okay. Would a maximum mean daily water temperature of 65 degrees at Daguerre Point Dam between June 1 and September 31st be harmful to chinook salmon?

MR. CRAMER: Harmful to chinook salmon, no.

MR. FRINK: Okay. That's all.

MR. CRAMER: That extends until -- 65 extends until what date?

MR. FRINK: June 1st through September 31st a maximum mean daily water temperature of 65 degrees, would that be harmful?

MR. CRAMER: At Daguerre Point, no. That should not be harmful. Now, here's -- you're at Daguerre Point. What I would want to do with the model is look at what's happening at Rose Bar, Parks Bar, that's where you have a heavily concentrated spawning above Daguerre Point.

So as I'm saying that "no" in general, I'm thinking, okay, in the area of Daguerre Point, no problem. But to affirm to myself that that, indeed, was the right thing to do I would want to know, well, what temperatures did that create at Parks Bar up at Highway 20 where all the fish are, because by the time you're at Daguerre Point, two-thirds or more of all your salmon are upstream now.

So I would want to know what the temperatures are there, but that would be the last thing that I would look at. You're on -- the margin is a reasonably good temperature for chinook rearing, but you're also cutting, shaving on the conservative side. They can do well in warmer temperatures. They, certainly, do well in the temperatures that you quoted.

MR. FRINK: Okay. Thank you.

MS. LOW: I have a few questions for both of the witnesses. I'll start with you, Mr. Cramer. I was wondering you're saying -- you testified that spring-run do not exist on the Lower Yuba River; is that correct?

MR. CRAMER: Correct.

MS. LOW: Okay. We've had extensive testimony by the Department of Fish and Game in this hearing that there is a phenotype of spring-run on the Lower Yuba River. There are fish that migrate upstream in the spring.

MR. CRAMER: Right.

MS. LOW: Holdover the summer and appear to be spawning in late September before fall-run are spawning.

MR. CRAMER: Right.

MS. LOW: What would you call these fish if they're not spring-run? They look like spring-run, they're coming in at the same time, what would you -- how would you classify those fish?

MR. CRAMER: And those fish are spawning in September you said?

MS. LOW: Late September. We've had testimony --

MR. CRAMER: Right.

MS. LOW: -- by Fish and Game that the surveys were conducted in late September and there were fish spawning at that time.

MR. CRAMER: Yeah. Okay. Two things need to happen there with determining what those are. And my best -- my expectation is that because temperatures in the fall in the Yuba River are appropriate for an October spawner, not a September spawner -- in fact, you've got those fish spawning earlier, I think you would discover by checking their survival that in many years, particularly the warmer water years, there's very poor survival from those spawners.

But they are propagated by repeated strays from

Feather River hatchery. I have since confirmed, after Mr. Cunningham's examination and look of disgust that I didn't have my releases all memorized, I have a report that I did write on the status of spring chinook in the Yuba River. And I have the actual releases of the -- I'm sorry, status of chinook in the Sacramento Basin of spring and late fall that was supplied to the National Marine Fisheries Service as part of their review of the species.

It does list all of the hatchery releases of spring-run chinook from the Feather River hatchery. And I carried through the '93 brood. And in every brood from the '82 brood through the '93 brood substantial numbers of Feather River spring chinook were released at Benicia, or Maritime Academy. They were released in the estuary where the stream is very high, document is very repeatable.

So you would expect that some of those fish would end up in the Yuba River. So it would be an obvious source to supply -- once -- given that we know the temperatures are wrong for a spring chinook spawning time in the Yuba River.

MS. LOW: Is there evidence of the fish that are displaying those phenotypic characteristics of spring-run on the Lower Yuba River, is there evidence that those are strays from the Feather River hatchery?

MR. CRAMER: That's an important question that I'd

sure like to resolve. The unfortunate circumstance is that for a number of broods here the Feather River spring chinook releases trucked to Benicia have not been tagged or marked, so they're not distinguishable.

MS. LOW: Right. So you know of no evidence that these fish that are coming in the spring on the Lower Yuba River are strays or not? You don't have any evidence --

MR. CRAMER: Only when they were marking them with coded-wire tags, as I mentioned, at least the one time that we looked in the coded-wire tag records, I'm sure I could find additional ones, but I just know of the four from that one memo that were recovered in the Yuba River back when tag groups were being released.

MS. LOW: Okay. But there's no evidence in recent years of those fish being strays from another system?

MR. CRAMER: Or that they are not, either way.

MS. LOW: Okay.

MR. CRAMER: Yeah.

MS. LOW: Okay. Let's see, you also testified that there is a distinct genetic component to the spawning time of fall-run chinook?

MR. CRAMER: Chinook in general, yes.

MS. LOW: Chinook in general?

MR. CRAMER: Right.

MS. LOW: And on the other hand, Yuba County has

submitted in Exhibit 51 that salmon in the Lower Yuba River, fall-run chinook may be spawning later when temperatures are high?

MR. CRAMER: Right.

MS. LOW: And would you agree that there's also environmental influences that influence the timing of spawning?

MR. CRAMER: There certainly is. There certainly is. Generally, in chinook salmon -- I don't know what the maximum you can flex an individual chinook to do, but it would certainly be one week either way, early or later it can adjust. Two weeks -- Dr. Brannon would be a better one to ask of that, because he's dealt with hatcheries where he can kind of force them to deal with things that they wouldn't do in the wild.

But you can't move them a month. That's a matter of genetics. So they can make a minor shift of a week, that kind of a shift, just based upon their ability to adapt to the temperatures they experience.

MS. LOW: Okay. But you did testify that if we implemented temperatures for the protection of spring-run that there would be impacts to fall-run, because of the change in temperature?

MR. CRAMER: Right. Here's how it would work and it worked out -- we have a great example on the Rogue River.

It's kind of a reverse example of this, but what happens with a chinook is that they would migrate upstream. Say you're a fall chinook, you return to the Yuba River but this year we change the temperature regime and it's now cooler in the fall than it used to be.

That chinook will migrate upstream and encounter cool temperatures appropriate for its spawning downstream of where it normally would have encountered those. So the spawning will shift downstream. Alternatively, if you warm the temperatures it will continue to move upstream seeking the cooler temperatures.

And that's exactly the kind of effect that we've had on the Rogue River. We put in Lost Creek Dam, it changed the fall temperatures. And in that case, it warmed the fall temperatures so that the upper end of the spring chinook no longer survived. We lost the earlier spawning fish on the upper end. The middle segment stayed all right. And on the lower end, where temperatures are now warmer in the fall, the fall-run has moved further up into the basin. And so the spring-run is ever squeezed.

You're on the super squeeze here where spring chinook don't even fit. The temperatures are wrong for spring chinook in the Yuba River. But if you cooled them down, you'd see all that operating in reverse. As fall chinook came in they would stop and spawn within the

temperatures that were suited to their spawning. They wouldn't keep moving up if temperatures are cold where they are.

MS. LOW: Okay. Okay. That's a theory. Okay. Let's move on to some of your exhibits here. I wanted to look at, again, Figure SY 5-6. You have some spawning escapements from various systems on the West Coast. I wanted to point out that these graphs are not all on the same scale and so they aren't directly comparable.

If you look across these different systems, your scale on the Lower Yuba River is quite a bit different than the other scales.

MR. CRAMER: Correct.

MS. LOW: To directly compare -- if you want to compare just gross numbers of fish, which isn't really valid between different --

MR. CRAMER: Correct.

MS. LOW: -- river systems -- anyway, but to say just from this set of graphs that the Yuba River -- to make the statement that the Yuba River is the best among these systems, would you agree that you could do it based on just this set of figures?

MR. CRAMER: I'd have to have additional data at my hand to know that that's the best. Escapement alone is not the only answer. You have to know that their harvest

rates are similar. You have to know are there other sources of fish coming in here. What I know about the others is they all have hatchery supplementation, whereas the Yuba does not.

And you're right, the total magnitude of that Y axis is not the -- the primary point that I was making there was the stability of the Yuba runs in an environment where even hatchery-supplemented populations in some years are becoming scarce and then jumping to high levels in other years.

MS. LOW: Okay. That's fine. I'd like to move on to Figure 5-7, SY 5-7. I've never heard the term before, "peak carcass count." What is a peak -- "peak spawning count," what is that?

MR. CRAMER: Okay. Typically, in both the Rogue and in the Eel River the way that -- spawning surveys are done weekly. You have an unique system that's used in a lot of California where you tag the carcasses and then look for the recovery rate of tagged carcasses to do an estimate of population size based on the marked recaptured rate.

But in other areas, apparently in the Eel, the counts made weekly are not expanded using marked recaptured methodology. In the Rogue River they certainly are not, it's just a count of carcasses. Tails are cut in half, carcasses are returned to the stream, so the next

week when you come back you don't recount that carcass.

So this would be the peak of the run. And in Oregon the most -- and in the Washington and in Idaho a whole lot of their spawning survey data comes from peak counts. That would be the peak number of redds, the peak number of carcasses. In this case, with fall chinook it's carcasses recovered.

MS. LOW: Okay. So those wouldn't be comparable strictly to spawning escapement estimates based on surveys; is that right, weekly surveys?

MR. CRAMER: These would be an index of that. They are not a total -- in other words, what this would -- the population estimate would go up and down in a pattern much like is displayed here for these two graphs. But the number would be differed, because they would have to be expanded substantially. This does not represent all the fish in the population.

MS. LOW: Okay. Okay. Moving on then Figure 5-10, this timing of chinook smolt passage at Chipps Island, the fish captured at Chipps Island would include also San Joaquin Basin chinook salmon fall-run?

MR. CRAMER: Certainly could.

MS. LOW: Okay. And they would not be influenced at all by temperature at Freeport?

MR. CRAMER: That would be true. San Joaquin

numbers would probably be much less. But, nevertheless, I think that you would find low-flow years in one basin correspond to low-flow years in another. And there's a correlation. What that would do is add noise to the relationship.

It just makes it -- when I say, "noise," I mean scattered about how the relationship works out, anything like that, that kind of throws an extra bit of error into your index, would make it harder to distinguish the relationship. So the fact that one shows up is -- says it's a fairly strong probability.

MS. LOW: Okay. Well, it would change the relationship?

MR. CRAMER: Change the temperatures, yeah. If you -- and the way to do it properly on this one, properly the way to get the best answer is with coded-wire tagged information so you know you're dealing with a specific group and you actually monitor its movement. We don't have natural fish except for those '80 and '81 broods in the Yuba. So you generally can't do it in the Sacramento River.

MS. LOW: Okay. Moving on then to Figure 5-12. You present here some correlations between some different factors in survival to age two of fall-run chinook?

MR. CRAMER: Correct.

MS. LOW: And it shows basically here that higher water temperatures in the tributary streams here result in lower survival to age two. There's a negative correlation with river temperature. Would that be correct?

MR. CRAMER: In part. The temperature you see it at the footnote of that table, river temp one is measured by the USGS at Freeport. So the temperature is Freeport. River temp two, which appears only for Red Bluff and Knights -- well, "only." River temp one appears only for Sacramento, because Wilkin's Slough is near Sacramento. But as you move further upstream I used the further upstream temperature. So these are main stem Sacramento temperatures, the one week after fish were released.

MS. LOW: Okay. Okay. Does this support your hypothesis that lower water temperatures would be detrimental to juvenile chinook salmon rearing in these tributary streams?

MR. CRAMER: Couldn't be measured from this at all. These are migrating hatchery released fish. This is a measure of their survival moving through the Delta. So -- and this is at the end of the -- this is the very -- this is the piece that I'm saying is kind of the gatekeeper on the survival of juveniles. You've got to get them out through the Delta.

So this gives you a look at when they're trying

to pass out of the system, because the survival to age two is not measured as juveniles, you don't measure it until the adults return. So based upon adult returns you can back calculate their survival when you add back together all of the harvests, all of the spawners, you can estimate their survival to that first summer in the ocean when they start getting caught by fishermen.

MS. LOW: Right. Although you do have Battle Creek data here, that would be fish released in Battle Creek itself; is that right?

MR. CRAMER: Right. And they're released in May/June. They move directly out. They're generally out of the system within two weeks.

MS. LOW: Okay. Okay. I have a couple questions for Dr. Brannon. Let's see, at one point you said that the spring-run -- due to reduced water temperatures that spring-run would suffer due to redd superimposition. And I wasn't very clear how that would be happening and why.

DR. BRANNON: Yes. The spring portion of that run would spawn in their selected locations, which would be the same criteria the fall chinook use in redds site selection. And then if you get redds superimposition then, of course, that means they'll be dug up. And when we've looked at that, there's other species like pink salmon that spawn in much higher densities. That could

account for a loss of as high as 50 percent of the early spawning fish.

MS. LOW: And you're saying that would be increased by lowering water temperatures?

DR. BRANNON: By encouraging the earlier fish to expand you would have that risk associated with it.

MS. LOW: Okay. Due to decreased water temperatures you would have this effect?

DR. BRANNON: Yes.

MS. LOW: Okay.

DR. BRANNON: Every population of chinook will have segments associated with its run timing. And that's -- I feel the early run there is probably mid to late summer chinook that do follow the same migratory pattern as adults that spring chinook show, just that they spawn later and that would integrate with the earlier fall chinook.

Those -- that terminology is convenient for managers, but biologically it breeds a continuum. And when we get our genetics better we'll be able to differentiate genetically early spawners versus peak spawners versus late spawners. We have one of the better genetics lab in the region. And we're a long ways from being able to differentiate at the genetics level early versus late fish.

MS. LOW: Uh-huh.

DR. BRANNON: But eventually we'll be able to do that. And we can expect that there will be genetic differences that we can identify with timing.

MS. LOW: Right. Let's see, I have just one final question.

Dr. Brannon, you stated that fish populations are doing -- or at least fall-run fish populations are doing well on the Lower Yuba River. So you recommended not changing any management strategy. Is that correct?

DR. BRANNON: Temperature.

MS. LOW: For temperature?

DR. BRANNON: Not changing temperature.

MS. LOW: Okay. Would you recommend no change in flow also that would influence temperature?

DR. BRANNON: Yes. If it influences temperature, I would recommend not doing that.

MS. LOW: Okay. So you would recommend that the current flow regime in the Lower Yuba River be maintained; is that --

DR. BRANNON: I guess --

MR. LILLY: Excuse me, Dr. Brannon. I object to that question as vague and ambiguous. The current flow regime involves so many different things, the question is too general to be comprehensible for us to proceed.

MR. COOK: I'm sorry to interrupt, Mr. Brown, but certainly if the statement is made that the fish are healthy on the basis of the current regime, it would seem to me that the question is perfect and proper.

H.O. BROWN: Thank you, Mr. Cook.

I understood the question. If you understand it go ahead and answer it.

DR. BRANNON: Sure. I would, again, use the criteria associated with temperature. That the current regime should be maintained if an alteration in flow would alter the temperature.

MS. LOW: So if flow would alter -- has a relationship with temperature, you would recommend that on the average the current flow regime should be maintained?

DR. BRANNON: Yes.

MS. LOW: To maintain the populations in their current condition?

DR. BRANNON: Yes.

MS. LOW: Thank you.

H.O. BROWN: Okay.

MR. FRINK: Staff has no other questions.

H.O. BROWN: You have any redirect?

MR. MINASIAN: Just one question for Mr. Cramer.

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REDIRECT EXAMINATION OF SOUTH YUBA WATER AGENCY

BY MR. MINASIAN

MR. MINASIAN: Mr. Cramer, would you give us the title of the study that you were reading from in which you were able to determine that the Feather River hatchery -- or the Department of Fish and Game had continued to truck fish through 1993?

MR. CRAMER: Yes. The title of the report is, "The Status of Late Fall and Spring Chinook Salmon in the Sacramento River Basin regarding the Endangered Species Act," special report, January 1997. Prepared on behalf of the Association of California Water Agencies and California Urban Water Agencies by Steven P. Cramer and Douglas B. Demko.

MR. MINASIAN: And the table you were reading from?

MR. CRAMER: Table 2.

MR. MINASIAN: Thank you.

Nothing further, Mr. Brown.

H.O. BROWN: All right. Any recross on the redirect on the title and table? Do you have any additional exhibits you'd like to put in this evening?

MR. MINASIAN: We can do it tomorrow, whatever you'd prefer.

H.O. BROWN: Let's see if there's an objection. If

there's an objection we'll pick up in the morning.

MR. MINASIAN: I'm going to withdraw those exhibits that I agreed -- Mr. Cunningham was having a heart attack about which are the ones --

MR. CUNNINGHAM: I'm still alive.

MR. MINASIAN: I'm never sure of you. But, Mr. Cunningham, I would withdraw South Yuba 5-8, which is a copy of a portion of the testimony of Mr. Cramer. And 5- --

MR. CRAMER: 11.

MR. MINASIAN: -- 11, which is also a copy of a portion -- a graph from his testimony.

H.O. BROWN: Are you wanting to admit these, or are you withdrawing them?

MR. MINASIAN: I'm withdrawing them. So I would ask for the admission of the remaining exhibits of Mr. Cramer which would be: 5-1, 5-2, 5-3, 5-4, 5-5, 5-6, 5-7, 5-10, 5- --

H.O. BROWN: What about 9?

MR. MINASIAN: I think I withdraw 9 as well.

MR. CRAMER: No, you didn't.

H.O. BROWN: You haven't yet.

MR. CRAMER: Nope, 9 stays.

MR. MINASIAN: Yeah, that's right. It does stay.

H.O. BROWN: 9 stays?

MR. MINASIAN: Yes.

MR. CRAMER: 8 and 11.

MR. MINASIAN: Then I would go on and ask for the admission of 5-12, 5-13 and 5-14. Then I would ask that the Hedgecock presentation be marked as Exhibit 6 as hearsay, but a study utilized by Mr. Cramer in preparing and rendering his testimony.

H.O. BROWN: And that would be exhibit what?

MR. MINASIAN: 6.

H.O. BROWN: Okay. That would be hearsay?

MR. MINASIAN: Yeah, it's a -- it's a report of another expert.

H.O. BROWN: All right. Are there any objections to 5-1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, and 6 on hearsay?

MR. CUNNINGHAM: Mr. Brown, on 6, more than just hearsay. I'd object to Exhibit 6 also for lack of foundation. This witness in cross-examination was unable to testify as to any of the substance, or any of the issues raised. We don't even know whether this is a complete report.

There's reference made that this is something that will be published in the Canadian Journal of Fisheries and Aquatic Science. We have no idea if this is a complete substance of it, or a portion of it, nor was

Mr. Cramer able to help us out in deciding exactly where this information came from, or how it was interpreted, or analyzed.

If this is going to be presented as a published and peer-reviewed report, then I'm sorry, Exhibit 6 does not appear to be such a document. At least, I've never seen any published report in any Canadian Journal of Fisheries and Aquatic Science or any other journal that looked quite like this.

I would suggest also that there is a lack of foundation laid for this to be accepted in any way, shape, or form. If this was something relied upon by Dr. Cramer even in his own preparation of his own opinion, it appears from cross-examination he wasn't even familiar with some of the terms and context of some such documents.

So I would suggest you give it that standard. It also suffers from a relevance problem. He used this, he should have at least been familiar with some of the limitations of the study and study methodology.

H.O. BROWN: Thank you.

Mr. Minasian.

MR. MINASIAN: As I understand the rule, the fact that an expert relies on something does not mean that the material relied upon must be peer reviewed, or published. We proved that in this case through some of the witnesses

from DFG.

The bottom line is Mr. Cramer relied upon it. It's the weight that you wish to give. Now we've been very cautious about this, indicating further studies are being done. This is all we have at this point.

So I suggest that it be accepted and the weight be basically weighed by the staff and the relevancy is clear. The representations in regard to spring-run are certainly not substantiated genetically by any testimony given by the Department of Fish and Game, or NMFS, or U.S. Fish and Wildlife.

Now, if there wants to be a stipulation that when the final peer-reviewed article is complete it may be substituted for this exhibit and this removed, I certainly would entertain that.

H.O. BROWN: I don't want to do that.

Mr. Cunningham.

MR. CUNNINGHAM: Mr. Brown, if I might, I have no problem bringing -- in fact, I have myself used experts who have relied upon other information, information that they themselves did not prepare. But I have taken some effort to avoid them trying to submit those additional documents in fragmentary pieces as exhibits.

These were, at best, I think prepared and could have been recognized and identified as illustrative for

purposes of how Mr. Cramer formed his own opinion. But to submit these themselves as exhibits then suggests somehow that these should be used as an exhibit. It's my understanding -- again, I'm a lawyer, so perhaps I look at things a little more narrow than this Board -- that an admitted exhibit can oftentimes be examined even with the caveats that I'm now raising and by the time this shows up in the record a year from now in preparation of any subsequent review or report of this document by this Board, this thing will then be oftentimes used for the actual substance of the matter contained.

And I don't think it should be in this case, especially since it is so unqualified. And especially since among other things, it includes a truly egregious statement, in my mind, on the third -- I take it back, on the fourth page of this document.

As this head line, "Feather River chinook are fall-run only." Now, that may or may not be Dr. Hedgecock's conclusion. We don't know. It may or may not be supported by the documents in his full report, we do not know.

Whether Mr. Cramer relied upon that or not, he may be entitled to do that in preparation of his own opinion, but this document itself I think is highly prejudicial, has little probative value and is truly

irrelevant for the grounds it's being submitted.

H.O. BROWN: Thank you, Mr. Cunningham.

Mr. Morris.

MR. MORRIS: I see this as no different than Dr. Rich criticizing some of the reports some of the reports that Yuba County Water Agency brought up where she personally called -- and I don't remember the report -- personally called the authors and got clarifications and provided those clarifications to us. That information came into the record.

I think it's pretty clear that there are some limitations to this. The only thing this is is a handout from a talk, that was made pretty clear by Mr. Cramer. And I don't know it's going to get a great deal of weight, but I think the testimony itself is so interwoven with it, it would be difficult to follow without having the exhibit there. I think it should be admitted.

H.O. BROWN: Thank you, Mr. Morris.

Mr. Cunningham, last word.

MR. CUNNINGHAM: Last word, I'm sorry. Mr. Brown, the only exhibit to my knowledge that the Department of Fish and Game put in that was a document of a treatise, was the Cech and Myrick study. And we put in the entire study.

And, in fact, it was a study that was identified

in Exhibit 19 of the Yuba County Water Agency and not us. So we choose to go ahead and put it in before we made reference to it, or challenge its applicability to the current proceeding.

We have not, nor ever attempted to put in five pages excerpted from some report unpublished and unseen where we don't have any ability to examine either the preparer of this document -- I'll accept that as part of the hearsay problem. That's not a problem, at least, in accepting this.

We haven't seen the whole substance of this. We have no idea whether the author of this report also put in additional qualifications as to its use, or the use of its interpretational analysis.

And, again, I'm sorry, Mr. Cramer can say he relied upon it, he so has. But then to ask that this itself stand as a separate exhibit and be recognized as a separate exhibit I think goes beyond the scope of what this hearing should recognize.

H.O. BROWN: Thank you, Mr. Cunningham.

I will admit into evidence 5-1, 2, 3, 4, 5, 7, 10, 9, 12, 13, and 14. On 5-6, I agree with Mr. Cunningham, who's done an excellent job of identifying the concerns associated with it, but I am going to admit it into evidence with the limitations as have been

discussed here. And we'll give it the weight of the evidence with the special notation in the record for the Board.

MR. FRINK: Excuse me, Mr. Brown. I think the exhibit that all the discussion was about most recently was Exhibit SYWD Exhibit 6.

MR. MINASIAN: That's correct.

H.O. BROWN: 6 is what I --

MR. FRINK: Right. You referred to Exhibit 5-6. It's just plain Exhibit 6.

H.O. BROWN: Just plain Exhibit 6?

MR. FRINK: Yes.

H.O. BROWN: All right.

MR. FRINK: I would like to make one statement.

H.O. BROWN: Is it going to change my ruling?

MR. FRINK: No, I don't think it will. I know better than that. In view of the fact that it is a preliminary -- apparently it is excerpts from a presentation of a preliminary report and the author of that report isn't here, I think that the record should reflect that according to the testimony of all the witnesses, the author himself is in the process of looking at doing some further revisions on the report.

I know the Board is very liberal about hearsay, but when it's someone's draft work that is still in the

process of being revised, I think the record should clearly reflect that.

H.O. BROWN: Thank you, Mr. Frink.

And with Mr. Cunningham's cautions on this I believe we've covered the value of this document. And on that basis the ruling will stand. And thank you for doing that.

Gentlemen, thank you very much for a long afternoon. I think you can still make your airplane.

Mr. Cunningham?

MR. CUNNINGHAM: Mr. Brown, a real quick question.

Mr. Minasian, did you offer Exhibit 4 at all?

MR. MINASIAN: No. We'll do that tomorrow morning, if that's all right.

MR. CUNNINGHAM: Okay.

MR. MINASIAN: Because I have to withdraw certain of the plates that were not referred to.

MR. CUNNINGHAM: That's fine. I didn't want to have that missed.

H.O. BROWN: Remind me first thing in the morning.

MR. MINASIAN: Thank you.

H.O. BROWN: I'll see you all back here at 9:00 in the morning.

(The proceedings concluded at 4:58 p.m.)

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REPORTER'S_CERTIFICATE

STATE OF CALIFORNIA)
) ss.
COUNTY OF SACRAMENTO)

I, MARY R. GALLAGHER, certify that I was the Official Court Reporter for the proceedings named herein, and that as such reporter I reported in verbatim shorthand writing those proceedings; that I thereafter caused my shorthand writing to be reduced to typewriting, and the pages numbered 2713 through 2993 herein constitute a complete, true and correct record of the proceedings.

IN WITNESS WHEREOF, I have subscribed this certificate at Sacramento, California, on this 30th day of May, 2000.

MARY R. GALLAGHER, CSR #10749