STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

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PUBLIC HEARING
REGARDING WATER RIGHT APPLICATIONS FOR THE
DELTA WETLANDS PROJECT
PROPOSED BY DELTA WETLANDS PROPERTIES
FOR WATER STORAGE ON WEBB TRACT, BACON ISLAND,
BOULDIN ISLAND, AND HOLLAND TRACT
IN CONTRA COSTA AND SAN JOAQUIN COUNTIES

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HELD AT
901 P STREET
SACRAMENTO, CALIFORNIA
TUESDAY, JULY 22, 1997
9:00 A.M.
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Reported by: ESTHER F. WIATRE
CSR NO. 1564

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1054

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1055

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1056

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INDEX

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1058

SACRAMENTO, CALIFORNIA
TUESDAY, JULY 22, 1997
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HEARING OFFICER STUBCHAER: Good Morning. We will reconvene the Delta Wetlands Properties hearing. We are going to continue with cross-examination of the CUWA panel by Delta Wetlands' attorneys.

Who is going to start?

MS. BRENNER: I will.

HEARING OFFICER STUBCHAER: Ms. Brenner, you requested two hours for cross-examination. I will give you sixty minutes to start, and we will see how you do at the end of the 60 minutes.

MS. BRENNER: That will be fine.

MR. ROBERTS: If I may, Mr. Stubchaer.

HEARING OFFICER STUBCHAER: Yes.

MR. ROBERTS: We have three witnesses who we had in our Notice of Intention who we are here for purposes of cross-examination. I would just ask them to introduce themselves.

HEARING OFFICER STUBCHAER: They probably need to take the oath.

MR. ROBERTS: Two have; one hasn't.

(Oath administered by Mr. Stubchaer.)

MR. ROBERTS: Would you like them to introduce

1059

themselves for the record?

HEARING OFFICER STUBCHAER: Yes.

MR. McCOLLUM: For the record, I am Larry McCollum. I am the Water Quality Superintendent for the Contra Costa Waste District.

DR. WOLFE: My name is Roy Wolfe. I am Chair of the California Urban Water Agencies Water Quality Committee. I am also the Associate Director of Water Quality for the Metropolitan Water District of Southern California. I have a Ph.D. in environmental science and have 17 years of experience in the drinking water quality area.

DR. DENTON: My name is Richard Denton. I am the Water Resources Manager of the Contra Costa Water District. I am a registered civil engineer in California and have a Ph.D. in civil engineering. I assisted Dr. Shum in the preparation of CUWA Exhibit Number 7.

HEARING OFFICER STUBCHAER: Proceed.

MS. BRENNER: Good morning. A couple of preliminary matters before we move forward on the cross-examination. As you recall, Mr. Stubchaer, we raised several objections to the exhibits that were presented by CUWA last week. I just wanted to indicate that you instructed me to tell you this morning which ones were new information and which ones were just a reformation of the information that was already presented in other exhibits or in the testimony.

1060

I haven't pulled those out and made a list, so to speak. But you will see, as we go through the cross-examination, which ones are new and which ones are a reformat of particular information, and, during that

reformation of the information, how they have changed the information in a different way, or presented certain facts and not other facts on those particular exhibits.

If you don't mind, I would like to just proceed and indicate during the cross-examination process what has occurred. And I think it will be pretty evident with the questions being asked.

HEARING OFFICER STUBCHAER: Yes.

MR. ROBERTS: If you like, Mr. Stubchaer, I think each of the witness that prepared those exhibits can briefly describe where the information came from, if that would make it any easier.

MS. BRENNER: I don't think that that is particularly necessary. The cross-examination questions will indicate where they've come from other exhibits and how they differ.

HEARING OFFICER STUBCHAER: Rather than do that at the beginning, I think we will let that be developed during the cross-examination.

MR. ROBERTS: We also have a revised 6E, per your suggestion.

HEARING OFFICER STUBCHAER: Do you have copies

1061

available for everyone?

MR. ROBERTS: We do.

HEARING OFFICER STUBCHAER: Is this the first time you have seen this, Ms. Brenner?

MS. BRENNER: The revised 6E?

HEARING OFFICER: Yes.

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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY DELTA WETLANDS PROPERTIES
BY MS. BRENNER

MS. BRENNER: I don't see winter yet.

How is this revised, can you tell me?

DR. LOSEE: This is Rich Losee.

This is the revised version of this figure. And what you asked me to do was to extend this out so that the curve, the biomass curve, properly corresponds to an entire year cycle. That is what I have done here.

So the winter cycle comes after fall and before spring, on this figure.

HEARING OFFICER STUBCHAER: It appears that the beginning and ending the points are the same instead of being different.

DR. LOSEE: That is correct.

HEARING OFFICER STUBCHAER: The ending point is now below the Delta Wetlands' consumption.

1062

DR. LOSEE: That is correct. That was an oversight on my part. It still shows the key parameter, and that is that biomass fluctuates over time, and the maximum biomass is in the late summer, early fall period.

HEARING OFFICER STUBCHAER: I know this is qualitative and not quanitative, but is the Delta Wetlands' assumption line, well, I am looking for a word, realistic in relation to the biomass line?

DR. LOSEE: It is qualitative in that it is less than

the maximum biomass. And the implied assumption in their calculation is that there a single value for biomass in their work.

HEARING OFFICER STUBCHAER: All right.

Ms. Brenner, we will give Delta Wetlands the opportunity to study this and ask questions, if necessary. You will have a break this morning, and we will see how the time goes.

MS. BRENNER: Okay, That will be fine. Thank you.

As indicated in CUWA's exhibits as well their revised exhibits and their testimony, they have focused on DOC, not so much on DOC as it compares to the Delta Wetlands project and no-project, but DOC as a containment in some odd sense of that use of the word of the contaminant that they want removed. What I am going to try to do in cross-examination is focus on what I consider the issue before the Board; and

1063

that is, what's the difference between Delta Wetlands' no-project situation with regard to DOC and Delta Wetlands with the projects DOC.

You will see that kind of a focus, gentlemen.

I would like to start with Exhibit 8, and I spoke to Mr. Roberts earlier this morning regarding Exhibit 8. I wasn't sure who had actually testified as to Exhibit 8 and determined that Dr. Shum was the person who prepared that particular piece. I just have a couple questions.

Isn't it true that the quality of Delta Wetlands' water is one matter and the effect of that water on export another matter which is dependent upon a fraction of Delta Wetlands' discharge water as compared to the total export?

DR. SHUM: In a very general sense, that is correct.

MS. BRENNER: Is the fraction simply Delta Wetlands' discharge divided by the total export, using the monthly average?

DR. SHUM: The simulation I have is not based on monthly averages, per se. The discharge from the Delta Wetlands is constant throughout the month, but the tidal variation varies.

MS. BRENNER: You are trying to take a daily look at the tidal influence in the Delta Wetlands' discharge?

DR. SHUM: What I did was I took one month, from the 17-year hydrology and used the corresponding Delta Wetlands'

1064

discharge during that month and also the exports, and used a surrogate tidal variation to simulate the dispersion of that discharge and how much of that gets to different intakes.

MS. BRENNER: But still a month, one-month average?

DR. SHUM: If you look at the figures I had, those are not average values. For example, if you look at Figures 1, 2, 3, and 4, those are the actual daily variations. But from that you can draw some very general conclusions on the distribution.

MS. BRENNER: Those conclusions are basically the same as what has been developed in the Environmental Impact Report, aren't they?

DR. SHUM: I don't understand your --

MS. BRENNER: The conclusions, the numbers that you

reached, are substantially the same as the ones that were reached. In this particular instance, the percentages that you've reached are basically the same as the Environmental Impact Report, aren't they?

DR. SHUM: I did not go into a comparison with the numbers in the Draft EIR/EIS.

MS. BRENNER: Isn't it true that the extensive modeling efforts of Dr. Brown and Dr. List take tidal influence into account?

DR. SHUM: To start with, Dr. List's exhibit in Delta Wetlands 14 assumes a 19-year median level, as such, the

1065

tidal detailed variations are not taken into account, explicitly. From what I understand in Dr. Brown's simulation, he may have used DeltaMOVE or some other less elaborate or less detailed models.

MS. BRENNER: But the intent of these models is to take those tidal influences into account, aren't they?

DR. SHUM: Which simulations are you referring to?

MS. BRENNER: Both of them.

DR. SHUM: Both, meaning Dr. Brown?

MS. BRENNER: Yes.

DR. SHUM: I am not sure that Dr. Brown's simulation takes tidal variation into account.

MS. BRENNER: Your efforts or your calculations weren't a modeling run?

DR. SHUM: My own Exhibit 8?

MS. BRENNER: Yes. Did you use a model to develop that exhibit?

DR. SHUM: Yes. As I discussed in the exhibit in the text, I used the Fischer Delta Model.

MS. BRENNER: So, you used the same model as Dr. List did?

DR. SHUM: That is correct. But the input data in terms of tidal variation are different.

MR. CORNELIUS: Could you tell us a little more explicitly where your Exhibit 8 is, so we can find it and

1066

follow it.

MS. BRENNER: It is a piece of testimony that CUWA presented as Exhibit 8 in their original --

MR. CORNELIUS: Their summary.

MS. BRENNER: Original direct summary. It just doesn't have any particular name associated with it, as to who.

MR. CORNELIUS: I was trying to find the figures, and I was having difficulty.

MS. BRENNER: The figures were brought in.

MR. MADDOW: Starting Page 13.

MR. CORNELIUS: Thank you.

MS. BRENNER: Mr. Krasner, good morning.

MR. KRASNER: Good morning.

MS. BRENNER: How are you?

MR. KRASNER: Pretty good. How about yourself?

MS. BRENNER: Doing good.

MR. KRASNER: Just being polite.

MS. BRENNER: That is okay.

A Day in the Life of TOC.

MR. KRASNER: Yes.
MS. BRENNER: You indicated that your Day in the Life of TOC chart started at a particular place, and we talked a little bit about that last time with Mr. Nomellini.
MR. KRASNER: Yes.
MS. BRENNER: Isn't it true that this would be more

1067

correctly called a Day in the Life of TOC starting at the intake to the water plant?
MR. KRASNER: No. I was trying to show a Day in the Life. The afternoon was what happened at the treatment plant. The morning was what happened in the Delta.
MS. BRENNER: TOC is not DOC, is it?
MR. KRASNER: In terms of our studies in the Delta, about 90 to 96 percent of the total organic carbon in these waters is dissolved organic carbon. The additional five to ten percent, particularly in organic carbon, is a very insignificant part of the total organic carbon. So you can use the two terms, in the cases of the exports, interchangeably.
MS. BRENNER: Your chart is really reflecting the time period that begins at the treatment plant?
MR. KRASNER: That was CUWA Exhibit 5A showed what happened at the treatment plant. And CUWA Exhibit 5B gave an example of what happens in the Delta.
MS. BRENNER: We are going to take a look at 5B. I am just talking about 5A.
MR. KRASNER: Right; that is the afternoon.
MS. BRENNER: Afternoon, starting at the treatment plant.
MR. KRASNER: Correct.
MS. BRENNER: You want to put 5B up, Patty?

1068

We look at -- can you tell me how much of the THM production is attributable to DOC and how much is attributable to bromides in this figure?
MR. KRASNER: Actually, it is a combination of both. Therefore, one would have to actually refer to -- I believe it is in my written testimony, CUWA Exhibit 5. I am looking for the appropriate figure.
MS. BRENNER: This is reflecting after THM treatment; isn't it?
MR. KRASNER: Correct. After chlorination.
MS. BRENNER: After chlorination. So, you have to look at this figure in mind that part of this is developed because of bromide not because of just DOC?
MR. KRASNER: Actually, that is not correct.
MS. BRENNER: Why isn't that correct, if only a portion of it is attributable to DOC?
MR. KRASNER: Can I take a moment and explain? In CUWA Exhibit 5, if you look at Figure 2 and Figure 3, that shows -- first of all, the data that you see on CUWA Exhibit 5B was derived from CUWA Exhibit 5, Figure 2, where I just extracted the median and 90th percentile trihalomethane levels for Sacramento River and H.O. Banks. And that data is shown on a weight basis.
However, in CUWA Exhibit 5, Figure 3, I show that same

data on a molar basis. And on a molar basis, basically, you
1069
are looking at how many molecules of trihalomethane you formed regardless of whether they contain chlorine or bromine. The reason we do that is because bromine weighs twice as much as chlorine. So, when you look at only on a weight basis, you might get a false sense of which is contributing. But when you look at the molar figure, Figure 3, you see where this is strictly due to the increase in total organic carbon resulting in increased trihalomethane formation. So, there is no bromide effect in Figure 3.

MS. BRENNER: That doesn't answer the question with regard to Exhibit 5B, though. I am talking about Exhibit 5B.

I know where you obtained the information to develop Exhibit 5B, but 5B is not the same as Figure 2 or Figure 3.

MR. KRASNER: 5B is using data exactly from Figure 2.

MS. BRENNER: I understand that it uses the data, but it is not the same presentation of that data?

MR. KRASNER: No. It is bar chart rather than box and whisker; it's the same information.

MS. BRENNER: It is a little bit different than that. If we take a look at Figure 2, on Figure 2, your original Figure 2, you showed the maximum THMs after treatment, didn't you?

MR. KRASNER: Yes.

MS. BRENNER: Is that reflected in your Exhibit 5B?

1070

MR. KRASNER: No.

MS. BRENNER: The 75th percentile of DOC, is that reflected anywhere?

MR. KRASNER: The 75th percentile of trihalomethane?

MS. BRENNER: Actually, we can back up.

MR. KRASNER: Okay.

MS. BRENNER: You've got the 90th and median of Exhibit 5B?

MR. KRASNER: Correct.

MS. BRENNER: On Figure 2 you have maximum, 90th, 75th, median, 25th, and 10th?

MR. KRASNER: Yes.

MS. BRENNER: As well as de minimis.

MR. KRASNER: Yes.

MR. BRENNER: Several of those particular spots are not on this Exhibit B?

MR. KRASNER: Correct. I am showing two of the five statistical values.

MS. BRENNER: Part of that is that you are not showing the minimum nor are you showing the maximum?

MR. KRASNER: Correct.

MS. BRENNER: Do you have a sense of what the 75th percentile for DOC would be?

MR. KRASNER: Yes. I show that on CUWA Exhibit 5, Figure 1. And the 75th percentile for total organic carbon

1071

at H.O. Banks is between four and five milligrams per liter, approximately four and a half.

MS. BRENNER: Approximately four and a half.

Do you know how many times a year the DOC is above this number?
MR. KRASNER: Above four and a half?
MS. BRENNER: Right.
MR. KRASNER: The way cumulative probabilities statistics work is 25th percent of the time you will be above this 75th percentile.
MS. BRENNER: You will be above four and a half DOC?
MR. KRASNER: Yes.
MS. BRENNER: How many times is it at a 25th percentile?
MR. KRASNER: Exactly at 25th?
MS. BRENNER: In the 25th percentile number?
MR. KRASNER: It will be -- the way cumulative probabilities statistics work is you will be once at the 25th percentile, and 75 percent of the time you will be above the 25th percentile.
MS. BRENNER: What is the 25th percentile number?
MR. KRASNER: That is approximately three milligrams per liter.
MS. BRENNER: Isn't your Figure 2 a more comprehensive of range and probability of THMs being formed after the

1072

treatment in your Exhibit 5B?
MR. KRASNER: It provides additional information, but I wouldn't say it is necessarily comprehensive. Typically, if one wants the best summaries of information, the median occurrence and the 90th occurrence, 90th percentile occurrence, gives you the typical occurrence at the median; and the situation that one has to deal with in terms of the outliers, that you still have to be able to control in order to comply with regulation.
MS. BRENNER: You still have to be concerned with the maximum and the minimum, don't you?
MR. KRASNER: Oh, yes.
MS. BRENNER: And you are not reflecting those particular numbers in Exhibit 5, are you?
MR. KRASNER: No.
MS. BRENNER: Can you tell me what is the mean on the 75th percentile of the real treatment plant value?
MR. KRASNER: Not the data I have here, but at the actual plants?
MS. BRENNER: Yes, at the actual plants.
MR. KRASNER: I don't know about all the plants in California, but I know, for example, at our Mills Treatment Plant, which gets water from Lake Silverwood, the trihalomethane levels from that plant tend to run between 60 and 90 mircrograms per liter. We have on occasion reached

1073

either a hundred mircrograms per liter or in the distribution system of our member agencies, we've gone above a hundred mircrograms per liter.
MS. BRENNER: Figure 2 is a simulated test, isn't it?
MR. KRASNER: Because we don't have H.O. Banks water, it is a bench scale test which evaluates both the impact of coagulation and chlorination on byproduct formation. In our simulations, we have documented in peer review literature

exactly match the full scale data.
MS. BRENNER: You utilized an assumption, 8, 16, and 32 milligrams per liter of DOC release in your testimony, correct?
MR. KRASNER: Yes.
MS. BRENNER: These assumptions did not derive from a qualitative or a quanitative projection of actually DOC loading and increase of DOC by the Delta Wetlands' islands, do they?
MR. KRASNER: The 8 value was derived from information provided by Dr. Kavanaugh. In terms of the 32 value, the calculations in Dr. Losee's exhibit indicated that the loading in the reservoir might be on the order of 30. So I took 16 as an intermediate value to do a sensitivity analysis of what would happen at these three levels.
MS. BRENNER: Your 30 value comes from Dr. Losee's vegetated biomass production of DOC?

MR. KRASNER: Let's have Dr. Losee answer.
MS. BRENNER: I am just asking you where you got your numbers.
MR. KRASNER: I got the 30 from Dr. Losee.
MS. BRENNER: What I want to know, is did that 30 include just vegetated biomass or is there also the adductive transpiration mechanism come into play?
DR. LOSEE: Rich Losee.
That number was strictly looking at potential releases from the sediments itself. In addition to release from sediment, there would be production by photosynthesis.
MS. BRENNER: So, it is your opinion that you are going to have 30 milligrams per liter DOC released from the peat soil?
DR. LOSEE: That is a possibility. It could be that very much. That is correct.
MS. BRENNER: It could be, plus the vegetative at the biomass?
DR. LOSEE: That is correct.
MS. BRENNER: Okay.
DR. LOSEE: These are shallow systems and there is light and nutrients, so there is going to be photosynthesis occurring there.
MS. BRENNER: We will talk about those mechanisms in a little bit.

If we start with your suggestion of 8, that would mean that we need an additional loading of 4 milligrams per liter, because the water coming onto the islands is oftentimes, if you take a median, about 44 milligrams per liter, correct?
MR. KRASNER: Yes.
MS. BRENNER: You need a loading or an addition of four?
MR. KRASNER: Yes.
MS. BRENNER: The 17 months that you analyzed includes more than one year of operations, doesn't it?
MR. KRASNER: Yes.
MS. BRENNER: In your 17 months, you have two Julys, two Augusts, and as Septembers?

MR. KRASNER: Correct.
MS. BRENNER: In order to get an average annual number, shouldn't we calculate an average of 12 months and just one cycle of Delta Wetlands' operations?
MR. KRASNER: Yes. What I did was running averages. So I didn't average all 17 data points together. I did running averages.
MS. BRENNER: You didn't do an average of just a 12 month?
MR. KRASNER: I have done that as well, yes.
MS. BRENNER: But in your testimony, you only did a 17 month; two July, two August, two September run?

1076

MR. KRASNER: They were part of the running averages that were analyzed, yes.
MS. BRENNER: You didn't go all the way to the end of the year, the second year, you stopped at the 17 months instead of going to the 24?
MR. KRASNER: Right. Because --
HEARING OFFICER STUBCHAER: Let him answer.
MR. KRASNER: The main reason that I didn't need to do the analysis for the other months was my analysis for the winter months, where there would be no reservoir releases, showed what the impact of the project would be, a slight decrease at that time. So I could have done the analysis for the other months, but we would have had the same impact. I was focusing on two different water years, what would happen with the impact of the reservoir releases.
MS. BRENNER: You are not adding to that equation the benefit that occurs in the winter months?
MR. KRASNER: Yes, I do.
MS. BRENNER: Once you do?
MR. KRASNER: No. Because as you do a running average, you are always including a combination of winter and summer periods.
MS. BRENNER: Can you just explain to me what you mean by running average?
MR. KRASNER: Yes. In the regulation lays for

1077

trihalomethanes, compliance is based on doing a running average of your trihalomethane levels collected in different seasons of the year. So, for example, if you were looking at compliance, you would look at what your running -- what your average was for 1996. As you go into 1997, you don't wait until an entire year of 1997. You take the last three-quarters of 1996 and average it with the first quarter in '97, or the first season, and a running average is just continually doing that.
MS. BRENNER: If we look at your example of 16 milligrams per liter, it would be necessary to have a loading of 12 milligram per liter of DOC, wouldn't it?
MR. KRASNER: Yes.
MS. BRENNER: That is three times the incremental loading as compared to current ag drainage from Delta Wetlands' island; isn't that correct?
MR. KRASNER: Would you repeat that question, please?
MS. BRENNER: 12 milligrams per liter of DOC loading or

increase is three times the incremental loading as compared to current ag drainage from the Delta Wetlands' island; isn't that correct?
MR. KRASNER: No.
MS. BRENNER: No?
MS. KRASNER: No.
MS. BRENNER: What is your testimony with regard to the

1078

current ag drainage loading from the Delta Wetlands' islands?
MR. KRASNER: That information is in CUWA Exhibit 5, Table 6. And you want the number on a -- but the data is in there or it is also in the figure that I showed, 5G.
MS. BRENNER: What does your Table 6 indicate as what the total base case condition loading is?
MR. KRASNER: Which month?
MS. BRENNER: Pick spring.
MR. KRASNER: If we look, for example, at April, that could be, potentially, of the order of 20 milligrams per liter of total organic carbon in the drainage.
MS. BRENNER: That is ag?
MR. KRASNER: Yes.
MS. BRENNER: Take a look at another month, and tell me what you come up with.
MR. KRASNER: Another month. If I look at September, that could be of the order, perhaps, 7 milligrams per liter of total organic carbon. See, the agricultural --
MR. CORNELIUS: Excuse me. Table 6 is seven pages long. Could you tell me which page it is on, for the record?
MR. KRASNER: Because we were using the example of 16 milligrams per liter from the Delta Wetlands Project release, I am looking at Page 3 of Table 6.

1079

MR. CORNELIUS: Thank you.
MR. KRASNER: That was when I looked at, for example, September; that drainage value was 6.9 milligrams per liter. And April, it was 21.7 milligrams per liter. The agricultural drainage, the loading varies during the year. It is different during the winter leaching periods than it is during the summer irrigation.
MS. BRENNER: What is the average?
MR. KRASNER: I don't use averages mainly because the values change over the course of the year, and they have different impacts at different times of the year.
MS. BRENNER: There is certain times of the year when your 16 milligrams per liter DOC, as you assumed, is going to be approximately three times the amount of the ag drainage?
MR. KRASNER: No.
MS. BRENNER: You don't think so?
MR. KRASNER: The ag drainage, if you look at the data that I give, has values between 6 in the and little over 40 milligrams per liter.
MS. BRENNER: How does that compare to your high end assumption of 32 milligrams per liter DOC?
MR. KRASNER: The 32 milligrams per liter is in the

range of 6 to 40 milligrams per liter; so it's within that range of what is in agricultural drainage.

MS. BRENNER: Do you think the reservoir islands could provide as much DOC as ag drainage?

MR. KRASNER: Yes.

MS. BRENNER: Did you review the Delta drainage water quality, DWQ, analysis?

MR. KRASNER: Which one was that?

MS. BRENNER: Delta DWQ, drainage water quality.

MR. KRASNER: Is that the material from the Draft Environmental Impact Report?

MS. BRENNER: It is in there also, yes.

MR. KRASNER: I am not sure I know specifically which item you are referring to.

MS. BRENNER: This is a State Water Resources Control Board's method of analysis which considers the number of hydrological conditions. Are you familiar with that?

MR. KRASNER: Could you please repeat that question?

MS. BRENNER: I am just trying to explain to you what the Delta DWQ is. It is a method of analysis done by the Board which considers a number of hydrologic conditions; it is a simulation and calculation over a 25-day period.

MR. KRASNER: Yes. I am familiar with that.

MS. BRENNER: Is there an error or mistake in that analysis which led to you recalculate that data?

MR. KRASNER: I don't believe I recalculated that data.

MS. BRENNER: You did a calculation that came to the same, using the -- coming to the same type of information. That was your 17-month analysis, correct?

MR. KRASNER: Yes.

MS. BRENNER: Is there a reason why you didn't use the Delta DWQ analysis?

MR. KRASNER: Yes. In the Department of Water Resources report that they put out in June 1990 on the Delta Island Drainage Investigation Report, they evaluated 17 months and looked at loading of dissolved organic carbon, total organic carbon, and disinfection byproduct precursors. The reason that I didn't use the same analysis was I didn't have in hand their tools. So I used my own analysis to, first, verify that I could come up with the same results on a no-project condition, just looking at agricultural drainage.

Then, once I confirmed that I could use my own tools and get a similar result, I then went and put in the project conditions to evaluate.

MS. BRENNER: But your analysis only took 17 months into consideration versus 25 years, correct?

MR. KRASNER: I was only looking at the same 17 months that the DWR had done in this report. Let me just briefly explain why I picked that.

Sometimes, if you look at 25 years and you look at a

25-year average, you can get misled a little bit because you might find that the DOC loading or the trihalomethane levels

would be acceptable. But because the regulations for both the controlled total organic carbon and trihalomethanes have to be met every year, you are not allowed to do a 25-year average.

So, I wanted to pick some data and do an analysis to see what would happen in a project condition; and, so, again, this data showed that under these conditions you would have a problem complying with the regulations.

MR. CORNELIUS: Excuse me, is that in the record some place so that we could refer to that?

MR. KRASNER: This report?

MR. CORNELIUS: Yes.

MR. KRASNER: The only place that I referred to it in the record is in my exhibit. I do cite all of the places from which I've obtained data. So I cite this report by Department of Water Resources and give a complete citation. We have not, as CUWA, entered it, but it is a public document.

MR. CORNELIUS: It is a public document?

MR. KRASNER: Yes.

MR. CORNELIUS: If worse came to worse, we can take official notice on that.

MS. LEIDIGH: I would like to point out that. Even

1083

though it is public document. It is not a document in this hearing record unless it is offered into evidence.

MR. KRASNER: That is one reason why I did my own analysis and just provided my own interpretation of what the organic carbon loading would be during the no-project condition, and then evaluated the project conditions.

So, I really wasn't attempting to put this into evidence; I just cited where I got some of my information. But I provided what I thought was stand-alone information in my own exhibit.

MR. ROBERTS: If you like, we could submit that by reference or attempt to submit it by reference.

MR. CORNELIUS: I would think that would be appropriate, in case we wanted to check on it. If we have a piece that is outside the record, it is hard to verify.

MS. BRENNER: Take a look at Exhibit 5.

We show a potential limit of 40 micrograms per limit of THM on this exhibit, correct?

MR. KRASNER: 40 micrograms per liter, yes.

MS. BRENNER: How are utilities going to meet these Stage II requirements?

MR. KRASNER: In a number of ways. We have done a compliance forecast, and I am trying to see if I included it in this exhibit. Yes, I have.

If you look at CUWA Exhibit 5, Table 3. I show what

1084

was the compliance forecast for surface water systems to comply with the Stage II regulation. And in there, it is a combination of many choices. Utilities will use enhanced coagulation for the removal of total organic carbon. There will also be some utilities who will need to use either granular -- may need to use granular activated carbons for more efficient removal of total organic carbon.

And in addition to the total organic carbon removal technologies, there would be use of alternative disinfectants, such as ozone and chlorines.

MS. BRENNER: Do you have the sense of the cost that it would take some of the smaller utilities to do that?

MR. KRASNER: By smaller, what size do you mean?

MS. BRENNER: Utilities that are not using any type of coagulation at this time or ozonation.

MR. KRASNER: By surface water systems, all surface water systems use coagulation except for a limited number of unfiltered supplies. So, coagulation, at least conventional coagulation, are used by all the surface systems for the unfiltered.

MS. BRENNER: But to meet the Stage II, some may need to use enhanced coagulation?

MR. KRASNER: Yes. Or the introduction of granular activated carbon.

MS. BRENNER: Do you have a sense of the cost?

1085

MR. KRASNER: Yes, I do. The cost of enhanced coagulation, I actually provide these data in CUWA Exhibit 5. Just want to get the numbers that I provided. As I had shown last week in my direct testimony, the cost of removing total organic carbon to meet the 25-percent removal requirement in Stage I, which means if your influence of total organic carbon is below 4, was $26 per acre-foot additional cost.

On the other hand, if you're over 4 milligrams per liter in a particular month, you need to go to a 35-percent removal requirement, and that is a $39 per acre-foot additional cost.

For those utilities who may use ozone in addition to enhanced coagulation, the cost for ozone tend to be similar to enhanced coagulation when looked at over a 25-year period capital and operation and maintenance.

In terms of granular activated carbon, on the other hand, those costs are $150 per acre-foot.

MS. BRENNER: Smaller utilities will have a hard time meeting those type of costs, won't they?

MR. KRASNER: By what size do you mean smaller utility?

MS. BRENNER: The ones that don't have ozonation, don't have the type of methods that are necessary to meet the Stage II requirements.

1086

MR. KRASNER: Could you ask that question again? We have a different term --

MS. BRENNER: I will ask you in a different way.

Stage II requirements are not implemented right now, are they?

MR. KRASNER: That is not completely true. There are many parameters in the agreed upon Stage I rule, which directly utilize the 40 microgram per liter trihalomethane standard as one of the regulatory requirements in Stage I. So, there is indirect implementation of certain Stage II requirements as part of Stage I.

MS. BRENNER: They are -- not all of the limits set

forth in Stage II are implemented at this time, are they? The 2.0 milligrams per liter TOC is not?

MR. KRASNER: No. I should say that it is in there in that you don't have to do enhanced coagulation if your influent water or your settled water has less than 2 milligrams.

Actually, it was very clear how things were crafted. Every element that you see in the Stage II is indirectly an element in the Stage I regulation agreed to and signed upon last Tuesday.

MS. BRENNER: But the limits that are placed on the water treatment plants are not the same as in the Stage II as in Stage I? And I will ask you another question on top

1087

of that, and we will give you two questions at once.

Doesn't EPA consider the cost to implement Stage II before it actually promulgates that particular rule?

MR. KRASNER: We already have considered the cost during the 1992-1993 negotiated rate regulations.

MS. BRENNER: Those regulations will be implemented and required if they can be met, taking cost into consideration, with or without the Delta Wetlands Project?

MR. KRASNER: Let me answer in this sense. The cost figures that we came up with for both Stage I and Stage II of the regulation, we did a full regulatory impact analysis, and felt that those costs could be met. One thing that is important to recognize is that when the EPA developed best available technology to comply with both the Stage I and Stage II standard, they looked at what could -- what was both technically feasible and what could be afforded. So those have already been examined.

MS. BRENNER: With or without the Delta Wetlands Project?

MR. KRASNER: They weren't examining our water; they were looking at the nation as a whole.

MS. BRENNER: Right. It didn't make any difference to these regulations or to the treatment plant, these regulations, if they are going to be implemented, and the stages that they are going to implemented at will be

1088

required, with or without the Delta Wetlands Project?

MR. KRASNER: Yes. My testimony has been that the Delta Wetlands Project will make it more difficult for utilities to comply with the regulation and more costly.

MS. BRENNER: I understand your testimony. I just want a simple yes-no kind of answer. It is a very simple question.

These regulations will be implemented and required whether Delta Wetlands goes on line or not?

MR. KRASNER: Correct.

MS. BRENNER: Thank you.

What range of DOC is your plant capable of treating?

MR. KRASNER: For what?

MS. BRENNER: DOC. What range of DOC can your plant treat? What is the Met plant currently capable of treating?

MR. KRASNER: Typically, we get levels that are generally below 4 milligrams per liter. Not only is that

what we are set up for, but also in terms of our designs for implementing ozone, which the demand is based upon how much total organic carbon you have in the water; we are not set up for higher levels.

MS. BRENNER: You are not capable of treating any TOC over 4.0 or DOC over 4.0?

DR. WOLFE: Can I jump in. This is Roy Wolfe.

Our treatment plant processes are not designed to

1089

remove TOC at this time. So we don't really remove TOC. The processes that are in place are not designed to remove TOC. So if a TOC at 5 came in, that is about what would go out of the treatment plant.

MS. BRENNER: You don't treat TOC?

DR. WOLFE: We don't treat TOC at this time, no; that is correct.

MS. BRENNER: You don't regulate or determine what the rate of TOC or DOC coming in or going out?

MR. KRASNER: We do.

MS. BRENNER: You monitor it, but you don't treat it?

DR. WOLFE: Correct.

MS. BRENNER: So, if it is 6.0, doesn't make any difference?

MR. KRASNER: That is not correct.

MS. BRENNER: Well, you don't treat it?

MR. KRASNER: Are you saying it makes no difference what the 1979 THM regulation or the --

MS. BRENNER: Today, today. If you get TOC at 6.0, you don't treat it?

MR. KRASNER: We do treat the water. It also impacts our chlorine demand. So, it would actually -- we're set up to meet the current hundred microgram per liter THM standard based on water that has a total organic carbon level of less than 4. If we had a water that had, as you suggested, 6

1090

milligrams per liter, we would, one, increase our chlorine demand, and, two, form more trihalomethane, so we exceed the current hundred microgram per liter standard.

MS. BRENNER: Do you currently use coagulation at your plant?

MR. KRASNER: Yes, we do.

MS. BRENNER: What percentage removal do you achieve with that process?

MR. KRASNER: With the plants that treat state project water, probably, generally is no more than ten percent of total organic carbon.

MS. BRENNER: So ten percent?

DR. WOLFE: It is not designed to remove TOC, but, using the coagulation process at the level we do, we inherently remove a smaller amount of TOC. But it is certainly not designed to remove TOC.

MS. BRENNER: You testified about a 20 percent safety factor for the less than or equal to 80 percent of the MCL standard. Is that an explicit regulatory requirement by the EPA?

MR. KRASNER: Yes, it is. First, as I mentioned before, when EPA developed the best available technologies

and analyzed what were the maximum contaminant levels that they were setting, the whole analysis that was done in the regulatory impact analysis was based on not complying with

1091

an 80 microgram per liter THM standard, but 80 percent of that value, 64 micrograms per liter.

In addition, in the new Stage I standard that was approved, one of the other parameters to make sure that utilities do not compromise their microbial protection by altering their disinfection processes, any utility whose trihalomethane levels were greater than 64 micrograms per liter have to explicitly do a profiling of three units of disinfection practices, which they will use to establish a benchmark, and then they will need to operate no lower than that benchmark when they make changes to comply with the rule.

And this benchmark, actually, we have done the analysis at our plant, will require us to actually have to apply a higher disinfection criteria than there is the current surface water treatment rule. So, the 64 is explicitly in both the regulatory analysis and in the new framework of the regulation.

MS. BRENNER: EPA requires that 20 percent safety factor?

MR. KRASNER: They have deemed, based on both the scientific and engineering information, that the utilities need to operate at that level or lower to reliably, year in year and year out, get to comply; and they also have deemed that that is a level that they want utilities, if they are

1092

higher than that, to profile the disinfection practice to make sure that any changes they make to stay below the 80 microgram per liter THM standard don't compromise disinfection at the same time.

MS. BRENNER: Is it an explicit requirement that you do that? That is my real question. Is that explicitly required?

MR. KRASNER: The profiling for the disinfection is explicitly required for systems that have more than 64 micrograms of THM.

MS. BRENNER: Is the 20 percent safety factor explicitly required?

MR. KRASNER: It's explicitly assumed in the level that EPA developed for compliance with the regulation. The analysis that we did in regulatory impact analysis was that if your trihalomethane levels were currently greater than 64 micrograms per liter, our analysis, you would need to make changes in your practices to be able to reliably comply year in and year out with the regulation.

MS. BRENNER: Are water treatment plants designed to treat the range of variabilities of different water quality parameters?

MR. KRASNER: Yes. But not all plants; some are. Depends on if you're -- typically, utilities who are on reservoir systems, generally, are not designed to treat a

1093

wide range of water qualities compared to systems that are,

for example, on rivers.
MS. BRENNER: They are designed to treat the natural variabilities of the quality of the water that comes into their plant?
MR. KRASNER: Depends on what the natural variability has been historically. They are generally not set up to treat future variabilities, but set up to treat historical variability.
MS. BRENNER: Did you have something to add?
DR. WOLFE: No, I think that was a pretty good answer.
MS. BRENNER: When the future becomes the present, I guess, they treat that current range of variability, too?
MR. KRASNER: Actually, that is not correct. What I mentioned earlier about we had occasions where, for example, in our distribution system or member agencies, our trihalomethane levels have either approached or exceeded a hundred micrograms per liter. It was at a point in time where the natural variability was higher than it had historically been, and we were not set up to handle that variability.
In fact, there are some utilities in California treating Delta water who have experienced new natural variability and have, as a result, actually, failed to

1094

comply with the trihalomethane standard of a hundred micrograms per liter.
MS. BRENNER: And they make adjustments?
MR. KRASNER: In some cases they have, although not all these adjustments have been made yet.
MS. BRENNER: Isn't it true the compliance monitoring for the current THM MCL and proposed DDT MCLs are based on quarterly running annual averages and quarterly monitoring as required?
MR. KRASNER: Yes. Although that formula is only a temporary standard, and the EPA is currently evaluating the potential for a more frequent standard of potentially monitoring on a more frequent basis. That is one of the reasons why in the current information collection role the EPA is requiring utilities to not just collect data on a quarterly basis, but monthly to look at the variability, with the idea in mind, not for Stage I, but potentially for Stage II, changing those requirements.
MS. BRENNER: Potentially, you could have a monthly, but not a daily requirement?
MR. KRASNER: Correct.
MS. BRENNER: Currently, the quarterly are not continuous monitoring as required for ascertaining DDT MCL compliance as well as annual averaging of these results on a quarterly basis; is that correct?

1095

MR. KRASNER: True. Today they are currently based on -- maybe one thing that will help edify the reason why the things are in the process of changing. The current standard, and the reason it is based on an annual averaging of quarterly values, the health effect is based on cancer. So, there are many years of exposure to the result of the

person developing cancer from exposure.
MS. BRENNER: May I -- I understand that things are going to change in the future, and Mr. Krasner has, obviously, followed this quite closely. But what I am interested in is: What are the standards today? What are the probabilities of some sort of change? But I don't think we need to keep going beyond what is currently regulated, what the current regulations require of these water treatment plants. We've had testimony regarding the Stage II requirements. I have asked him about the Stage II requirements. I'd really appreciate it if you can keep a little bit more to the question.
MR. KRASNER: I thought the question was: Are these going to be the future compliance monitoring requirements, as well?
MS. BRENNER: No, that wasn't the question.
HEARING OFFICER STUBCHAER: I would appreciate as brief answers as possible. You have a lot of knowledge, obviously, but the time is --

MR. KRASNER: I understand.
HEARING OFFICER STUBCHAER: -- a weapon.
MR. KRASNER: I thought she was trying to get at future requirements as well as the present.
MS. BRENNER: You indicated that the future may be monthly, and I acknowledged that. I wanted to make clear for the record what the current monitoring requirements are. And that is okay?
MR. KRASNER: Yes.
MS. BRENNER: Thank you.
You indicated that currently your operation treatment plant includes coagulation, correct?
MR. KRASNER: Correct.
MS. BRENNER: Can you tell me what the cross of that current treatment is?
MR. KRASNER: For treating the water?
MS. BRENNER: Should I be directing it to you, as well?
DR. WOLFE: I don't really know the answer to that specific question.
MS. BRENNER: We can take it a step farther. You indicated that the cost of removal TOC is $26 per acre-foot and $39 acre-foot, correct?
MR. KRASNER: Correct.
MS. BRENNER: Is that the total removal cost or the incremental cost of removal?

MR. KRASNER: That is the incremental cost.
MS. BRENNER: Is that the cost to go from 30 to 40 percent removal?
MR. KRASNER: You're talking about the removal of TOC?
MS. BRENNER: Right.
MR. KRASNER: The $26 was the incremental cost for us at Metropolitan to be able to remove 25 percent total organic carbon; and the $39 per acre-foot was the incremental cost to be able to get the TOC removal up to 35 percent.
MS. BRENNER: One is a cost for 25 and the other one is

for 35 percent removal?
MR. KRASNER: Correct.
MS. BRENNER: These costs will be incurred whether Delta Wetlands is discharging water or not, correct?
MR. KRASNER: No.
MS. BRENNER: No? You won't have to have a 25 percent removal or 35 percent removal of TOC whether Delta Wetlands is discharging water or not?
MR. KRASNER: Correct.
MS. BRENNER: The median of DOC in the waters is what, currently?
MR. KRASNER: At our treatment plant?
MS. BRENNER: Yes.
MR. KRASNER: At our plant, specifically, our levels

1098

range between 3 and 4 milligrams per liter. I haven't computed the median?
MS. BRENNER: Have you ever had a high of over 4?
MR. KRASNER: Yes.
MS. BRENNER: You won't have to treat that?
MR. KRASNER: Again, I have to give you more detailed information about the regulation. Take a moment, but I can do it quickly.
MS. BRENNER: Will you have to remove a certain percentage of that DOC if it is over 4.0 and you receive it in your treatment plant?
MR. KRASNER: On a monthly basis?
MS. BRENNER: Running quarterly average.
MR. KRASNER: We will indirectly, yes, have to remove some of that TOC; that will be part of our requirements.
MS. BRENNER: That is if Delta Wetlands is discharging water or not?
MR. KRASNER: Actually, the Delta Wetlands will greatly change what our compliance requirements will be.
HEARING OFFICER STUBCHAER: That doesn't answer the question.
MR. KRASNER: In the regulation, there is an alternate performance requirement. The figure that we showed earlier, CUWA Exhibit 5C, showed the normal requirements for probably about 90 percent of the systems we have to meet. There are

1099

alternate performance criteria.
One of those criteria is if -- as I mentioned, Stage I is based on an 80 microgram per liter trihalomethane standard with these removal requirements for total organic carbon. However, for a system that treats water with a total organic carbon level less than 4 milligrams per liter, an alkalinity greater than 60 milligrams per liter, and to achieve Stage I of the rule, trihalomethane levels less than 40 micrograms per liter does not have to also meet the 25 percent TOC removal requirement. They have alternate performance criteria.
MS. BRENNER: That criteria applies whether Delta Wetlands is discharging water or not, and you receive a variety of natural variation of DOC into your treatment plant currently without the Delta Wetlands Project?
MR. KRASNER: Without the project we would be able to

stay below the 4 milligrams per liter and be able to take advantage of that alternate performance criteria.

My calculations have shown, with the project we would exceed the 4 milligrams per liter. If you look at Dr. Kavanaugh's testimony, he, for example, shows information on Alameda County; and they have total organic carbon levels that average, I believe it was 5 milligrams per liter in his testimony. They have to meet both the 80 microgram per liter standard and remove 35 percent of the TOC.

1100

If the project results in our being at similar situation, we to have to meet the additional requirements.

MS. BRENNER: So, your assumption with this is that 8, 16 or 32 milligrams per liter of loading would will occur, correct?

MR. KRASNER: Yes. Actually, I didn't assume the eight; Dr. Kavanaugh did.

MS. BRENNER: You utilized the 8 in your analysis?

MR. KRASNER: Yes.

MS. BRENNER: The 8 may not raise to the level of requiring or jumping you over the 4.0?

MR. KRASNER: I'm looking at my table to check. I do know that we have gotten, as I mentioned, typically, our highest loading of total organic carbon at our plant, takes several waters, 3.9 something.

If we did have the Delta Wetlands Project, we have seen as much as 1 milligram liter increase in total organic carbon in a month. So the project could result, during the season in which there are reservoir releases, are exceeding 4.

MS. BRENNER: That water gets mixed with other water, doesn't it?

MR. KRASNER: In terms of the Silverwood, as I mentioned, the water flows through rather quickly. There isn't, quote-unquote, that much mixing.

1101

MS. BRENNER: There is some mixing?

MR. KRASNER: What?

MS. BRENNER: You are not getting all of Delta Wetlands' water?

MR. KRASNER: You talked about three months in a row of releases. You're diluting Delta Wetlands Project water released in one month with Delta Wetlands Project water released in the month, so it is diluting with itself.

MS. BRENNER: Can you check on the graph and tell me what would 8 milligrams per liter --

MR. KRASNER: According to what I calculated, 8 milligrams per liter could potentially result in the water at that plant exceeding 4 milligrams per liter.

MS. BRENNER: Do you have a percentage there on your graph that tells you that?

MR. CORNELIUS: Is this a graph or this a table?

MS. BRENNER: He is looking at Table 6.

Take a look at your Table 6, Page 2. You have a Delta Wetlands Project release of 8, fourth column in, and you have a Delta outflow.

MR. KRASNER: I should explain this analysis is a

different analysis upon which I was answering the question. This analysis was specifically only done to evaluate what were the impacts of the project on the trihalomethane levels. I have done other analyses to look at the impacts

1102

of the DOC.

MS. BRENNER: This is the DOC loading in the Delta, isn't it? We're just talking about what the outflow DOC range would be with the Delta Wetlands Project discharging at 8.

MR. KRASNER: As was mentioned earlier, there was only 17 months worth of analysis, not the full 25 years. So, again, I was only trying to evaluate using this data, just to evaluate the impacts during such a similar period of time on trihalomethane. Not using this to examine the TOC impact, directly.

MS. BRENNER: What is the first number in the Delta outflow column?

MR. KRASNER: Talking about for May?

MS. BRENNER: Delta outflow column for May.

MR. KRASNER: 2.6.

MS. BRENNER: If you go to Delta Wetlands Project release, with your assumption of a DOC loading of 8, in the month of July, what is the outflow?

MR. KRASNER: I showed in this particular analysis for this particular water year approximately a two-tenths increase in total organic carbon.

MS. BRENNER: What is the Delta outflow?

MR. KRASNER: July?

MS. BRENNER: Yes.

1103

MR. KRASNER: This specific month it was 3.1. However, I should mention that this analysis shows that, under the no-project condition, the TOC was 2.9. As I indicated a few minutes ago, we typically don't see TOC levels that low at the plant. The Silverwood water, that level tends to be more in the range of 3 to 4; and as I mentioned, it has gotten as high as 3.9. So a two-tenths milligram per liter could put you over 4 under those conditions.

MS. BRENNER: Well, Delta Wetlands Project discharges its water into the Delta, doesn't it, and then it mixes with the water in the Delta?

MR. KRASNER: Yes.

MS. BRENNER: So you get a total Delta outflow, right?

MR. KRASNER: In the case you picked, I had looked at this dilution factor. I should also mention, just for completeness, that if you look at the instance where you have 32 milligrams per liter, that same period of time, that 2.9, which I indicated was on the low side, ends up at 4.2. That even with mixing in the Delta, it result in increasing the exported water by over a milligram per liter.

MS. BRENNER: Let's take a look at August. The second to the last entry. We have a Delta outflow of 3.2, correct?

MR. KRASNER: Yes.

MS. BRENNER: With the Delta Wetlands Project we have 3.3?

1104

MR. KRASNER: Well, it depends on which table. If you look at Stage IV with a 32 milligrams per liter reservoir --
MS. BRENNER: We are just looking at 8. We can get into 32.
MR. KRASNER: Yes, it was raised by about a tenth.
MS. BRENNER: At Page 20 of your testimony, you discussed JSA's demonstration pond, vegetation, and soil experiments. Are these the same experiments you discussed in the 1994 AWWA Journal article in which you thanked Dr. Brown and JSA for their cooperative research on wetlands testing?
MR. KRASNER: Yes.
MS. BRENNER: Therefore, in your opinion, which will produce more DOC, wetland or ag soils?
MR. KRASNER: Are you talking about in the soils experiments?
MS. BRENNER: No. Just in your opinion.
MR. KRASNER: In my opinion, the wetlands.
MS. BRENNER: The wetlands will produce more DOC than ag soils?
MR. KRASNER: The combination of the soil and the vegetative biomass will.
MS. BRENNER: Is that what you indicated in your 1994 AWWA Journal?
MR. KRASNER: Yes. In fact, I have a copy here.

1105

MS. BRENNER: So do I. You know, I read through it rather carefully. I noted in that article that the experience in the Delta support the conclusion that more TOC and THMFP can be extracted from the soil in ag tracts than from that of a wetlands?
MR. KRASNER: Let me answer that since you threw out two things. One was the TOC level; the other was the DDT formation levels. The first was, I indicated that you can't examine just the amount of TOC in the experiment. You have to look at the volume. So, on a mass loading, these are a different situation. That was what I was attempting to show in CUWA Exhibit 5G. You have to look, not just at the concentrations, but at mass load. Again, this was based upon earlier work that Dr. Brown had done showing that you need to examine, not just the concentrations, but the volume and mass load.
I also indicated in the article that when you examine the agricultural soil and the Delta Wetlands' soil, the unit of reduction of trihalomethanes per unit of total organic carbon was identical, that they had similar reactivities. So if you end up with a scenario with a sufficient volume and mass loading of DOC from Delta Wetlands' reservoir release, it will have the same -- it can have the same or higher reactivities as the agricultural drain.
MS. BRENNER: That is assuming that you are going to

1106

have the same kind of loading on a reservoir as you would in an ag production?
MR. KRASNER: No. I am --
MS. BRENNER: Did I mishear you, what you just told me? You said, assuming that they were equal loading, the

reactivity would be the same.
MR. KRASNER: If you look at CUWA Exhibit 5, Table 6, one of the things I was trying to point out was, if you look at both the discharge volumes and the TOC levels, and you multiply them and get a mass loading, you can see a level that can be higher during the months. This is not annual average, but during the months of July, August, and September, when their reservoir releases a higher mass loading from the Delta Wetlands Project.
MS. BRENNER: Than the ag?
MR. KRASNER: Yes.
MS. BRENNER: During those particular months?
MR. KRASNER: Yes.
MS. BRENNER: But there are other months when it would be lower?
MR. KRASNER: Correct, and that was shown in CUWA Exhibit 5G.
MS. BRENNER: Is that assumption based on your 8, 16, or 32?
MR. KRASNER: In all three. In all three you will see

1107

that you see a slight reduction in the loading of total organic carbon during winter months, such as January and February, and regardless of whether you have 8, 16 or 32 milligrams of TOC in the reservoir, in all three scenarios you will have a higher loading in the project condition in those three months than in the base condition.
MS. BRENNER: You still have to get to your 8, 16, or 32, correct?
MR. KRASNER: Well, I borrowed the 8 from Dr. Kavanaugh. And, yes, we got to the 30.
MS. BRENNER: I just want to make clear what your assumptions are when you are saying what you are saying. You are saying that, even though I read your article a little bit differently, now you are saying that, unlike what is suggested in your article, the ag soils are constantly -- well, let's reword that.
The ag soils produce the same amount of DOC as reservoir conditions. The article suggests the exact opposite.
MR. KRASNER: I will refer you to Page 46 of the article, and I specifically say that the volumes of discharged water from either the drainage of, at the time the analysis was based on, seasonal wetland or agricultural operations, must be factored into the analysis of the effect of changing land management practices in the Delta.

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So, again, the time I wrote the article I did not have available the discharge volumes. Earlier this year, we had a meeting with Dr. Kavanaugh. Dr. Kavanaugh now provided me with -- in fact, I cite Dr. Kavanaugh in the testimony on the volumes that he provided me for the agricultural drainage and for the Delta Wetlands Project, and that was what I used to prepare CUWA Exhibit 5, was mass loading numbers.
MS. BRENNER: Isn't it true, because as you suggest in your article, ag soils are constantly exposed to oxidated

conditions and wetlands soils are not?
MR. KRASNER: You mean the difference in terms of the amount of organic carbon?
MS. BRENNER: Yes.
MR. KRASNER: Yes, that was one of the possibilities. I should mention that this was not a full analysis, and I did not include the kind of analyses that Dr. Losee has done.
HEARING OFFICER STUBCHAER: Excuse us, we have a question on the journal article you both are talking about.
Ms. Leidigh.
MS. LEIDIGH: Has this article been introduced in evidence?
MS. BRENNER: No.
MS. LEIDIGH: Would you like to do that?

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MR. KRASNER: I should mention --
MS. BRENNER: That's okay. I used it for cross-examination purposes only, just to indicate to the Board and to Mr. Krasner that previously he has had a different opinion with regard to ag soils and wetland type of production of DOC.
I would be more than happy to introduce it as an Exhibit and add it to Delta Wetlands' exhibit list.
MS. LEIDIGH: I think we would appreciate having it added to your exhibit list. It makes it easier for us to review the record if we have the document.
MS. BRENNER: Okay.
Do you have a clean copy, Mr. Krasner?
MR. KRASNER: You may have mine.
MS. BRENNER: Thank you.
MR. KRASNER: Now I am going to have to go by memory.
MS. BRENNER: I don't have any more questions on this particular subject; is that okay?
MR. KRASNER: Yes.
HEARING OFFICER STUBCHAER: Ms. Brenner, while we are interrupting, your first hour is expired. Do you have any outlook on --
MS. BRENNER: Many more.
THE COURT: Many more hours?
MS. BRENNER: I was trying to get through Mr. Krasner

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first. I anticipated he would have plenty to inform me of. I have several questions for Dr. Losee, as well as a few more for Dr. Shum and for Mr. Buck. So I am trying to -- you know, I've limited these questions and relimited them. And, unfortunately, the more information Mr. Krasner provides, there are additional questions that you ask. At the break I can take a look. I have eliminated questions as we are going through.
There is a lot of -- they have testified to a lot of things, a lot of assumptions are being made in their testimony, and I'm really trying to get to those assumptions and where they are derived from.
HEARING OFFICER STUBCHAER: It is important, important issues. I recognize that. I would again just ask that the answers be as brief as possible, but not to the extent of

not providing information. I don't know where that balance is.

Anyway, we will go another ten minutes, and then take the morning break.

MS. BRENNER: You indicated some flaws in the EIR, and I just want to briefly touch on those. Isn't it true that the THMFP testing, which you indicate is inaccurate, was actually in compliance with the applicable standards at the time when the testing was done, MWQI standards and protocols were utilized?

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MR. KRASNER: No, not at all. I again document in the comments on the Draft Environmental Impact Report, and it is also part of, I believe it is, CUWA Exhibit 10, that the laboratory did not follow standard practices.

As an example --

MS. BRENNER: Let's stop right there. I am asking about THMFP. The formulas or standard protocol that was utilized in that instance to determine the THMFP was the one, at that time, that was the EPA WTP protocol, wasn't it?

MR. KRASNER: No. The method was developed by the Department of Water Resources as part of the Municipal Water Quality Investigations. But the laboratory Delta Wetlands used did not follow the procedure and made many errors that resulted in inaccurately measuring THMs, and I documented all of those errors on the Draft Environmental Impact Report, and it is in CUWA Exhibit 10.

MS. BRENNER: What was the standard protocol that was utilized that you are complaining about with the complaining about the particular lab analysis or utilization of that protocol?

MR. KRASNER: Actually, that is not correct. Department of Water Resources no longer even uses that methodology.

MS. BRENNER: But that was the standard methodology at the time that testing occurred?

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MR. KRASNER: It is actually unstandard methodology according to the way THM formation testing is done around the world, even at that time. It was not even following the protocols of EPA or standard methods.

MS. BRENNER: Are there deficiencies in the DOC and bromide measures that you sent back to Dr. Brown?

MR. KRASNER: In our measurements?

MS. BRENNER: Right.

MR. KRASNER: No.

MS. BRENNER: Patty, would you put 3C-16 and 3C-17?

The Metropolitan Water District measurements consist of AnLab measurements for DOC and bromide?

MR. KRASNER: No. One of the comments that we pointed out to the laboratories doing the work, as part of doing analysis for ions in water, such as bromide and chloride, the water is electrically neutral and must be balanced, both the positive and the negative. The laboratories that did the work for Dr. Brown did not have balanced waters. Water did not even meet the standard requirements.

I did point that out to Dr. Brown at the time that I

sent him chapters from standard methods for examination and wastewater.
MS. BRENNER: Let's just talk about what the actual measurements were. I am sure that you -- I know that you informed Dr. Brown. What I am interested in is the actual

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measurements not what occurred back then with regard to you informing Dr. Brown.
Could you take a look at that, 3C-16 and 3C-17, and tell me where there is a discrepancy, a significant discrepancy, in the MWD measurements and AAL measurements? I don't see it.
MR. KRASNER: You're just showing the DOC and UV data here.
MS. BRENNER: That is what I am talking about.
MR. KRASNER: I thought I heard you say bromide.
MS. BRENNER: And bromide. This one is looking at UVA and DOC.
MR. KRASNER: In general, they tended to agree. If I remember correctly, there was a bit more variability in the AnLab's results than our own.
MS. BRENNER: Isn't it true that Dr. Brown used the measurements he received from you in the Environmental Impact Report?
MR. KRASNER: For?
MS. BRENNER: DOC and bromide.
MR. KRASNER: To be honest, I am not sure which values he used. I do know that when I read his reports, the analyses were much more complex; and when he interpreted the data, such as in the demonstration of wetlands, part of the interpretation was not just based on the DOC levels, but

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also information on salinity which allowed him to determine whether the organic carbon was coming from vegetative biomass or soil.
But, as I mentioned, the laboratories doing his work did not have proper measurements on the salinity measurements, so that flawed some of those interpretations.
HEARING OFFICER STUBCHAER: But the question was: Did he use the same data? That is the type of answer that goes beyond the question, and --
MR. KRASNER: I know he -- we did not run all of the experiments for Dr. Brown. So he had to use a combination of our data and their data. He did not strictly rely on our data. I know that.
MS. BRENNER: Your data shows right on that board, very similar to the data produced by AnLab?
I think the point is made. Let's go ahead and move on.
Can we put on Exhibit 5E?
MR. KRASNER: Do you have the THMFP data?
MS. BRENNER: I am sure we can find it.
MR KRASNER: Because that data was -- it specifically was flawed and did get the same results.
MS. BRENNER: Doesn't THMFP, isn't it a precursor to bromide?
MR. KRASNER: Correct.

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MS. BRENNER: So, isn't the important data DOC and bromide?
MR. KRASNER: No, not at all.
MS. BRENNER: You don't think so?
MR. KRASNER: No. I briefly explain it in my testimony. The reactivity of either agricultural drainage from peat soils or water from the Delta Wetlands Project peat soil has a much higher reactivity to form trihalomethane than waters in the channels.
MS. BRENNER: But we are talking about ag and reservoirs. So the reactivity, in your opinion, is basically the same?
MR. KRASNER: Yes.
MS. BRENNER: The precursors, DOC and bromide, are the ones that you really need to be looking at?
MR. KRASNER: Depends on what analysis you are attempting to do.
MS. BRENNER: I am talking about ag and wetlands, ag soil and wetland. Right?
MR. KRASNER: That is part of what you need to do.
MS. BRENNER: Can we look at Exhibit 5E?
MR. KRASNER: Yes.
MS. BRENNER: Your first dot and arrow, the if the experiment had stopped in December, the answer could have been 30, correct?
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MR. KRASNER: Correct.
MS. BRENNER: Your side and horizontal arrow indicates, according to your testimony, that no one knows what the number might have ended up being if the experiment had continued beyond January?
MR. KRASNER: That was part of my answer.
MS. BRENNER: Part of what you are saying in your testimony, right?
MR. KRASNER: Yes. I also indicated the time of the year that the experiment was conducted in the warmer time of the year and also the time of the year with different seasonal impacts. The result would have been different.
MS. BRENNER: Isn't it true that this is just Dr. Brown's first experiment to determine the DOC release level, and that a second experiment was conducted which answered some of these questions?
MR. KRASNER: I'm more familiar with this particular experiment. I'm not as familiar with the other. But I don't believe, when I looked at the other experiment, that that was as conclusive as --
MS. BRENNER: Can we look at Figure 3C-9? This is just a depiction of what you consider the first experiment that Dr. Brown conducted?
MR. KRASNER: Yes.
MS. BRENNER: Let's take a look at what he did.
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Take a minute and take a look at that. What months are indicated there?
MR. KRASNER: April, May, June, and July.
MS. BRENNER: This is the second seasonal storage

period experiment --
MR. KRASNER: I am not completely familiar with the details of this experiment.
MS. BRENNER: Can I -- go ahead.
MR. KRASNER: Dr. Losee is more familiar with the details of this experiment.
MS. BRENNER: Okay. Isn't it true that the second experiment answered the questions with regard to seasonality as well as peaking, and shook the DOC level, actually reached a plateau at approximately 30 to 34 milligrams per liter of DOC?
DR. LOSEE: I would say that one can't tell from this data. I am afraid that the design of the experiment didn't allow us to make an interpretation. If you will note, during this period the concentration hasn't changed very much. This is a single wetland. It is a single experiment, so no replication of this experiment. It is sitting out in the open. If you'll note in whatever the table is where the data are presented in here, during this time period, the oxygen concentration in the water was actually below saturation. That means that there was a good deal of

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respiration going on in this water column. That means the consumption of organic carbon.
So, there was consumption of organic carbon during this period, and yet there wasn't a decrease in the concentration. The assumption, the conclusion from this experiment was that this constant level indicates that the release rate has been complete during this experiment. There is no more organic carbon being released from the sediments. The data indicates the consumption of organic carbon.
The data doesn't just support that conclusion.
MS. BRENNER: That is what actually occurred?
DR. LOSEE: That is correct. That is what occurred. That is, that there was more going on in this experiment than what was discovered, elucidated, in the experimentation.
MS. BRENNER: Do you have a notion of how many acres was flooded during this experiment?
DR. LOSEE: It is in the EIR.
MS. BRENNER: You don't recall?
DR. LOSEE: As I recall, it changed during the experiment. I believe it was -- well, actually, you folks know. I would like to hear what it is.
MS. BRENNER: I don't know off the top of my head, either. My question is -- I know it is --

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DR. LOSEE: It is relevant to the question, I guess.
MS. BRENNER: Fifty acres of flooded wetland, and my question is: With that type of acreage, would you normally do a replicate experiment?
DR. LOSEE: I would if I was given the assignment. It isn't necessary to have a 50-acre wetland, several 50-acre wetlands. That wouldn't be necessary at all.
MS. BRENNER: All the mechanisms that you have testified about were occurring during this particular

experiment, were they not?
DR. LOSEE: That is right. There were mechanisms occurring in the reservoir.
MS. BRENNER: The data depicted in Figure C3-9 shows that the concentration plateaued, does it not?
DR. LOSEE: The assumption is that this concentration would be the -- would, it would increase the volume of this reservoir. We no have data to indicate that to be a fact.
MS. BRENNER: I don't think that really answered my question.
The data indicated that the concentration of the TOC during this second experiment, which started with the first experiment back in January, went all the way through July. So we have seasonality in here, correct?
DR. LOSEE: That is correct. The assumption in this experiment is that they understand all that is going on in

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this wetland. The fact is that they don't. There is respiration going on here. That is indicated by the data. And that respiration means that organic carbon is being consumed. Organic carbon that is allowing this concentration to remain constant has to come from somewhere. Unfortunately, there wasn't an effort made to determine where that organic carbon was coming from.
The problem then is that we don't -- since the underlying assumption for this experiment wasn't fully tested, we don't know what's going on here. So a plausible explanation would also suggest that, as you increase the volume of this artificial wetland or the demonstration wetland, you would perhaps continue to have the same concentration in a greater volume of water.
The assumption is that, if you increase the volume, you would decrease the concentration. It is unfortunate, but the data just doesn't support this conclusion. There could have been experiments done to look at processing that was going on here. They weren't done.
MS. BRENNER: Such as the Pace Soil Experiment?
DR. LOSEE: Well, we can get into that, also.
MS. BRENNER: I am just suggesting that that is one of the things that could have been done to determine what is occurring, correct?
DR. LOSEE: Well, I guess I would like to have a

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further explanation of what the objective is of this experiment that you are going to describe. Then we can talk about how well it has accomplished that objective.
HEARING OFFICER STUBCHAER: Let's take our break now.
MS. BRENNER: Thank you.
(Break taken.)
HEARING OFFICER STUBCHAER: We will reconvene the hearing.
Ms. Brenner.
MS. BRENNER: Let's take a look CUWA's Exhibit 5G, which is a total organic carbon in the Delta utilizing the assumptions of the 8, 16, and 32 milligrams per liter of DOC, correct?
MR. KRASNER: Correct.

MS. BRENNER: This actually gives a mass loading in pounds, doesn't it.
MR. KRASNER: Yes, pounds per month.
MS. BRENNER: Pounds per month. Is there some reason why you show only the months of January, February, and July through September on this exhibit?
MR. KRASNER: Yes. Because the Delta Wetlands' reservoir islands will only be releasing through July, August, and September; the impact or the results you see for January and February, you will see a similar result through the other months. In the detailed CUWA Exhibit 5, I show

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all the data, but just for simplicity I didn't think it was worthwhile to show nine months where we see the same impact.
MS. BRENNER: We actually I see benefits, don't we, in those nine months?
MR. KRASNER: Very slight, but, yes, you do see benefits.
MS. BRENNER: You do see benefits. That is, again an instance where a new exhibit has been changed slightly.
This indicates, correct -- Let's back track.
Are you aware of Dr. Kavanaugh's and Dr. Brown's estimate of 2.2 million pounds of DOC currently releases in the ag drainage from Delta Wetlands' islands?
MR. KRASNER: Yes.
MS. BRENNER: You are familiar with that estimate?
MR. KRASNER: Yes.
MS. BRENNER: If we compare that on a mass loading basis to your chart, isn't your 32 milligrams per liter then approximately 14,000,000 pounds?
MR. KRASNER: Approximately.
MS. BRENNER: 14,000,000 pounds. In your opinion, these two reservoir islands are going to release 14,000,000 pounds mass DOC loading, not released, but they will have a mass loading of DOC which is, what, seven times what the four islands are currently discharging under ag conditions?

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MR. KRASNER: No. I'm looking at -- I have to look at Dr. Kavanaugh's data, but he showed agricultural -- he showed agricultural return flows having levels of --
You are speaking just for those four?
MS. BRENNER: I am talking four islands.
MR. KRASNER: Yes.
MS. BRENNER: So, the two islands under reservoir conditions are going to have a mass loading of an increased amount, in your opinion?
MR. KRASNER: Yes, because of the larger volume of discharge.
MS. BRENNER: If you include the remaining seven months, all the blocks would be below your zero line, correct?
MR. KRASNER: Correct.
MS. BRENNER: The drinking water standards are based on running quarterly annual averages, and your exhibit should reflect the remaining months and calculate the total amount of loading for the year, shouldn't they?

MR. KRASNER: In terms of the other exhibit I showed, CUWA Exhibit 5H, I did consider all 12 months. But for illustrative purposes, I didn't see a point in showing nine months where the impact was the same as January and February. I showed those to illustrate a point.
MS. BRENNER: Did you calculate the total of mass

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loading for the year?
MR. KRASNER: Yes.
MS. BRENNER: What number did you come up with?
MR. KRASNER: I don't have it in front of me.
MS. BRENNER: Let's take a look at CUWA Exhibit 5H. And the data on this is obtained from your Table 6, correct?
MR. KRASNER: Correct. Yes. Actually, that is taken from CUWA Exhibit 5, Table 7.
MS. BRENNER: Table 7?
MR. KRASNER: Yes.
MS. BRENNER: The title for this diagram is Impact of Delta Wetlands Project on THM Formation in the Delta?
MR. KRASNER: Yes.
MS. BRENNER: Are THMs formed in the Delta?
MR. KRASNER: No. It was indicating the impact on the ability or the formation potential of how it will increase the amount of THMs formed when Delta water is treated at the utility.
MS. BRENNER: So, THMs are formed in the treatment plant --
MR. KRASNER: Correct.
MS. BRENNER: -- not in the Delta?
MR. KRASNER: The full title should --
MS. BRENNER: You can go ahead, but the title should be

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Predicted THM Formation in a Simulated Water Treatment Plant Using Estimates of Water Quality in the Delta Export Waters since all your numbers are predictions and not actual measurements, correct?
MR. KRASNER: Are you referring just to CUWA Exhibit 5H?
MS. BRENNER: Right, just to this CUWA Exhibit 5H.
MR. KRASNER: That particular one, it is based on predictions. In my written testimony, I do show that the predictions for the base condition are consistent with the results for actual measurements on the base condition.
MS. BRENNER: But these are all predictions, not actual measurements?
MR. KRASNER: In this particular figure, yes.
MS. BRENNER: I am just clarifying for the record and for the Board what this actually details.
As I understand this diagram, you are saying that in a base condition water utilities currently relying on Delta export water are able to meet the Stage I proposed standard for THMs of 80. Is that correct?
MR. KRASNER: If you read the detailed CUWA Exhibit 5, I explained the bases to combination of using enhanced coagulation and just chlorination through the treatment plant; and under those circumstances, the base condition the

utility would barely be able to comply with the 80 microgram
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per liter standard.
MS. BRENNER: For the base you show the 90th percentile as the median. These are the statistics used to determine the compliance with the primary drinking water standard, are they?
MR. KRASNER: No. But the reason I chose to do it this way was in cumulative probability statistics you want to look at what is the likelihood of over a period of time being able to comply or not. So, again, because the standard needs to be met all years, I just did not want to focus on the probability that you might comply 50 percent of the time. I wanted to look at, could you comply 90 percent of the time?
MS. BRENNER: That is not what the standard is based on?
MR. KRASNER: Oh, yes. You have to comply with the standard 100 percent of the time.
MS. BRENNER: On a running quarterly annual average?
MR. KRASNER: Correct.
MS. BRENNER: So, the statistics used to determine compliance is clearly by the annual average?
MR. KRASNER: Correct.
MS. BRENNER: Doesn't the median statistic more closely approximate the quarterly running annual average?
MR. KRASNER: That just shows the median likelihood of
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having such a running average. The 90 percentile shows the likelihood of having a higher running annual average.
MS. BRENNER: But the median is more closely approximating the standard of quarterly annual average?
MR. KRASNER: No. That only approximates the results under median water quality conditions. Under other conditions, one could find that the 90th percentile is representative of what you had under those water quality conditions.
MS. BRENNER: How often does the 90th occur?
MR. KRASNER: The way in which the cumulative probability statistics work is ten percent of the time you could be at the 90th percentile value or higher.
MS. BRENNER: Ten percent of the time?
MR. KRASNER: Correct?
MS. BRENNER: Did you compute the quarterly running annual average for the base condition?
MR. KRASNER: Yes.
MS. BRENNER: What is it.
MR. KRASNER: Is what you want to know the median value or the 90th percentile?
MS. BRENNER: Median.
MR. KRASNER: The median was of the order of -- looks like in the sixties; I don't have the exact number in front of me.
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MS. BRENNER: What would it be, then, for 8 milligrams per liter?
MR. KRASNER: A little higher.

MS. BRENNER: How much?
MR. KRASNER: Maybe a couple mircrograms per liter. The reason I showed the 90th percentile was the important issue is not, you know, on a 50 percent of the time basis can you get a similar compliance, but can you all of the time get a similar compliance. The data shows that, when you examine the 90th percentile, under those water quality conditions, you have a higher result under the project condition.
MS. BRENNER: You used the 90th percentile bromide occurrence level to compute the THM levels?
MR. KRASNER: In this particular figure, but in the full testimony I examined median and bromide occurrence level.
MS. BRENNER: Why did you use this extreme value?
MR. KRASNER: It is actually not an extreme. We treat that water on a regular basis, and my understanding is that what my database shows is that the 90th percentile bromide level at H.O. Banks is also median bromide level at Delta Rock Slough. At the time I prepared this, I hadn't seen Dr. Kavanaugh's testimony. So this is actually a median bromide level for Rock Slough and 90th percentile at H.O. Banks.

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MS. BRENNER: 90th bromide at Banks, and median overall would be .29?
MR. KRASNER: No. This value is based on -- I don't have it in front of me. It is something like about .5 five milligrams per liter bromide. I believe in Dr. Kavanaugh's testimony, he showed in his database that was about the median for Rock Slough and the percentile for H.O. Banks.
MS. BRENNER: What equation did you use to estimate the THMs?
MR. KRASNER: It was an equation developed by Malcolm-Pirnie and it was an equation developed in Delta waters over a wide range of conditions, both a wide range of dissolved organic carbon levels and a wide range of bromide.
MS. BRENNER: The THM formation levels shown in the Pirnie report?
MR. KRASNER: Correct. In the exhibit, I gave the exhibit formula for the equation.
MS. BRENNER: Doesn't this equation show the THM formation to be more sensitive to changes in bromide concentrations than in DOC?
MR. KRASNER: Actually that is not a correct interpretation. If you look at that equation, there are many parameters that affect trihalomethane formation. The total organic carbon level, the ultraviolet absorbance which

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is an indication of reactivity of precursor, the chlorine dose, the bromide level, pH, and temperature.
Briefly, as I pointed out, also on that same page, as your TOC level goes up, your chlorine dose goes up. I also pointed out as an example the article that we talked about that I published in the American Water Works Journal in 1994, you have higher UV levels when you have higher TOCs. You have actually have a total of three parameters going up

as you raise the TOC. Only bromides don't. So you have to look at the increase in all three of those parameters that are directly or indirectly due to increases in total organic carbon.

MS. BRENNER: Isn't the bromide the more sensitive of those?

MR. KRASNER: No. Both are very sensitive.

MS. BRENNER: The base condition in your graph for THM levels are well above the proposed Stage II standard of 40, correct?

MR. KRASNER: That is correct.

MS. BRENNER: Therefore, you right now, without the Delta Wetlands Project, the median THM levels are far above the standards?

MR. KRASNER: Proposed standard.

MS. BRENNER: Proposed standard, correct? Okay.

Looking at estimates from the hypothesized increases in

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DOC from 8 to 32, with hypothesized concentrations of 8, 16, and 32 in the reservoirs which selected, are not based on your calculations, are they?

MR. KRASNER: The 8, 16, and 32?

MS. BRENNER: Right.

MR. KRASNER: No. I used the 8 from Dr. Kavanaugh and a range of 30 from Dr. Losee. My analysis was to simply state, given a certain TOC level, what would be the impact on THM compliance.

MS. BRENNER: Let's turn to Dr. Losee.

Thank you, Mr. Krasner.

Would you take a look at Exhibit 6A which was from Figure 1 of CUWA's original TOC sources. Got a couple questions in the change.

You changed this figure to reflect a TOC pool versus a DOC pool, correct?

DR. LOSEE: No.

MS. BRENNER: Your original figure didn't show a DOC pool?

DR. LOSEE: Yes, it did.

MS. BRENNER: The new figure switches from a TOC to a DOC pool?

DR. LOSEE: TOC is a subset -- Doc is a subset of TOC.

MS. BRENNER: I understand that concept. I am just asking you about this particular figure and the switches

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from Figure 1 to 6A.

DR. LOSEE: Can we put Figure 6 up?

MS. BRENNER: You have 6A up; you want Figure 1 up?

DR. LOSEE: That's correct, Figure 1.

MS. BRENNER: I don't have it.

DR. LOSEE: I have it.

MS. BRENNER: It's a little bit different, isn't it?

DR. LOSEE: All those boxes in the water column make up TOC.

MS. BRENNER: Yes.

DR. LOSEE: The TOC pools are all of those, for clarification.

MS. BRENNER: I understand that. I am just pointing

out the differences.
DR. LOSEE: Would you repeat what you perceive to be the differences?
MS. BRENNER: We will go through them.
Figure 1 is a far more accurate depiction of what occurs in the system than your new 6A, isn't it?
DR. LOSEE: It is more detailed, yes.
MS. BRENNER: 6A shows two sources of the TOC pool.
Can we switch back to 6A?
Two sources, photosynthesis and peat soil. Correct?
DR. LOSEE: That's correct.
MS. BRENNER: There are no losses to the carbon dioxide

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shown in Exhibit 6A, are there?
DR. LOSEE: Those are in the detailed figure which I showed immediately following this one in my testimony.
MS. BRENNER: There are no losses depicted here?
DR. LOSEE: No, that is correct.
MS. BRENNER: Isn't it true that almost all of the peat soil photosynthesis processes goes to the carbon dioxide and not to the TOC pool?
DR. LOSEE: I think that is misunderstanding of what happens in the system.
MS. BRENNER: In your opinion, then, most of the peat soil photosynthesis does not go to the carbon dioxide?
DR. LOSEE: The peat soil photosynthesis -- I am sorry to be picking at this. Are you talking about two processes, photosynthesis and the organic carbon pool that is in the sediment?
MS. BRENNER: Right. Let's just go to the photosynthesis as in higher plants. Maybe that is the confusion, is that insert of peat soil.
Is that where we are getting confused?
DR. LOSEE: I am not confused.
MS. BRENNER: Isn't a portion of the photosynthesis algae in higher plants that goes to carbon dioxide?
DR. LOSEE: Yes, of course.
MS. BRENNER: On every basis; average, monthly, daily?

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DR. LOSEE: Yes. Photosynthesis results in production of organic carbon, and that organic carbon, if it is metabolized, can go to carbon dioxide.
MS. BRENNER: Isn't it true that almost all of photosynthesis process goes to carbon dioxide and not to the TOC pool?
DR. LOSEE: That is incorrect.
MS. BRENNER: What percentage, in your opinion, would go to the TOC pool?
DR. LOSEE: Unfortunately, you have oversimplified the issue, I'm afraid, also. Production -- the carbon ultimately -- the ultimate source of the carbon is photosynthesis. Carbon dioxide is removed from the air or water and fixed into organic molecules by photosynthetic organisms. That organic matter now that has been fixed in photosynthesis is going to reside in this ecosystem for some period of time, until either it metabolized away and leaves the system as CO2 or some other end product of metabolism.

Or it is going to -- that would be the ultimate fate.
However, that material can be buried in the sediments. A good example of that is the existence of these islands, to begin with. The peat soils in those islands have come from photosynthesis at some point in the past.
MS. BRENNER: So let's take a look at your oversimplification. Okay. You're showing photosynthesis

1135

going directly into the TOC pool?
DR. LOSEE: Right.
MS. BRENNER: That is not what you just explained to me.
DR. LOSEE: As soon as the carbon, the inter organic carbon, is fixed in photosynthesis, it is a component of the total organic carbon pool.
MS. BRENNER: I think we will get more into that, and it will be a little clearer to the Board as this particular exhibit is somewhat misleading.
Have you actually --
DR. LOSEE: There were two points made from this figure, if you will recall. The two points were that there are two sources for the organic carbon pool in the water column. Those sources are photosynthesis and release of organic matter from the sediments. And I also stated that there was a third source, and that was the organic carbon to be complete. That was the inorganic carbon that was in the water as it was pumped onto the land.
MS. BRENNER: To be complete, there is always losses?
DR. LOSEE: Absolutely. That is covered in my detailed figure which is the next one I brought up.
MS. BRENNER: Have you ever actually measured the amount of peat soil carbon that becomes dissolved in water and is in your TOC pool?

1136

DR. LOSEE: Fortunately, I guess -- my obligation in this was to review the environmental impact report by Delta Wetlands, and then to assess Dr. Kavanaugh's analysis.
And so, no, I haven't made the measurements on these islands. But that wasn't necessary to come up with an opinion about what happens here.
MS. BRENNER: I just wanted to know if you ever measured it.
Isn't it true that this was measured in the Jones & Stokes' experiment?
DR. LOSEE: Would you like to talk about those experiments?
MS. BRENNER: I just want you to answer the question I posed.
DR. LOSEE: There were measurements made in the Jones & Stokes experiments. I believe that there were flaws in those measurements.
MS. BRENNER: I understand that is your belief. But those measurements were made by Jones & Stokes?
DR. LOSEE: Measurements made.
MS. BRENNER: And no measurements were made by you?
DR. LOSEE: My obligation -- my objective in this was to assess the potential impact based on the information

provided and my knowledge of ecology. In that case, I was able to analyze what was done by Jones & Stokes and by Dr. Kavanaugh.

In the EIR and Dr. Kavanaugh's assessment, there were areas where they either overlooked or underestimated values. And, therefore, I was able to come to a conclusion that whatever value they came up with, that it was an underestimate.

MS. BRENNER: What I would like to do is just talk about some of what you testified to. I understand your entire testimony. Unfortunately, I don't have the time or the days to go through each and every bit of it. So my cross-examination questions are very precise and meant to elicit particular information. And I know you would love to have the opportunity to clarify or quantify or expand upon them.

But my point is that calculations were made by Jones & Stokes. No calculations were made by you; is that true?

HEARING OFFICER STUBCHAER: Calculations or measurements?

MS. BRENNER: By Jones & Stokes on the peat soil.

It is just a yes or no.

DR. LOSEE: Yes, I made calculations.

MS. BRENNER: Measurements, excuse me. I am sorry.

DR. LOSEE: That is correct. I did not take measurements.

MS. BRENNER: Thank you.

You assert that the EIR did not either address or adequately address various sources of DOC, correct?

DR. LOSEE: That's correct.

MS. BRENNER: Did the EIR or the Environmental Impact Report address peat soil as a source of organic carbon?

DR. LOSEE: It attempted to.

MS. BRENNER: Did the EIR address wetland plants as a source of organic carbon?

DR. LOSEE: Inadequately.

MS. BRENNER: It did address them?

DR. LOSEE: Inadequately.

MS. BRENNER: I know you feel it is inadequate. I want you to answer the question.

DR. LOSEE: Yes, it inadequately addresses the question.

MS. BRENNER: Did the EIR experiments directly measure the total contributions of DOC?

DR. LOSEE: I don't believe so.

MS. BRENNER: It didn't?

DR. LOSEE: I didn't believe they did.

MS. BRENNER: They didn't directly measure the total contribution of DOC?

DR. LOSEE: That is my feeling.

MS. BRENNER: We looked at -- we talked briefly about Dr. Brown's experiments with wetted wetlands experiments, correct?

DR. LOSEE: Yes.

MS. BRENNER: We concluded that they were actually conducted between the months of October and January? The first one was conducted between October and January? See?
DR. LOSEE: That is correct.
MS. BRENNER: The seasonal storage experiment, which was the second of that flooded wetland experiment, was conducted in the months of April through July of the following year?
DR. LOSEE: Yes.
MS. BRENNER: During the seasonal storage experiments, in your opinion, were all the natural sources and release mechanisms you show in Exhibit 6C operating in the two flooded wetland experiments?
Patty, you can go ahead and put up 6C.
DR. LOSEE: They were -- were they operating?
MS. BRENNER: Yes.
DR. LOSEE: Yes. They were operating. Were they operating at a level that one would expect in the Delta Wetlands once it's in operation? I don't know.
MS. BRENNER: Those are natural occurrences, correct?
DR. LOSEE: Those are natural occurrences, yes.
MS. BRENNER: There is nothing that Jones & Stokes or Dr. Brown did to stop any of those occurrences during these

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experiments?
DR. LOSEE: That is correct.
MS. BRENNER: We need to look at Exhibit 6D, which is comparable to the old Exhibit 3. And I think the only change in this particular exhibit was the emergent wetland vegetation column. Is that correct?
DR. LOSEE: The roe, yes. I included the data from the EIR.
MS. BRENNER: Other than that, it is the same as your old Exhibit 3?
DR. LOSEE: Correct.
MS. BRENNER: What would the values be for crop plants if they were added to this table?
DR. LOSEE: It would be a range. They would be high. A range --
MS. BRENNER: Do you have a sense?
DR. LOSEE: Yes, sure. They are in the range of the emergent wetland vegetation.
MS. BRENNER: So, a thousand to 2,000 grams carbon per meter squared per year?
DR. LOSEE: Certainly.
MS. BRENNER: Isn't it correct that only a fraction of that carbon becomes organic sediment matter or residue, and most of it is oxidized carbon dioxide?
DR. LOSEE: In which case are we speaking of?

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MS. BRENNER: Crop plants.
DR. LOSEE: I haven't studied crop plants but, of course.
MS. BRENNER: You testified on Page 7 of your written testimony that only 78 percent of that 2,250 grams of carbon from vegetated biomass becomes carbon dioxide, correct?
DR. LOSEE: I am sorry, I am not picking that up. On

Page 7?
MS. BRENNER: That is what my notes indicate.
Do you recall what your estimate of carbon dioxide versus organic carbon residue is from vegetation biomass?
My notes indicate that your testimony says 78 percent carbon dioxide, 22 percent comes to carbon residue or organic carbon residue.
HEARING OFFICER STUBCHAER: The number would be 1 minus 22 to get at 78. So the testimony doesn't actually say at 78. It is induced from this.
MS. BRENNER: From the testimony. Okay.
DR. LOSEE: Now that I found where you are, could you repeat the question?
MS. BRENNER: I am just clarifying what your opinion with regard to the amount of carbon from vegetated biomass becomes carbon dioxide versus carbon residue, organic carbon.
DR. LOSEE: The first, that is highly specific to the case. The environment, natural environment, is highly

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variable.
MS. BRENNER: Those are the numbers you used in your estimate, right?
DR. LOSEE: I was indicating that there is a lot of variability in the environment, and it can be higher.
MS. BRENNER: That is the highest range that you could find?
DR. LOSEE: No. These are -- I guess -- may I put this in context?
MS. BRENNER: I think we will be putting it into context very shortly here. You have used this extreme value to conduct your analysis, haven't you?
DR. LOSEE: As it was one component, that's correct. Because there can be extreme values in the environment.
MS. BRENNER: You referred to an article by Gale & Reddy in your testimony and that was the basis for this 22 percent carbon from vegetation biomass?
DR. LOSEE: In their case, that is right.
MS. BRENNER: As you indicated, that was due to your sediment that Delta Wetlands would get, also?
DR. LOSEE: I never said that.
MS. BRENNER: You are not saying then that the Delta Wetlands' islands would actually get 22 percent of organic carbon from the wetland vegetation?
DR. LOSEE: I am saying it is unknown and should be

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measured.
MS. BRENNER: The data that creates these numbers is from a subtropical lake in Florida; isn't that correct?
DR. LOSEE: It's from a shallow peat lake in Florida; that's correct.
MS. BRENNER: And the lake was only 5.4 feet?
DR. LOSEE: It was shallow, yes.
MS. BRENNER: 30,000 acres.
DR. LOSEE: I am not sure of the size.
MS. BRENNER: Average temperature range, 16 to 27 degrees Celsius?
DR. LOSEE: Yes.

MS. BRENNER: Those conditions are very different than the conditions expected from the Delta Wetlands' islands?
DR. LOSEE: They are different. I would point out that there issuance of organic matter primarily -- what is stated here is from algae. And as we have discussed in earlier testimony, algae is more labile and does decompose faster. This study is an annual cycle. So this is more complete. They are talking about from an annual cycle how much organic carbon would -- from the algae would end up in the sediment. This is an amount that could happen in a highly productive system dominated by photoplankton water column algae growth.
MS. BRENNER: It is the number that you used in your

1144

analysis of the Delta Wetlands Project?
DR. LOSEE: I used it in a qualitative way. The qualitative way is to say, if you have algae, can there been large inputs from the algae? Yes, there can be.
MS. BRENNER: These condition are quite different than the conditions expected of the Delta Wetlands? The subtropical lake is not what Delta Wetlands is building, is it?
DR. LOSEE: The primary input determining the amount of biomass produced is, the primary inputs are light and nutrients. In Delta Wetlands there will be light and nutrients.
MS. BRENNER: Isn't it true that a better estimate of the amount of vegetation biomass that is likely to become carbon versus carbon dioxide would be those values of five percent or less, based on local data or estimates derived from the Bay Delta, or similar conditions?
DR. LOSEE: From algae sources? All organic matter?
MS. BRENNER: Talking vegetation biomass.
DR. LOSEE: On an annual basis?
MS. BRENNER: Yes.
DR. LOSEE: To be perfectly honest, I don't know. I haven't studied that issue so I don't know in the Delta what the value would be.
MS. BRENNER: You had some -- are you familiar with the

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Castaic Lake down south. I am not sure where it is. I just know it is Castaic Water Project.
DR. LOSEE: Castaic Lake is the terminal reservoir on the west branch of the State Water Project.
MS. BRENNER: Are you familiar with it?
DR. LOSEE: Yes.
MS. BRENNER: They experience taste and odor problems for six months out of 20 years?
DR. LOSEE: No, that is not correct.
MS. BRENNER: Would the Castaic Lake be more, be a better analysis to the Delta Wetlands' reservoirs?
DR. LOSEE: In what context?
MS. BRENNER: Than your subtropical Florida lake?
DR. LOSEE: As a source for organic --
DR. BRENNER: Algae growth, taste and odor?
DR. LOSEE: I am sorry, you are going to have to be more specific in your question.

MS. BRENNER: The different types of algae, different types of algae produce different types of situations. One that you testified to is algae growth with regard to taste and odor problems.
Do you recall that testimony?
DR. LOSEE: Yes. Algae can produce taste and odor problems.
MS. BRENNER: You made some sort of estimate as how

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large that problem would be for the Delta Wetlands' reservoir?
DR. LOSEE: I gave an example of how high concentrations can get. I used data which we have; we, being Metropolitan. Those data were derived from taste and odor events that happened in state project water. That is correct.
MS. BRENNER: If we look at the Castaic Lake, you're indicating that they didn't have taste and odor problems, or that they do have taste and odor problems more often than six months out of 20 years?
DR. LOSEE: It is an annual thing now.
MS. BRENNER: Do the nutrients for taste and odor at Castaic come from an oxygen depleted deep hole layer?
DR. LOSEE: No.
MS. BRENNER: Is Cladophora a common growth in aqueducts, in the California aqueduct?
DR. LOSEE: It is a relatively common species, yes.
MS. BRENNER: Is commonly treated by the water agencies, including Department of Water Resources?
DR. LOSEE: I am not aware of how they treat it or if they do at all.
MS. BRENNER: Are you aware of the scientific publication showing that DOC is degraded by the UV light in shallow waters?

1147

DR. LOSEE: Yes, I am.
MS. BRENNER: DOC is taken up by algae and thus not available for release from the reservoirs?
DR. LOSEE: That is half of what the paper talks about. The paper says that more recalcitrant organic matter can be broken down by UV light and producing less recalcitrant organic matter. Organic matter that may be able, may be metabolized by bacteria. That work was elucidating a mechanism. So their analysis -- this was a paper by Wetzel and -- I don't remember the others. Dr. Kavanaugh cited it in his testimony.
MS. BRENNER: We might be talking about two different particular publications, but go ahead.
DR. LOSEE: That paper, its data indicated that there was further breakdown of the organic matter was a simulation in their experimental situation, a simulation of the growth in bacteria. This was merely elucidating the mechanism. There were no estimates made on how much organic matter might be degraded at this point.
MS. BRENNER: But there is evidence that it is degraded?
DR. LOSEE: Yes. In fact, UV light is used in the

analysis of organic carbon to break down organic matter in a laboratory situation.

MS. BRENNER: Would you expect to grow Cladophora

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biomass in a reservoir than biomass of plankton?

DR. LOSEE: Again, this is nature. It depends on the particular circumstance.

MS. BRENNER: We have the new Exhibit 6E. You're indicating now that the start and finish of this curve is now on the same point on the Y axis, correct?

DR. LOSEE: Yes.

MS. BRENNER: Doesn't this curve only show what may happen with fresh biomass; it doesn't say anything about how much plant matter actually decays and when it decays and when it becomes DOC?

DR. LOSEE: This is a simplification of that potential combination, yes. This only shows what happens to the biomass.

MS. BRENNER: It depicts when plants grow and biomass increases, correct?

DR. LOSEE: It depicts when biomass increases and decreases.

MS. BRENNER: Isn't it true, a more appropriate parameter would be plant decay?

DR. LOSEE: For what purpose?

MS. BRENNER: For determining DOC or total organic carbon. Your title says, Impact of Timing on Discharge, Total Organic Carbon.

DR. LOSEE: That's right. That is the amount of

1149

organic carbon that will be in the discharge that is driven by production, photosynthetic production.

MS. BRENNER: This is production of plant biomass?

DR. LOSEE: Yes.

MS. BRENNER: Plants have to die before they become organic carbon, right?

DR. LOSEE: The inflection point, when the biomass turns downward, when over time you have decrease in biomass, is the point when the degradation of organic matter exceeds the production. So, yes, that point is in this figure.

MS. BRENNER: So, it is the low point on the figure?

DR. LOSEE: What is the low point on this figure?

The low point on the figure is the point when you have a minimum biomass in the system; that also coincides with the winter when you have the lowest light levels.

MS. BRENNER: My point is that, when you are trying to figure out TOC, what you need to look at is not when the plants are growing, but actually when the biomass, plant biomass, is decaying?

DR. LOSEE: Yes. We call that a turnover. And there is turnover of organic tissue, of plant tissue, throughout the year. That turnover goes on throughout -- I said, that it goes on throughout the year.

You do have a maximum release of organic matter in decay happening and that inflection point.

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HEARING OFFICER STUBCHAER: Question. My recollection

of math is the inflection point is where a curve changes from concave downward to concave upward. I think you are referring to the maximum.

DR. LOSEE: Thank you. I'm sorry, I'm not a mathematician.

MS. BRENNER: Wasn't Dr. Brown's first experiment, as we indicated, in the fall when measurements would reflect full biomass production for that year?

DR. LOSEE: According to what I put here, this conceptual diagram, that the time that they took their fall sample, would likely be past the maximum biomass time.

MS. BRENNER: You're talking the mass, biomass of -- plant biomass growing?

DR. LOSEE: This depicts biomass. There is a very large, a very rapid turnover of biomass when you get to that point when there is turndown when you hit the maximum there.

MS. BRENNER: Let's switch to peat soil.

You reference an abstract of an article by Hulthe, Hall & Damm. Has this article been published?

DR. SHUM: Actually, I got that reference from International Conference in Germany last year. During the talk, he mentioned that the article has been submitted for publication. I think it is marine chemistry or geochemical.

1151

But I sent him, the first author, a few E-mails. He has not got back to me. I did not go to the library to see if published.

MS. BRENNER: At this point, as far as we know, it is an abstract and it hasn't been peer reviewed?

DR. SHUM: It has been peer reviewed, I think, for all likelihood. But the decision has not been known to me.

MS. BRENNER: Didn't Dr. Losee use this article to justify the assumption that 20 percent of the organic carbon in peat soil could be converted into DOC in the water and into the water column?

DR. LOSEE: That is correct. We chose a value to use for the percentage of organic matter that would be converted into dissolved organic matter. We chose 20 percent as being within the range from this paper.

MS. BRENNER: Are you aware of the fact that the article stated the flux of carbon from particulate organic carbon in the sediment in certain parts of the frigid Arctic Ocean are not in peat soils that is about room temperature?

DR. SHUM: That experiment is done, I believe, in the North Sea, which is not part of arctic. The temperature would be different.

MS. BRENNER: Excuse me?

DR. SHUM: The temperature would be different. The purpose of that is to indicate some of the potential

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transformation from organic matter to DOC. And as the temperature increases, I believe, the conversion may be faster.

MS. BRENNER: I am looking at the article, and it specifies in the Arctic Ocean. So --

DR. SHUM: You mean abstract?

MS. BRENNER: Yes, the abstract.
So the amount of carbon that remains for conversion to DOC is in an extremity high range in the arctic, isn't it?
DR. SHUM: Actually, I think they're ongoing experiments. I am not expert in that particular field.
MS. BRENNER: Isn't it true that this extreme value based on the frigid arctic conditions in your calculations rather than a more representative example would be a one to two percent conversion?
DR. LOSEE: We could use two percent.
MS. BRENNER: Okay. Would you agree that local data, which consists of measurements conducted on peat soil from the Delta, better estimates your, quote, R value in your calculations which is your estimate of the fraction of carbon matter that could be turned into DOC?
DR. LOSEE: If you are referring to the work presented in the Draft EIR, I would say I can't tell from that data.
MS. BRENNER: I am not talking about just the Draft EIR. I am talking about local data which is maybe the EIR

1153

as well as other articles that are dealing with peat soils in the Delta or similar conditions.
DR. LOSEE: That may be. That may be. Would you like to -- are we going to -- shall we negotiate on this model?
MS. BRENNER: No. We are not negotiating on anything. We are talking about how you -- where your 20 percent value came from in your calculations of the amount of DOC coming out of peat soils?
DR. LOSEE: This was done as a conservative estimate. We wanted to understand what was the potential. We chose 20 percent. We could use your two percent.
If you'll note in that model, we use as the percentage of organic matter in the sediments, only ten percent.
MS. BRENNER: What model?
DR. LOSEE: The model we are speaking of.
MS. BRENNER: You mean your calculations?
DR. LOSEE: Yes, that is called a model.
MS. BRENNER: Okay.
You used 20 percent even though the EIR experiments conducted by Dr. Brown indicated carbon release of only .1 percent to .2 percent of soil saturation test?
DR. LOSEE: Dr. Brown's soil saturation test, you can't determine from their experiment what the actual values are.
MS. BRENNER: Other researchers have shown that DOC represents a small fraction of carbon flux from peaty soils.

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Dr. Deverel states that eroded soils, the amount of carbon flux represents less than one percent of the total carbon loss.
Do you disagree with this conclusion?
DR. LOSEE: To be honest, I haven't read or studied his papers. I can't offer an opinion on that.
MS. BRENNER: Would you agree the main issue is the amount of carbon that ultimately becomes dissolved organic carbon in the water column?
DR. LOSEE: I would agree.
MS. BRENNER: Isn't it true that your testimony never

reaches the question how much of your huge estimated original carbon load gets through all the processes and becomes DOC in the water column?

DR. LOSEE: The objective of this model was to look at the potential amount of organic carbon that could be released.

MS. BRENNER: Only from the peat soil?

DR. LOSEE: From the peat soil.

MS. BRENNER: If your theory is correct, isn't it true that the peat soil in the Delta submerged now, why hasn't the peat dissolved like cotton candy?

DR. LOSEE: We said only 20 percent of that organic carbon would be dissolved and released, so, no.

MS. BRENNER: Based on your equation, is it true that

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the Delta Wetlands' islands alone would produce 8,000,000 kilograms of DOC each year?

DR. LOSEE: I haven't done the math. If that is what you have calculated, I would accept that.

MS. BRENNER: Based on your numbers, that is what we calculated. Isn't this a large estimate given the fact that the estimated DOC production for the entire Delta is a minimum of 12,000,000 kilograms DOC per year?

DR. LOSEE: It may well be. The objective here was to look at the potential ability of the sediments to release organic carbon. This analysis was done because the EIR didn't provide us with a way of estimating that at all. So we had to come up with some method of doing that. This is what we chose to do.

If, in fact, the 20 percent is too high, than we can chose a lower percentage. But I point out that we had a low organic carbon content, a very low organic content used in this model or calculation; and so if you move that organic matter, that level of organic matter, up to what has actually been measured in the Delta, then the potential release is still very high. If you move up to 50 percent organic matter in the soils, then I think, if I recall correctly, that calculation then comes to 120 milligrams per liter versus 300.

So this, the conclusion that we arrived at from this

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calculation, is that there was a large component of the potential release from the sediments that was not fully considered. There is another point of uncertainty in those calculations.

MS. BRENNER: The peat soil experiments, the Pace Experiment was done to determine that, wasn't it?

DR. LOSEE: Determine what?

MS. BRENNER: The amount of organic carbon sediment coming out of the peat soil. That was the intent of that experiment, was it not?

DR. LOSEE: The intent of the experiment, as I understand it, was to measure the amount of organic carbon that could be leached, if you will, from the soil.

MS. BRENNER: Let's move to bioturbation, benthic organisms. On Page 15 of your testimony you state that biological activity of benthic organisms in benthic sediment

leads to an efficient transport mechanism for water constituents such as DOC.

Did you consider any benthic biological processes such as tube building by midge larvae in our sediment armory that would reduce the transport of DOC from sediment to water?

DR. LOSEE: No, I didn't.

MS. BRENNER: To your knowledge, are chironomid or midge larvae one of the most prominent benthic invertebrae organisms?

1157

DR. LOSEE: I would guess, yes.

MS. BRENNER: Are you aware that rigid crusts or armored sediments are present over the sediments in some lakes?

DR. LOSEE: That may well be.

MS. BRENNER: Those crusts would decrease the flux of TOC into the water column?

DR. LOSEE: I didn't see any reference to that in the EIR.

MS. BRENNER: I am just asking you in general. That is, in your opinion?

DR. LOSEE: Where the incrustation is, it may. But the tube that the -- the interaction between the organism and the sediments may not have that net effect. That would have to be studied.

MS. BRENNER: In your analysis you considered bioturbation methods that only increased DOC?

DR. LOSEE: Well, in our analysis we were looking at the EIR, and we wanted to see whether the EIR had adequately covered all conditions. And bioturbation wasn't considered.

So it was -- we were under the obligation of seeing whether this could be and important source of organic carbon. While it may be true that if you have this certain kind of benthic insect larvae pollinizing the bottom of a lake, that it would decrease the release of organic carbon.

1158

It is also true that there are many different benthic organisms which would increase the release.

MS. BRENNER: I don't think we're disagreeing. I am asking in your analysis did you take into consideration those benthic organisms that actually decrease the DOC versus just looking at the ones that increase?

DR. LOSEE: We didn't have any information about what would be colonizing the lake bottoms. We were under the obligation to see what would happen if there was release.

MS. BRENNER: Did you make any calculations of the amount of DOC released by the Delta Wetlands' islands as a result of bioturbation only?

DR. LOSEE: No, we didn't.

MS. BRENNER: You also talked about pore water flows and mobilization mechanism for TOC, correct?

DR. LOSEE: Yes.

MS. BRENNER: And you indicated that Langmuir circulation could also be set up by the wind and intimated that these would increase the mobilization of TOC or DOC?

DR. LOSEE: Yes. That is part of what I said.

MS. BRENNER: Did you estimate the approximate diameter

of these Langmuir swells, or cells, excuse me, if they would reach the sediments when the Delta reservoir was in the normal, full, 22-foot deep condition?

DR. LOSEE: It wouldn't be necessary for them to, for

1159

the Langmuir circulations to impinge upon the bottom for them to have this effect. I am talking about increasing pore water circulation at least from the sediment.

MS. BRENNER: Did you measure the approximate diameter of these Langmuir cells?

DR. LOSEE: As I said, that wasn't really necessary for the point of the analysis. When you have Langmuir circulation, when you have sufficient wind blowing in a particular direction to set up Langmuir circulation, this is a case where you have a spiraling of the water motion as it moves in a horizontal direction, that results in a net movement of water across the surface of the body of water in that direction.

MS. BRENNER: Across the surface of the body of the water?

DR. LOSEE: That's correct, across the surface. Once that water is there, it's got to go someplace. It has to return flow. And that return flow is going to be across the bottom.

MS. BRENNER: The return flow will be on the bottom?

DR. LOSEE: That is correct.

MS. BRENNER: That is your opinion, correct?

DR. LOSEE: Yes, that is my opinion, yes.

MS. BRENNER: Based on the literature values and the small size of Delta island reservoir, isn't it reasonable to

1160

expect that the upper end velocity of the Langmuir circulation to be about 1 centimeter per second or less?

DR. LOSEE: I am not sure what you are characterizing as small size.

DR. SHUM: That may be the ballpark value or the rough estimate.

MS. BRENNER: Just a rough estimate?

DR. SHUM: I may want to the clarify. The so-called Langmuir circulation are deep height and vertical flow in the vertical plane.

MS. BRENNER: I didn't understand what you are telling me.

DR. SHUM: Just the nature of what we are talking about.

MS. BRENNER: Would you expect that the mixing potential of the Langmuir swell in the Delta Wetlands' reservoir is over ten feet from the sediment and had an upswelling velocity of one centimeter per second to mix more than the very top centimeters of the sediment?

DR. SHUM: Two things. First, the reservoirs are not always full. When the reservoirs, I believe, statistics on the percentage of capacity of the reservoirs, and I believe what we find is between just 40 percent of the time the reservoirs are only filled to a certain percentage, and part of the time the water level is probably less than ten feet.

1161

Under those circumstances, given the horizontal extent of those reservoir islands, any circulation generated from the water column could reach to the bottom. One centimeter per second does not sound like a large number. When you compare that number with the length scale and time scale of molecular diffusion, it is large.

MS. BRENNER: But you would agree that it was only affected about one centimeter?

DR. SHUM: I think you are misinterpreting the one centimeter per second. That is a velocity scale. What we are talking about is transport scale.

For example, when we are talking about molecular diffusion, we are talking about unit of centimeters squared per second. In molecular diffusion is ten to the minus five centimeters squared per second. And that is the kind of comparison we are talking about in diffusion.

MS. BRENNER: Between diffusion and invection?

DR. SHUM: So, I think just looking at one centimeter per second is misleading unless you put it in context with molecular diffusion.

MS. BRENNER: You indicate at Page 14 of your testimony, the steady wind typical in the Delta in the summer afternoon would lead to a pile of water on the windward side of the reservoir. This action is known as the setup. Setup would be accompanied by return flow near the

1162

bottom.

That is what you were indicating earlier, correct?

DR. LOSEE: Correct.

MS. BRENNER: You state this return flow would enhance the transfer of DOC, correct?

DR. LOSEE: Correct.

MS. BRENNER: Would the piled up water in the sediments set up new water and less dense or cooler than the water below it?

DR. LOSEE: Dr. Kavanaugh has testified that this water -- these reservoirs would not become stratified. So it wouldn't be significantly warmer, according to Dr. Kavanaugh.

MS. BRENNER: I am asking, according to your opinion.

DR. LOSEE: That seems like a reasonable assessment.

MS. BRENNER: I am going to turn to Dr. Shum.

Thank you.

If we take a look at Exhibit 7A, which was data from Delta Wetlands Exhibit 14, Table 14, I believe. This is a completely new plot, Exhibit 7A.

HEARING OFFICER STUBCHAER: While we are paused, how much more time do you estimate you have?

MS. BRENNER: I am almost through. Ms. Schneider has some questions for Mr. Buck. And then we have Mr. Nelson has some questions for Mr. Nuzum regarding fish.

1163

I would estimate probably about another hour and a half, maybe two. That is a conservative estimate.

HEARING OFFICER STUBCHAER: Your estimate was two hours.

MS. BRENNER: That was two hours without the new

exhibits.
HEARING OFFICER STUBCHAER: Okay. We have five minutes before we run out of paper, so when the Court Reporter runs out paper we will take our lunch break.
MS. BRENNER: This is a completely new exhibit, correct?
DR. SHUM: The look of it is. But the data, the FDM, or Fischer Delta Model, input is part of Delta Wetlands Exhibit 14B. Numbers are contained there.
MS. BRENNER: I understand this particular exhibit was derived from Delta Wetlands direct written testimony. It was not developed from any CUWA's direct written testimony, was it?
DR. SHUM: The numbers are not.
MS. BRENNER: The data or the exhibit? It just a point I need to make with the Board. It is another instance where you have completely new information provided in exhibit, and I was requested to show that, and that is all I am trying to do.
Does CUWA Exhibit 7B show actual drainage from the

1164

Delta Wetlands' islands?
7B, which is your drainage estimates.
DR. SHUM: The numbers in CUWA Exhibit 7B is obtained from the September 1995 Draft EIR/EIS from Table A1-9.
MS. BRENNER: Those are actual drainage from the Delta Wetlands' islands, correct?
DR. SHUM: Those are estimates from Power records.
MS. BRENNER: Is the Bacon Island drainage higher or lower than other Delta Wetlands' islands?
DR. SHUM: According to this estimate, the drainage per acre is higher.
MS. BRENNER: How do these actual flow rates compare to the Fischer Delta Model assumptions?
DR. SHUM: They are lower. I can give you specific numbers.
MS. BRENNER: They are lower?
DR. SHUM: They are higher. The Fischer Delta Model numbers are lower.
MS. BRENNER: Fischer Delta Model numbers are lower than the drainage numbers set forth in this Exhibit 7B?
DR. SHUM: That is correct.
MS. BRENNER: They are about four times lower?
DR. SHUM: Yes, around there.
MS. BRENNER: Isn't it quite logical then that the Bacon drainage salinities would be lower than the Fischer

1165

Delta Model assumptions?
DR. SHUM: Can you repeat that?
MS. BRENNER: Isn't it logical that the Bacon drainage salinities would be lower than the Fischer Delta Model simulates them to be?
DR. SHUM: What do you mean by logical?
MS. BRENNER: You have flow rates four times higher than what the Fischer Delta Model reflects for Bacon Island?
DR. SHUM: If you believe in the flow rates in CUWA

Exhibit 7B, it may be the case. But if you believe that, you would also have to believe that the Delta may have up to two and a half million acre-feet of drainage per year. But I don't believe it is reasonable.

MS. BRENNER: That is based on actual electrical or base of data, correct? Do you have any reason to believe that those numbers are wrong?

DR. SHUM: Yes. There are two reasons to believe that these numbers are wrong. The first is what I actually did here, which was prorate the drainage volume to the entire Delta, which gives me a very high number that I cannot believe.

The second one is the Department of Water Resources has programmed more specifically by the Municipal Water Quality Investigation Program that set out to estimate the

1166

actual drainage in the Delta islands from Power records. And that project has been abandoned because of the lack of accuracy.

The conclusion is that the Power records is a very poor reflection of the actual drainage pumping. The report for that particular study has been circulated in the U.S.GS and is not readily available. That is why I did not use it in my presentation.

MS. BRENNER: The Fischer Delta Model actually reflects four times or less, right? My point is, are you saying these flow rates are four times off, that they are so inaccurate that they would be inaccurate by four times?

DR. SHUM: I would not put so much emphasis on the number four as that it's a substantial overestimate. It may be twice overestimate or it may be four times. Or even six times. At this point I don't think any one of us can say.

MS. BRENNER: The Fischer Delta Model has a lower number proposed?

DR. SHUM: That's correct.

MS. BRENNER: So, if the Fischer Delta Model has a lower number proposed, wouldn't the Fischer Delta Model actually show a less of a benefit than what these numbers reflect in the salinity numbers?

DR. SHUM: That would be correct.

MS. BRENNER: That would be correct?

1167

DR. SHUM: If we accept these numbers.

MS. BRENNER: I am saying, even if you don't accept these numbers because of the discrepancy between the Fischer Delta Model numbers and these numbers, somewhere inbetween would be some sort of accurate numbers, wouldn't it, under your assumption?

DR. SHUM: I cannot support that.

MS. BRENNER: Have you done any sort of mass balancing of the salinity concentrations in Exhibit 7A to determine if the Fischer Delta Model is actually overestimating the benefits of foregone ag drainage from Bacon Island?

DR. SHUM: I have done some rough estimates. And if the salinity in the -- and the data is correct, and if the volume of the drainage in the Fischer Delta Model is correct, --

MS. BRENNER: If the what?
DR. SHUM: If the drainage volume estimated in the Fischer Delta Model is correct, then they will be overestimated by about 200 percent, 200 percent in the simulation.
MS. BRENNER: Overestimated by the fact it is a foregone ag drainage?
DR. SHUM: Yes. If you mean by benefit you mean water quality improvement.
MS. BRENNER: Yes.

DR. SHUM: Reduction in degradation.
MS. BRENNER: Right.
HEARING OFFICER STUBCHAER: We are going to stop now, and we will reconvene at 1:00 p.m.
(Luncheon recess taken.)
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AFTERNOON SESSION
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HEARING OFFICER STUBCHAER: We will reconvene, and continue cross-examination of the panel by Delta Wetlands Properties.
MS. BRENNER: Thank you, Mr. Stubchaer.
Dr. Shum, to continue. We have been discussing the Fischer Delta Model overestimates ag drainage, correct?
DR. SHUM: Only from those Delta islands.
MS. BRENNER: Let's just start from step one.
Previously, we were just talking about, before lunch, whether the Fischer Delta Model overestimates ag drainage.
DR. SHUM: Are you talking about the salinity or volume? There is a difference.
MS. BRENNER: Salinity.
DR. SHUM: Yes.
MS. BRENNER: The Fischer Delta Model takes a volume of water as a salinity value. The Fischer Delta Model itself takes the volume of water, salinity value, and discharges that back into the Delta, correct?

DR. SHUM: That's correct.
MS. BRENNER: It does a little bit more than that. Those are the parameters that are necessary when you are -- that are pertinent, when you are looking at ag drainage, correct?

DR. SHUM: Salinity and the volume.
MS. BRENNER: Salinity and the volume?
DR. SHUM: Yes.
MS. BRENNER: Your Figure 7A says the salinity value measured by the MWQI were about half of the Fischer Delta Model for Bacon Island, correct?
DR. SHUM: It varies between very close to maybe off by a factor of more than three, I would say.
MS. BRENNER: The flows from the Figure 7B are four times approximately the Fischer Delta Model flows, that you question their accuracy, correct?
DR. SHUM: I did not put the exact numbers from the Fischer Delta Model in this table. But the comparison is about right.
MS. BRENNER: Go ahead.
DR. SHUM: I called the accuracy of these numbers into question, not because of its comparison with the Fischer Delta Model, but because of the magnitude related to the entire Delta.
MS. BRENNER: You are trying to take the Bacon Island numbers and put them across the entire Delta. It just doesn't seem to make sense, correct?
DR. SHUM: That's correct.
MS. BRENNER: Well, based upon the MWQI salinity and the Fischer Delta Model flow, would the result be about half

the amount of salt discharging off of Bacon Island?
DR. SHUM: Under existing conditions that would be about right.
MS. BRENNER: That would be about right.
DR. SHUM: Without going into numbers.
MS. BRENNER: If you measured the flows and MWQI measured salinities, what would be the salt discharged off of Bacon?
DR. SHUM: The total salt flow?
MS. BRENNER: Right.
DR. SHUM: I don't remember making that particular estimate.
MS. BRENNER: If you have four times the flow, and half the salt, wouldn't that be two times the Fischer Delta Model results?
DR. SHUM: That's correct.
MS. BRENNER: The Fischer Delta Model is fairly conservative based on that?
DR. SHUM: Conservative is relative. If you are referring to whether it overestimates or underestimates, until we've got the actual, reliable estimates measure in the field, I don't think we can make any claims.
MS. BRENNER: We are just taking the measured flows and the measured salinity, or MWQI data, we would have about two times the salt than the Fischer Delta Model results?

1172
DR. SHUM: I would not call this measured flows if you are referring the numbers I have in Exhibit 7B. These are estimates from Power Record, and, as I explained, this has been shown to be unreliable estimates.
MS. BRENNER: Let's talk about those estimates. Isn't it true that the ag drainage for Bacon Island and other Delta islands was determined in the 1955 study set forth in the Table C2-1 of the Environmental Impact Report, and the drainage from that study is basically the same as your calculations?
DR. SHUM: The ones from the Fischer Delta Model.
MS. BRENNER: No. The ones that are used in the 1955 study, which is set forth in Table C2-1 of the Environmental Impact Report.
Go ahead.
DR. SHUM: I need to refer to that.
I have the table in front of me. Which information?
MS. BRENNER: Doesn't that table indicate that the 1955 study is basically the same as your calculations?
DR. SHUM: My calculations you are referring to --
MS. BRENNER: The data output, the 7B.
DR. SHUM: By numbers in this table -- to be more specific, which column are you referring to?
MS. BRENNER: Take a look at Bacon Island.
DR. SHUM: There are a number of rows. Which
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particular number are you referring to?
MS. BRENNER: The ag drainage.
DR. SHUM: You have got the fourth and fifth column. Drainage water and the outside water, are those the numbers you are referring to?
MS. BRENNER: Should be drainage as inches.
DR. SHUM: I haven't looked at this table in any detail before. First thing that comes to my mind is the second column drained land acres. Under Bacon Island, the unit, 22 to 27, the acreage varies between 2,800 to 33,000 acres. And that seems to be different from how our understanding of the total acreage before Delta Wetlands. I don't know exactly what this data would refer to.
For example, 22 right next to Bacon Island, the drained land is listed as 19,000 acres. And I don't know what that number would refer to, whether it is the sum of -- for comparison, the Bacon Island has a total acreage of 5,456 acres, which is much, much smaller than that 19,000 number that you have over there.
MS. BRENNER: Do you have a total drainage for that island on the Table C2-1?
DR. SHUM: I wish you can tell me. I don't know. I cannot identify that number.
MS. BRENNER: If you look at the third column in, DW drainage water in inches. If you go down to Bacon Island,
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and meet those two numbers across, you get a number, don't you?
DR. SHUM: The 74.4. Before we go on, does that 74.4 relate to that drained land of 19,000 acres, or does it

refer to something else? What does that have to or how does that correspond with Bacon Island?
MS. BRENNER: I am not sure how the drained lands corresponds to irrigated lands percentage.
DR. SHUM: Clarify this. It is hard for me to interpret these numbers.
HEARING OFFICER STUBCHAER: I have a question. If the drainage is expressed as a depth, does the acreage matter Or does the acreage matter only as to the total volume?
DR. SHUM: The question is how you estimated the drainage. If you estimate by the total volume, say, measured at a particular point and divide that by the area, and get the inches from there, then, the number you use for the acreage would matter.
HEARING OFFICER STUBCHAER: Yes. But is this -- I don't have the appendix in the EIR. I have it before me. Are you looking at a --
MS. BRENNER: He's looking a 1955 study that took in several different factors.
HEARING OFFICER STUBCHAER: So there is no one here who can testify whether the depth was calculated correctly,

1175

whether the total volume was divided by the right number or not; we don't know?
MS. BRENNER: I think my understanding of this study is that it took more than just that factor to determine the drainage. It was an extensive study done in 1955 to determine the ag drainage in the Delta.
I am just trying to point out to Dr. Shum that these numbers are similar to his 7B calculations. Thus, there is another avenue here to justify the 7B numbers. Those are different numbers than the Fisher Delta Model uses. That is the main point.
DR. SHUM: Just by looking at that number of inches, which is 74.4, which is over six feet, and if you consider the applied irrigation water in the Delta or elsewhere for agricultural, I believe it's of the order, depends on the crops, from eight feet to six, seven feet. If you have to get six feet of drainage, I think you have to apply a lot of irrigation water. So it does not seem to be reasonable to me.
MS. BRENNER: But it correlates with the other numbers that you don't think seem to be reasonable either?
DR. SHUM: Well, if you look further down, you have the number 6.6, which is half a foot.
MS. BRENNER: Which island?
DR. SHUM: On the same column. If you instead look at

1176

unit 22, if you look at 27, or the bottom of the column, the same column, you got numbers 74.4. The number here is 6.6. Also, if look across from 74.4, the applied water is only 16.7 inches and the column under missing water is 76.7; that is inches of water missing. Until we figure out where that water went, it will be premature of us to use those numbers in any context.
HEARING OFFICER STUBCHAER: Where is the precipitation in this table?

MS. BRENNER: You have to ask some other people in the room. I don't know where the precipitation is.
DR. SHUM: At the bottom of that same table, it said the rainfall for the water year 1955 was 14.2 inches.
HEARING OFFICER STUBCHAER: Thank you.
MS. BRENNER: The 1955 study that you are looking at, they came up with very similar numbers as your 7B, Exhibit 7B numbers; isn't that correct?
DR. SHUM: That would depend on which number you refer to.
MS. BRENNER: Bacon Island.
DR. SHUM: If you refer to 74.4, there is a chance that it is. But if you look at 6.6, I guess it would be quite different.
MS. BRENNER: If you look at the averages, though, with your daily average --

1177

DR. SHUM: If you look at the average, say, from 74.4 all the way down to 6.6, next highest number is 22.9. And the average, I believe, would be more in the area of around 20.
MS. BRENNER: Do you have any drainage estimate other than those in the EIR from the Delta Wetlands' islands? Do you have any other than what is in the EIR?
DR. SHUM: No, I don't.
MS. BRENNER: And the output data used in the 7B --
DR. SHUM: You mean the lower half of the table?
MS. BRENNER: I am talking about the lower half.
Let' move on.
Consumptive use is not the same as drainage flow, is it?
DR. SHUM: Is consumptive use drainage flow? Is that your question?
MS. BRENNER: Right.
DR. SHUM: Consumptive use is the diversion minus agricultural return. So it is different from drainage.
MS. BRENNER: During a rainfall, drainage increases, doesn't it?
DR. SHUM: It does.
MS. BRENNER: Could ag drainage volumes be underestimated in the Fischer Delta Models?
DR. SHUM: The way that the Fischer Delta Model

1178

estimates return flow on drainage includes the rainfall on the islands and assigns a factor to the total rainfall and return volume to the Delta. So, as far as those factors are reliable, it takes into account rainfall.
MS. BRENNER: The Fischer Delta Model accounts for the incremental effects of reduced ag drainage from the Delta Wetlands' islands, doesn't it?
DR. SHUM: If you are referring to the Delta Wetlands Exhibit 14B, they've got specific description on how that is accounted for.
MS. BRENNER: You used the data from the Delta Wetlands' islands and attempted to extrapolate to all the other islands, or have you just focused on the Delta Wetlands' islands in your 7B, 7A?

DR. SHUM: Actually, it's easier if we put on 7B.
MS. BRENNER: I just wondered if you have attempted to extrapolate those numbers to the entire Delta?
DR. SHUM: I did, and the way I did it was by using the same drainage volume per acre.
MS. BRENNER: Did you use the Bacon number?
DR. SHUM: Yeah. For example, for Bacon Island, which is the second column, the measured value in 1988 is around 29,000 acre-foot. And I divided that number by 5539 which is the number of acres on Bacon Island, and I multiplied that by the total drainage -- total irrigated area in the

1179

Delta, which is -- the number I used was 378,000 acre.
MS. BRENNER: Based on your position with regard to the Bacon Island numbers, is that a justified extrapolation, then?
DR. SHUM: Without -- I do not have a very detailed understanding on the land use of different islands in the Delta. That would be a rough estimate.
MS. BRENNER: You don't have any familiarity with the different irrigation practices then?
DR. SHUM: Only in a very casual sense.
MS. BRENNER: You don't know how much irrigation would be applied to potatoes versus some other crop?
DR. SHUM: At one time I have seen those numbers, but I do not recall.
MS. BRENNER: Are you familiar with the Department of Water Resources estimates in their DIDI Report?
DR. SHUM: DIDI?
MS. BRENNER: They use 700,000 thousand acre-feet as an average.
DR. SHUM: Yeah. That is the kind of numbers I have. As a matter of fact, I have computed or calculated the Fischer Delta Model number used in ag drainage, including the contribution from rainfall; and that is around 500,000 acre-feet.
MS. BRENNER: The Fischer Delta Model uses around

1180

500,000 acre-feet?
DR. SHUM: Yes. It varies from year to year.
MS. BRENNER: The EIR used about, approximately a million acre-feet?
DR. SHUM: For the entire Delta? I thought it is between 500 and 700, as you suggested. Also, I remember, but Russ Brown, Dr. Brown, would be the person to confirm this. I think he used a number between 500 and 700,000.
MS. BRENNER: If you take all of the numbers and average them out and extrapolate them to the entire Delta, won't you get numbers about a million acre-feet, using your 7B?
DR. SHUM: How do you get 1,000,000?
MS. BRENNER: If you apply those -- if you extrapolate to the entire Delta and you average it out.
DR. SHUM: Yeah. I got 1.2.
MS. BRENNER: You got about 1.2 million acre-feet?
DR. SHUM: Yes.
MS. BRENNER: You don't recollect what the EIR used?

DR. SHUM: You are referring to the --
MS. BRENNER: The Environmental Impact Report.
DR. SHUM: The total Delta drainage? I thought it was between 500 and 700.
MS. BRENNER: Did the Contra Costa or CUWA version of the Fischer Delta Model analyze ag drainage in the same way

1181

as what has been done whether in this instance for Delta Wetlands?
DR. SHUM: I don't belief CUWA, per se, has Fischer Delta Model. Metropolitan and Contra Costa both have versions of the Fischer Delta Model. At the Contra Costa Water District, the major use application of the Fischer Delta Model is to look at seawater intrusion under different upstream levels of operation conditions.
And I don't recall specifically if Fischer Delta has been used to study the effects of ag drainage in a cell.
MS. BRENNER: CCWD has never used the Fischer model to determine any kind of ag drainage?
DR. SHUM: I have been at CCDW for two and a half years, so I cannot state before my time what has been used. I don't recall I have used it myself.
MS. BRENNER: Ms. Schneider will take over from here.
MS. SCHNEIDER: Mr. Stubchaer. I have a number of questions for Mr. Buck.
Mr. Buck, I have some questions. I want to clarify the testimony you gave, in particular with respect to the terms that you're suggesting that the Water Board include in any permits that are issued to Delta Wetlands.
I think you testified that it is CUWA's position that no water users in all of the Delta Wetlands' place of use, and that is the whole service area in the state and federal

1182

projects, believe that the Delta Wetlands' water will be helpful in meeting their reasonable needs in the future. This certainly implies that CUWA doesn't see any demand for the water that Delta Wetlands will provide.
So, it is your testimony that it's CUWA's position that DW water cannot meet any of the 4,000,000 acre-feet shortfall that the state projects?
MR. BUCK: If the water were of a quality that would be acceptable for introduction into the system, it possibly could meet a portion of those demands were a deal be struck and that water be purchased. At this level of quality, what we expect, we see no market for it. We also see that this would be spot market for the most part, and there will be cheaper water available, in that event.
MS. SCHNEIDER: One of the reasons that you intimated in your testimony was that you were worried about the ultimate reasonable beneficial use of this water. My question to you: Would CUWA's concerns be alleviated to any extent if Delta Wetlands were to agree that any purchaser of its water or of the whole Delta Wetlands Project would have to sign the ag or urban water conservation MOU's?
MR. BUCK: I don't think that, in and of itself, would make sure it's a reasonable and beneficial use. What we are saying, it hasn't been demonstrated where that water would

be used. So, that hasn't be demonstrated to the Board. It
is possible that it could be at some point; it hasn't to
date, however.
MS. SCHNEIDER: CUWA is taking the position, and it
appears that even if the project had no net annual impact on
export water quality, that no project should be permitted
unless it substantially improves State Project export water
quality.
Is that the case?
MR. BUCK: I don't think that is quite the case. What
we are looking for here is not to be injured by the project.
What we are looking for in the broad sense of projects in
the Delta, like through the CAL/FED process, we are at a
point where the water quality is marginal. We want to see
projects come along that improve the water quality. It
wouldn't necessarily have to have a standard that everyone
absolutely had to do. But what we are looking at here is we
don't want injury from this project, and we see injury from
this project.
MS. SCHNEIDER: So, the standard of absolutely no
injury is one that you would apply to Delta Wetlands, but
maybe not necessarily to any other upcoming projects?
MR. BUCK: No. We are looking certainly no more than
a de minimis impact. What we are talking about here is
public health and safety for 20,000,000 people.
We've got bad water quality now. We've got increasing
regulations that are making our ability to treat more
difficult. It is putting costs on us, and certainly for
meeting those regulations. It's at a point of a matter of
public policy, but it's probably bad policy, we believe, to
have projects come along that externalize their cost and
cause impacts on the public water purveyors that have to
treat that water. That cost should be borne by the
applicant.
MS. SCHNEIDER: Maybe the standard is more de minimis
impact rather than no impact. Can you think of any upcoming
projects, other than, maybe, some version of the peripheral
canal that can meet this criteria, that you meet this
criteria that you are setting out here today?
MR. BUCK: The canal in itself does not change the
water quality. One of the projects that CUWA is working on
is to bring in a banking concept within the Valley where you
do have increases. We are looking at going out and putting
a technology or retiring land, for instance, that would
improve the water quality in the system.
So projects that would be brought along would have to
be mitigated in more or less a bubble concept to get
improvement in water quality, and that is what we are
looking for. We are at the point we can't stand anymore
degradation.
MS. SCHNEIDER: Among the other things you mentioned
in your testimony, you want to make sure that Delta Wetlands
is required to monitor these various water quality
parameters; isn't that correct?

MR. BUCK: That's correct.
MS. SCHNEIDER: Are you aware that in the EIR mitigation measures extensive monitoring is already required, for instance, for chlorides, DOC, UVM, THM, temperature, dissolved oxygen, algae?
MR. BUCK: Certainly, we are aware there are monitoring requirements. They were not adequate to address the things we are concerned with. Also, there was no requirement for mitigation of impacts that might occur, in our view. Hence our recommendation for the water quality monitoring requirement and the limitations.
MS. SCHNEIDER: I take it your review of the EIR didn't disclose to you that there were mitigation measures in there that would relate to either monitoring those parameters adequately or doing anything about them if so level was exceeded?
MR. BUCK: They were certainly not adequate mitigation measures, and we don't consider monitoring it and of itself mitigation, which the EIR seems to indicate it does.
MS. SCHNEIDER: I want to talk about the terms that you're explicitly requesting. You testified that it is CUWA's position that 4 milligram per liter DOC limit on

1186

Delta Wetlands' diversions should be a permit term.
Isn't that correct?
MR. BUCK: Yes, that's correct. We are wanting better than average water quality to go onto the islands.
MS. SCHNEIDER: At the same time, though, in your testimony you note that DOC levels range up to 11 milligrams per liter at five various South Delta locations; isn't that correct?
MR. BUCK: We recognize it is higher at times, yes.
MS. SCHNEIDER: The range of DOC and TOC at the export pump is measured, right?
MR. BUCK: Yes, it is.
MS. SCHNEIDER: Patty, could you put up Figure 17 from CUWA Exhibit 7?
Figure 17 shows that Banks, various measurement points related to Banks pumping plant have quite a range. It shows that Banks already is receiving water that is at or well in excess of 4 milligrams per liter DOC. Isn't that correct?
MR. BUCK: Looking at this data, yes, that is correct.
MS. SCHNEIDER: That is your CUWA Exhibit 7, Figure 17, right? That is your own data, in other words?
MR. BUCK: These are not averages; they are grab samples.
MS. SCHNEIDER: The box up at the top of that figure indicates range, isn't that correct, average?

1187

DR. SHUM: Yes. There are two lines. The range is -- this data came from grab samples, if I understand correctly, and there are people in the room who can correct me if I am wrong. So those are instantaneous concentrations at one particular time at Banks.
And as it is shown here, it can range up to ten and a half, but the average of all those numbers is a little bit under four.

MS. SCHNEIDER: Sometimes you have taken grab samples at Banks, for instance, that have a DOC in milligrams per liter of over 10.0, right?
DR. SHUM: That's correct.
MS. SCHNEIDER: So, maybe -- back to Mr. Buck.
Mr. Buck, when has the State Water Project stopped diverting water because DOC levels at Banks were over 4 milligrams per liter DOC?
MR. BUCK: I am not aware of any, but that is not what we are talking about here. We are talking about another project coming in, adding constituents to the water. We want to see that water quality improve as a result of the project.
MS. SCHNEIDER: You are not aware of any time that the project has stopped diverting water because of DOC level at any particular rate?
MR. BUCK: At this point, no.

1188

MS. SCHNEIDER: Would it be true then that state project exports are never limited solely because of DOC levels?
MR. BUCK: At this time, no.
MS. SCHNEIDER: You testified that Delta Wetlands' discharged water DOC must not exceed ambient DOC levels in the channel or 10 milligrams per liter, whichever is less. So, basically, isn't it your testimony that Delta Wetlands has water in storage? When it discharges that water, it can't discharge that water if that discharge DOC level is more than the level of the receiving water in the channel?
MR. BUCK: Yes. We are looking at no increase over ambient. This is not to say that our conditions are perfect. The Board certainly has latitude to craft something that has a de minimis impact. What we are looking for is not to be injured by this project. What we see right now is a wide possibility that there could be great injury and great increase in treatment costs and pushing us over the thresholds for treatment that we would otherwise not have to incur.
MS. SCHNEIDER: CUWA testified that there will be an addition DOC to water in storage on Delta reservoir islands; isn't that correct?
MR. BUCK: That is our belief.
MS. SCHNEIDER: Wouldn't the term that we just

1189

discussed mean that Delta Wetlands would be prohibited from discharging for export at essentially all times?
MR. BUCK: I don't think we have data to indicate that at all times. Certainly, it couldn't increase over ambient.
DR. WOLFE: I would say that certainly the potential is there. And we believe that that potential is pretty real, that it would exceed 4 milligrams per liter, and we would incur additional treatment costs as well as new treatment processes.
MS. SCHNEIDER: It seems that that term is not really tied to 4 in terms of discharges. It is tied to ambient channel salinities. If you testified, as you have

previously today, that DOC levels will increase when Delta Wetlands' water is in storage, no matter how much, then what this term does, doesn't it, it prevents Delta Wetlands from discharging?

DR. WOLFE: I think you have to -- we are kind of missing the picture here. And the picture -- the issue is that Delta Wetlands is contributing, the project is contributing organic carbon to a base load that is already high and it is already causing problems. So, with the project in place, we are increasing the amount of DOC, and that increase in DOC is going to relate to cost. That is what this about. You are adding a contaminant to the water,

1190

which is the designed -- regulations are designed to prevent.

MS. SCHNEIDER: Is it your testimony, Mr. Wolfe, that DOC is a contaminant then?

DR. WOLFE: Yes, it is; it is my testimony.

MS. SCHNEIDER: What we are looking at here is a discharge term that would appear to be equivalent to a zero change significance criteria; is that correct?

DR. WOLFE: That is correct.

MS. SCHNEIDER: In EIR's parlance, if there is any change in DOC, any increase at all, that would be a significant effect?

DR. WOLFE: We believe that to be the case, given the fact that these are public health-based standards and when the public health is at risk, we cannot, as a water utility, permit anything which could increase the public health risk associated with a project.

MS. SCHNEIDER: Do you or Mr. Buck have any upcoming project in mind that could meet the zero change significance criteria?

MR. BUCK: Ones that we are contemplating now?

MS. SCHNEIDER: Do you know of a project in contemplation by CAL/FED or anyone else that you are aware of that could meet a zero significance criteria?

MR. BUCK: That is a different question. If you are

1191

talking about CAL/FED, certainly some of the alternatives could improve export water quality significantly.

MS. SCHNEIDER: But your testimony would be, if they didn't improve water quality significantly, they shouldn't be considered?

MR. BUCK: We certainly want to see CAL/FED's goal of improved water quality for export in-Delta uses realized, that if the project does meet its objectives or its solution principles, it doesn't do that.

MS. SCHNEIDER: I want to clarify your discharge terms with a couple more questions. It appears that it would allow Delta Wetlands to dribble out water that it had in storage at a very low rate --

MR. BUCK: Or treat that.

MS. SCHNEIDER: -- only during extremely high Delta flows, flood events, basically. So it can dribble out its water, if it didn't decide to put a treatment plant on the reservoir island. It can dribble out its water if it had to

get rid of it, if stored water DOC were higher than channel DOC levels.
Is that the gist of the provision?
MR. BUCK: Yeah, at certain threshold, at 10 I believe. At the point the water quality got that bad, you'd have to do something to the water, and you'd want to discharge it under high flow conditions at a level that

1192

wouldn't cause great impact.
MS. SCHNEIDER: It is CUWA's position that it would want Delta Wetlands' water to be wasted in this flood event if its DOC levels were higher than channel DOC levels, no matter what the DOC at the export pumps might be?
MR. BUCK: I object to the term "wasted." We would not want to see it introduced into the export system.
MS. SCHNEIDER: In addition to DOC terms, you have salinity terms. Your testimony is that the Delta Wetlands should not divert if its TDS levels exceed 180 milligrams per liter. 180 milligrams per liter TDS is about 50 milligrams per liter chloride.
Is that essentially your term?
MR. BUCK: Can I refer to Dr. Denton?
MS. SCHNEIDER: The question is: You're recommending that Delta Wetlands not divert if chlorides are over about 50 milligrams per liter or TDS is over 180 milligrams per liter. Isn't that your term?
DR. DENTON: That is about right.
MS. SCHNEIDER: So it is correct?
MR. BUCK: Yes.
MS. SCHNEIDER: Isn't it true that that limitation is even more restrictive than, say, Contra Costa self-imposed 50 milligrams per liter chloride goal for diversion to Los Vaqueros storage?

1193

DR. DENTON: If it's 50 milligrams per liter, it is the same.
MS. SCHNEIDER: I didn't actually translate 180 TDS to milligrams per liter chloride. I think it is under 50.
DR. DENTON: I think what we did is we started off with a calculation of what the 50 was, and then took into account what the water quality would have to be. So that at the end of the evaporation cycle, it would be closer to the 50 milligrams per liter chloride.
MS. SCHNEIDER: Along the same lines of the DOC issue, has the State Project, Mr. Buck, ever stopped exporting solely because chloride at Banks exceeded 50 milligrams per liter?
MR. BUCK: To my knowledge, they haven't stopped exporting. There has certainly been significant problems with export salinity that has been brought to the attention of the State Project with the emphasis on them to try and meet the export goals.
MS. SCHNEIDER: So, it is your testimony that the project has had significant problems at chloride over 50 milligrams per liter?
MR. BUCK: There has been significant problems with salinity in the project during drought periods.

MS. SCHNEIDER: I am not sure you answered my question.

DR. WOLFE: I guess this would be in reference more to the TDS. There have been projects the Department of Water Resources has shut down because of introduction of that TDS water has been higher than the ambient level in the aqueduct at that time. So, there is precedence, at least for TDS.

MS. SCHNEIDER: Your testimony is that Delta Wetlands should not divert unless salinity is less than 180 TDS or less than 50 milligrams chloride because that is the State Water Project's "long-term TDS requirement."

Isn't this referring to the ten-year average salinity objective for State Water Project delivered water? In other words, you want Delta Wetlands' daily diversions to be limited to what is a ten-year average salinity goal for State Water Project delivered water; is that correct?

MR. BUCK: Again, the point is better than average water quality so we can be reasonably assured that reasonably good water quality would come off.

MS. SCHNEIDER: My question is to the basis for setting that number. And is it correct that your testimony is that the basis for setting that number is this ten-year average salinity goal for delivered water?

DR. WOLFE: Yes, that is correct.

MS. SCHNEIDER: You want to apply that to Delta Wetlands' diversions on a daily basis?

DR. WOLFE: That is, I don't -- yeah, that is correct.

MS. SCHNEIDER: Your testimony is, further, that Delta Wetlands should not be able to discharge water from reservoir storage if salinity levels in the discharge water exceed ambient channel salinity levels or 440 milligrams per liter TDS, whichever is lower; isn't that correct?

MR. BUCK: That's correct.

MS. SCHNEIDER: And you also suggest that the 440 milligram per liter TDS is the maximum because the State Water Project's maximum monthly average salinity objective for delivered State Project water is also 440; isn't that right?

MR. BUCK: That is the reference, yes.

MS. SCHNEIDER: Isn't it true that Delta Wetlands' discharges are almost always less than 440, but may well be above ambient channel salinities at any given time?

DR. DENTON: This is Dr. Denton.

The reasons we came up with these requirements was in the literature that we read about Delta Wetlands the idea was that it was that Delta Wetlands would take water when there was high flows, good water quality, put it onto the islands, and help the Delta by discharging into the Delta during periods of low flows when there was poor water quality.

The more we looked at the data, we found that that was not the case. So what we realized is that there are times

from the data from Dr. List, for instance, that the water was being discharged off the islands because of the timing

of when it was taken onto the islands and because evaporation was much higher salinity than the receiving water.

Here was a project that was taking on water, poor water quality; it was being diverted by evaporation and being put back into the Delta when, curiously enough, the water quality was good and at the time when the state projects and Los Vaqueros, Contra Costa Water District, would be wanting to use that water.

We needed to have a permit term that would protect urban water users against that situation, where the project was acting to degrade water quality.

MS. SCHNEIDER: Since you mentioned Dr. List's work, because that was work done at the request of Contra Costa Water District, in Dr. List's work, a very important factor was the reduction in ag diversions and discharges.

Have the benefits of those reductions come into any of your calculations in determining what kind of a term to require here?

DR. DENTON: The benefits of diversion, the existing agricultural diversion onto Delta Wetlands' islands, was included in Dr. List's testimony. What we will be presenting in more detail in Contra Costa Water District's

1197

testimony is that that benefit does not exist. It may be existing as a water supply benefit. But because it is occurring during balanced conditions, that water will be saved in upstream reservoirs and used somewhere else. It will not appear as an increase in Delta outflow, which is the basis on which Dr. List was making his assumption that with the Delta Wetlands in place as an integrated part of the complete water projects in the Delta and upstream, somehow the fact that Delta Wetlands retired some diversions from agricultural island was going to suddenly appear as additional Delta outflow and produce for all time improvements in water quality in the Delta. And that is absolutely not true.

MS. SCHNEIDER: For purposes of CUWA's testimony, no analysis was included of the effects at all of any reduced agricultural diversions or reduced agricultural discharges; is that correct?

DR. DENTON: We took the data from Dr. List and looking at what he was showing.

MS. SCHNEIDER: I am talking about CUWA.

DR. DENTON: Well, in preparing CUWA's testimony, we looked at the data that was coming from Dr. List's studies, and we discounted the improvement due to reduction in ag diversions onto the island because that wasn't being modeled correctly.

1198

What we found, that even if you were looking at the modeling that he was doing in terms of agricultural discharges off the islands, they weren't -- that wasn't appearing as a water quality improvement.

MS. SCHNEIDER: Are you saying for your analysis of the Draft EIR/EIS, I suppose, that you discounted completely any benefits from agricultural diversions or discharges

foregone?
DR. DENTON: In terms of the EIR/EIS, any work that we did in analyzing that was just looking at the resulting changes in salinity. And we didn't see any effects of removal of existing agricultural premises.
MS. SCHNEIDER: Let me go back to the salinity discharge water term that you are proposing. You don't want Delta Wetlands' reservoir water to be discharged whenever salinities are above ambient channel salinities.
Isn't this term essentially a limitation that is saying that there can be zero change and that is, therefore, a zero change significance criteria?
You answered that last time, Mr. Buck.
MR. BUCK: It is saying zero degradation, basically. That is what we are looking for is no impact.
MS. SCHNEIDER: Just to give some sense of what that means in the project situation, may we look at your Figures 10 and 11 from CUWA Exhibit 7?

1199

That salinity in Webb Tract discharge -- if you go to Figure 10, is salinity in Webb Tract discharge and 11 is Bacon Island discharge.
Isn't it the case that these figures show that the CUWA salinity term for DW discharges would not allow Delta Wetlands to discharge for export even when discharge water chlorides are less than the 250 milligrams per liter objective under the Water Quality Control Plan for Banks all the time?
DR. DENTON: The water quality impacts for Banks?
MS. SCHNEIDER: In this --
DR. DENTON: How about Rock Slough?
MS. SCHNEIDER: My question had to do with the 250 limit at Banks.
HEARING OFFICER STUBCHAER: Ms. Schneider --
MS. SCHNEIDER: Is it correct that that --
HEARING OFFICER STUBCHAER: You said chlorides and this chart says TDS.
Do you mean TDS or chlorides?
MS. SCHNEIDER: I mean TDS.
DR. DENTON: What our concern is, as it is shown here, here is a project that is taking on poor water quality, storing it for a period of time, degrading it, and then returning it to the Delta and creating a problem.
You need to have a --

1200

MS. SCHNEIDER: If you had to draw a line at the level of TDS that is now the requirement under the Water Quality Control Plan, wouldn't that line be at 250 milligrams per liter TDS?
DR. DENTON: No objective. At the moment there is no objective. There is a hundred chloride goal at Banks, but it is not an objective or Water Quality Control Plan objective.
MS. SCHNEIDER: You are suggesting that the protections in the Water Quality Control Plan are not adequate and you need to impose a no-change significance criteria on Delta Wetlands' discharges?

DR. DENTON: We are saying any impact of the project should be fully mitigated by not allowing the project to come in and degrade water quality.
MS. SCHNEIDER: By fully mitigated, you are equating that no impacts, no discharge?
DR. DENTON: If you mitigate impacts, you remove that impact.
MR. BUCK: Or compensated in some expense with the added treatment cost that might occur.
MS. SCHNEIDER: I am sorry, Mr. Buck?
MR. BUCK: Mitigation can also include compensation for the added costs that would be borne or externalized by Delta Wetlands to the water purveyors to the project.

MS. SCHNEIDER: So, you are suggesting that mitigation could be provided by compensation?
MR. BUCK: I am saying that is certainly a definition of mitigation. What we have asked for is to be protected by permit conditions that prevents the injury. Mitigation could be in the form of compensation for the impacts. That is not what we are asking for.
DR. WOLFE: Mitigation can also take the form of treating the water prior to discharge. That would be another form.
MR. BUCK: Which we have indicated in our petition that the water could to be treated to create no impacts.
MS. SCHNEIDER: Just as with the DOC discharge limitation, isn't there a salinity discharge limitation that would, again, let Delta Wetlands' water be dribbled out if its satisfy levels were somewhat higher than channel salinity levels?
DR. DENTON: Yes, there is. I think the reason for that is that we have also had a concern, and we have expressed it to Delta Wetlands in meetings with them, that if our experts are correct and their experts are wrong, then there will be a time when the water quality on the Delta would be bad, bad enough that it shouldn't be discharged into the Delta for export, or at times when it would cause damage.

But then you get into a situation where you would end up with a reservoir full of water, and you could never do anything about it. So, you have to have some way of removing that water in a very low impact way so that Delta Wetlands could continue operations by refilling.
MS. SCHNEIDER: But by "bad enough," you have defined bad enough when discharge water quality is any worse at all than channel water quality?
DR. DENTON: I think the time that would trigger a discharge from the island is when the ambient TDS, or the TDS on the island, was above 440 or TOC was above 10. In other words, that there was, in fact, water would be taken on to a TOC of four. It would degrade up to a TOC of 10, at which stage there would be a problem, and that water should be discharged slowly back into the Delta.
MS. SCHNEIDER: I might have to inquire about that term because it looks like Delta Wetlands would not be able to

discharge if its discharges were above ambient water quality, not that they wouldn't be Delta discharged unless they are up to 10.

DR. DENTON: The trigger for bleeding water back into the Delta would be when?

MS. SCHNEIDER: One thing about this figure is that it shows there are some times improved water quality.

DR. DENTON: Actually, Dr. List, just before we

1203

submitted our testimony, was too late to change it, but actually sent us some more data. These data, there was another, slightly different error in the way he created those data. It was before the correction that he made in terms of the export file error.

I have actually got a new plot of that which I will submit later on in rebuttal. But the new data, when plotted, actually show there is only one data point slightly below the one-to-one line. All the other data points are well above the line.

MS. SCHNEIDER: Thank you for the preview, Dr. Denton.

HEARING OFFICER STUBCHAER: Does that conclude your cross-examination?

MR. NELSON: No. I have some questions for Mr. Nuzum.

HEARING OFFICER STUBCHAER: Let me ask a question while you are getting ready.

Who else is going to cross-examine this panel? Can you raise your hand?

You expect your cross-examination to be lengthy, Ms. Murray?

MS. MURRAY: I plan to take 20 minutes allotted.

HEARING OFFICER STUBCHAER: Just the 20 minutes.

Mr. Maddow?

MR. MADDOW: Just about, between 15 and 20 minutes.

HEARING OFFICER STUBCHAER: Mr. Moss?

1204

MR. MOSS: Very short.

HEARING OFFICER STUBCHAER: Who else?

Mr. Jackson?

MR. JACKSON: Under 20.

HEARING OFFICER STUBCHAER: The reason I ask is that we have some people in the room who are waiting to be called for their direct, I think, and if it appears we were not going to get to their direct, they might be able to go back to work if they wish.

Some people from the Department of Water Resources asked if we were going to get to them today. I would say right now it doesn't look like we will. They can take that information and do what they like.

Okay Mr. Nelson.

MR. NELSON: Mr. Nuzum, your testimony with respect to fishery resource impacts was based on the Draft EIR/EIS assessment; is that correct?

MR. NUZUM: That is correct.

MR. NELSON: While you referred to the DEIR/EIS, in your testimony you did not reference specifically the Final Operations Criteria that have been developed in cooperation with Fish and Wildlife Service and NMFS and Delta Wetlands.

Did you review the Final Operations Criteria in preparing your written testimony?
MR. NUZUM: I did.

MR. NELSON: Was it is your understanding when reviewing that Final Operations Criteria that Delta Wetlands was subject to the restrictions of the Water Quality Control Plan in the Accord?
MR. NUZUM: I don't know the answer to that.
MR. NELSON: Patty, would put up the Final Operations Criteria. This is Table 1 from DW Exhibit 7, David Forkel's testimony, which shows a graph of the Final Operations Criteria.
Isn't it true that that graph, and take it for a fact that also Fish and Wildlife Service opinion specifically states that Delta Wetlands is subject to the Water Quality Control Plan criteria export limits, export inflow ratio limits, X2 limitations?
MR. NUZUM: Yes.
MR. NELSON: In addition to that, looking at the Final Operations Criteria, the gold color box in the middle, isn't it true that outside of the Water Quality Control Plan, that Delta Wetlands has initial protections that go beyond those required of other projects in the Delta?
MR. NUZUM: Yes, I think that is fair to say that.
MR. NELSON: So to that extent, Delta Wetlands has restrictions and project operations will be more protected than in the Water Quality Control Plan; isn't that correct?
MR. NUZUM: I think that is fair to say that.

MR. NELSON: In your testimony you raise the concern regarding project effects on outmigrating juvenile salmonid. Would you agree that the channels adjacent to Webb Tract and Bouldin Island are the main migration corridors for those salmon for the east side tributaries?
MR. NUZUM: I think that is true unless they are entrained to Middle River and Old River and end up in the South Delta. Yes, it would Bouldin and Webb Tract.
MR. NELSON: Would the majority of salmon presently use the channel around Webb Tract and Bouldin Island?
MR. NUZUM: Yes.
MR. NELSON: Isn't it that the Final Operations Criteria state that Delta Wetlands may not discharge from Webb Tract from January through June?
MR. NUZUM: Yes, that is true.
MR. NELSON: So, to the extent that that prohibition applies the salmon juveniles, outmigrating salmonids would not be affected by any discharges by Webb Tract since they are not allowed from January through June; isn't that correct?
MR. NUZUM: That is true.
MR. NELSON: Also, with respect to juvenile smolt outmigration, you stated that the peak outmigration period is April and May; is that correct?
MR. NUZUM: For smolts, that is true.

MR. NELSON: For juvenile smolts.

And isn't it true that the Final Operations Criteria also prohibit diversions onto Delta Wetlands' reservoirs islands in April and May?
MR. NUZUM: That is true.
MR. NELSON: Again, there would be protections for that peak outmigration period for juvenile smolts; isn't that correct?
MR. NUZUM: For the peak, that is correct.
MR. NELSON: Those protections aren't offered with other projects with respect to the fact that they only have to comply the Water Quality Control Plan; isn't that correct?
MR. NUZUM: Yes. I think you are correct.
MR. NELSON: The next thing, you also expressed a concern about June and July diversions for Delta Wetlands.
Can you please put up Figure 2A from the Exhibit DW-4, which is an exhibit prepared by -- this document was prepared by Jones & Stokes Associates at the request of the Army Corps of Engineers looking at the Final Operations Criteria.
Looking at June and July, there up on the chart, you'll see upper in the right-hand corner going down. Actually, Patty, can you move it up so we see the totals at the bottom?

1208

Counting over, you will see 30 and 33. Those are two columns for June and July. Isn't it correct that, based on that table, the average diversions in June and July are only going to be 30 and 33 cfs?
MR. NUZUM: According to that table, that's correct.
MR. NELSON: Isn't it also true, looking at that table in June, out of 70 years, only 8 Junes that Delta Wetlands would divert at all?
MR. NUZUM: I can't see the top right now, but I can see six of them, so I would assume you are correct.
MR. NELSON: Is it your understanding right now the Delta Wetlands Project divert for their agricultural activities in June and July?
MR. NUZUM: They divert to storage?
MR. NELSON: They divert agricultural activities right now onto their islands in June and July.
MR. NUZUM: Currently?
MR. NELSON: Currently.
MR. NUZUM: Yes.
MR. NELSON: So, to the extent that Delta Wetlands is diverting 70 years, every year for 70 years for agricultural activities in June, versus eight, only eight times in 70 years under the Final Operations Criteria for it reservoir operations, there is a protection afforded to east side tributary salmon, is there not?

1209

MR. NUZUM: I have to take a look at the quantities, but you could be correct, and you may not be correct.
MR. NELSON: Depending on the quantities of the agricultural diversion versus the diversions that would be derived from the Delta Wetlands?
MR. NUZUM: For example, there was testimony -- I

believe that there was something like 90 facilities to divert to the project islands, including all four of them. That is correct, I don't know the sizes or locations of those, I think you need to compare sizes, locations, times of operation, compared to what you are proposing.

MR. NELSON: You also mentioned -- finally, you mentioned a September 1st through December 31st period for protection, at that time, of upstream migrating chinook salmon. Isn't it true that the Delta Wetlands also has final operations --

Can you put the Final Operations Criteria back up again?

Isn't it true that Delta Wetlands also has restrictions placed upon it during that September 1st through December 31st period with respect to its diversions?

MR. NUZUM: There are limitations, yes.

MR. NELSON: Included in those limitations, isn't it true, that Delta Wetlands can't even divert until after X2 is past Chipps Island?

MR. NUZUM: That is what the Final Operations Plan calls for, yes.

MR. NELSON: Once again, aren't these restrictions more restrictive than the Water Quality Control Plan?

MR. NUZUM: Yes, they are.

MR. NELSON: Let's talk a little bit about other potential diversions in the Delta now.

Do you believe that any additional diversions or exports in the Delta will have an impact on the salmonids migrating through the Delta?

MR. NUZUM: I think that they can have, yes.

MR. NELSON: Do you believe that there should be no additional diversions or exports through the Delta?

MR. NUZUM: I believe that is true if you are talking about diverting or exporting without mitigating what that diversion or export is going to be, yes.

MR. NELSON: Would you consider mitigation being such things as modifying physical facilities and reducing the rates of operation?

MR. NUZUM: I think those would be the things that would be considered, yes.

MR. NELSON: In your opinion, would you apply the -- excuse me. I just asked you that question.

Let's move on to olfactory queues. You have mentioned, in fact, you have a concern about fall-run chinook salmon having enough olfactory queues to determine their native streams.

Isn't it true that adult salmon are very sensitive to relatively small amounts of native stream flows, olfactory queues?

MR. NUZUM: That's true.

MR. NELSON: Have you identified what percentage of change Delta Wetlands will have on the east side tributary flows?

MR. NUZUM: I have not.

MR. NELSON: Patty, will you please put up Figure

3B-1?
Looking at this, and I apologize for not having a pointer here, but looking at the Figure 3B-1, which is from the Draft EIR/EIS, you will see a 60,000 figure right above Twitchell Island.
MR. NUZUM: Yes.
MR. NELSON: That is the tidal flow or average tidal flow for that confluence, and isn't that confluence where the Mokelumne River and Lower San Joaquin River merge?
MR. NUZUM: Yes, it is.
MR. NELSON: So there is an average 60,000 cfs tidal flow at that point?
MR. NUZUM: That's correct.
MR. NELSON: Is it your -- do you have any knowledge as

1212

to what the net flow, for example, for the Mokelumne River is in October, November?
MR. NUZUM: It could be 325 cubic feet per second, or, if there is additional flood releases, it could be up to 5,000 in a controlled manner.
MR. NELSON: Are you also familiar with the flows that come through the DCC and Georgiana Slough that mix with the Mokelumne River before it gets to that confluence?
MR. NUZUM: Yes.
MR. NELSON: Are you aware of how much flows run through the DCC, for example, and mixing with the Mokelumne River water there?
MR. NUZUM: They can be quite high, yes.
MR. NELSON: Does 5,000 sound about right?
MR. NUZUM: I think that is a good number.
MR. NELSON: Given the fact you have approximately 60,000 cfs tidal flow, a 5,000 cfs flow through the DCC and Georgiana Slough mixing with the Mokelumne River water, and you only have a 350 cfs Mokelumne River flow, are you talking about a very extreme amount of olfactory queues that salmon aren't able to detect; isn't that true?
MR. NUZUM: That's true.
MR. NELSON: When you were looking at the Draft EIR, did you review and read the discussion on the Cross Delta flow parameter that Mr. Shaul utilized in his analysis?

1213

MR. NUZUM: Yes.
MR. NELSON: Yes?
MR. NUZUM: Yes.
MR. NELSON: Do you understand that that Cross Delta flow parameter acts or measures, was sometimes referred to as the Mokelumne box, which shows the Mokelumne flows coming down and entrainment into the Central Delta?
MR. NUZUM: Yes.
MR. NELSON: Are you aware that Mr. Shaul's cross Delta flow parameter data for September through December shows an average change from the Delta Wetlands' operations on that Mokelumne River box of between 1.6 and 2 percent over a seven-year period?
MR. NUZUM: Yes, I know it was quite low.
MR. NELSON: Thank you.
Let me turn to predation.

HEARING OFFICER STUBCHAER: Before you take this graph down, I have a question.

You said that -- the question was: Is this the average tidal flow on Twitchell Island, 60,000? I think the answer was yes. But if that is average, you can't have a 60,000 average coming in. Is that the average of the maximum inflows?

MR. NELSON: I am sorry, say that again.

HEARING OFFICER STUBCHAER: I believe your question

1214

was: Is that the average tidal flow, at that point was 60,000?

MR. NELSON: I believe this actually identifies it. It's the average flood tide flows.

HEARING OFFICER STUBCHAER: Flood tide. I thought that's what it had to be, but I didn't hear that.

MR. NELSON: I'm sorry.

If I can turn a little bit to predation.

You testified regarding a concern for predation of fries; is that correct?

MR. NUZUM: That's correct.

MR. NELSON: Isn't it true that predation is less when there is high turbidity and colder temperatures?

MR. NUZUM: That is true.

MR. NELSON: Isn't it also true that fry typically occur in the Delta only after there have been high flow events to move them out of tributaries?

MR. NUZUM: That is what usually triggers their movement.

MR. NELSON: Isn't it also true that the high flow events in the Delta are characterized by high turbidity as well?

MR. NUZUM: Yes.

MR. NELSON: Isn't it true that the water temperatures in November through March are relatively low?

1215

MR. NUZUM: They are very low, yes.

MR. NELSON: Let's move to temperature.

In your testimony you referred to concern regarding temperature related effects on eggs carried by adult migrating salmon.

Isn't it true that there is a difference between adult female exposure to transient temperatures versus fertilized egg exposures to higher temperatures at spawning and during egg incubation?

MR. NUZUM: Absolutely.

MR. NELSON: Isn't it true that most studies that have been conducted so far have only identified the temperature effects for spawning on the fertilized eggs and have not been able to differentiate the transient exposure for adult -- for the eggs while they are in the upstream migrating season?

MR. NUZUM: That is true. That is why I characterized the testimony that I gave as a concern. It depends on, I believe, the temperatures, the condition of the female, meaning how ripe she is, and what the delay factor, the length of the delay factor.

MR. NELSON: Isn't it true that, generally speaking, that there, at in the beginning of the upstream migration, the eggs are developed to the point where they become quiescent and no further development occurs until after

1216

spawning and fertilization?
MR. NUZUM: Sounds like you have been there.
I think that is the scientific guess, yes.
MR. NELSON: So, to the extent that we are referring to the upstream migration, then referring to quiescent eggs, that there is no greater development or change that are going during the upstream migration to the eggs?
MR. NUZUM: To the eggs themselves within the female's body cavity, I think that is correct.
MR. NELSON: Isn't it true that the studies have identified the problems with temperature effects to the -- at spawning and during incubation, their effects on the rate of cell division?
MR. NUZUM: Yes. That would definitely be one of the major effects.
MR. NELSON: Cell division does not occur during the upstream migration period, does it not?
MR. NUZUM: Only after fertilization.
MR. NELSON: Is it your understanding that -- isn't it true that there is no spawning that would occur around the Delta Wetlands' islands?
MR. NUZUM: I don't believe there would be any spawning around the Delta islands, no.
MR. NELSON: Just last couple of questions with respect to screening.

1217

Isn't it true that on unscreened diversions represent a significant threat to fry and juvenile salmonids?
MR. NUZUM: That is the belief, yes.
MR. NELSON: Are you aware that the Delta Wetlands will eliminate many two-inch screened diversions on its four islands?
MR. NUZUM: You verified the 90 number. Yes.
MR. NELSON: Are you further aware that Delta Wetlands will have its diversions made through fish screens that operate to approach velocity of no less than 0.2 feet per second?
MR. NUZUM: Yes.
MR. NELSON: Isn't it true that that approach velocity of 0.2 feet per second is more protective than the present DF&G 0.33 feet per second screening for salmonids?
MR. NUZUM: It is.
MR. NELSON: I have no more questions.
HEARING OFFICER STUBCHAER: Does that conclude the Delta Wetlands cross-examination?
MS. BRENNER: Yes, it does.
Thank you very much for your indulgence.
HEARING OFFICER STUBCHAER: Mr. Roberts.
MR. ROBERTS: Mr. Wolfe has to leave. Dr. Wolf has to leave by about 3:00 today. So if there is anyone that has questions specifically for him, perhaps you can front load

1218

them.
HEARING OFFICER STUBCHAER: Are there any people who are going to cross-examine this panel who have questions for Mr. Wolfe?
Mr. Maddow. Just have to go ahead of Pacific Gas & Electric.
Is that all right with you, Mr. Moss?
All right. Mr. Maddow.
MR. MADDOW: This is not limited to my questions of Dr. Wolfe, however?
HEARING OFFICER STUBCHAER: You might as well do your full 20 minutes.
MR. MADDOW: I don't think it will take much more than that.

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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY CONTRA COSTA WATER DISTRICT
BY MR. MADDOW

MR. MADDOW: I would like to begin with Mr. Buck.
I am Robert Maddow appearing for the Contra Costa Water District.
Mr. Buck, is it your understanding that M&I entities are expected to be potential purchasers of water stored by Delta Wetlands?
MR. BUCK: Yes. Given the quoted price of 2 to $300 an

1219

acre-foot, that is the only market who can afford it.
MR. MADDOW: As I understood your testimony and your qualifications, you represent an organization that consists of the 12 largest urban water suppliers in California; is that correct?
MR. BUCK: That's correct.
MR. MADDOW: You're the Executive Officer of that organization. I take it it has a Board of Directors?
MR. BUCK: Yes, it does.
MR. MADDOW: Has the Board of Directors taken a position in regard to the project that is before this Board?
MR. BUCK: Yes, they have.
MR. MADDOW: What is that position?
MR. BUCK: They authorized the Water Quality Committee and the testimony group to oppose the project based on water quality impacts, primarily.
MR. MADDOW: Who are those member agencies? Could you just identify the members of your organization?
MR. BUCK: Alameda County Water District, Contra Costa Water District, East Bay Municipal Water District, City and County of San Francisco, City of Sacramento, Central and West Basin Municipal Water Districts. That is in the South Bay/Torrance area of Southern California. City of San Diego, San Diego County Water Authority, Metropolitan Water District of Southern California, Municipal Water Districts

1220

of Orange County, and Los Angeles Department of Water and Power.
MR. MADDOW: Mr. Buck, is it the position -- Strike that.
Can the Delta Wetlands Project, in your estimation,

deliver the quantity and quality of water that your organization's member agencies need?

MR. BUCK: Neither total quantity, and certainly we have concerns with the quality. Again, the way we look at this, given the operational constraints and the water quality constraints, this project would basically compete with the spot market water transfer water. And when you look at what the spot market is in a drought, we learned in the 1991 water bank we had a market clearing price of about 150, $200 an acre-foot. Meaning when the price got to a level, there was plenty of water.

So, in our estimation, given this would compete with that spot market, there would be better quality water available at that time at a lower price. So, I can't see any of the CUWA member agencies or their sub members being interested in this water.

MR. MADDOW: In terms of the terms and conditions which you have recommended in your testimony and which you discussed with Ms. Schneider a few moments ago, I heard discussion of de minimis and zero discharge and that sort of

1221

thing. And it occurred to me, what I believe I was hearing was a suggestion that the Board should adopt, in effect, an antidegradation term as a part of any permit that it might adopt here.

Is that a fair characterization of what you said?

MR. BUCK: Yes, it is. We are interested in not being impacted by the project and having the public have to pay for those impacts. So, it should be borne by the applicant.

MR. MADDOW: I want to ask Dr. Wolfe a question before he gets away.

Dr. Wolfe, when you introduced yourself to the Board this morning, I understand you to say that you chair the Water Quality Committee of CUWA; is that correct?

DR. WOLFE: That's correct.

MR. MADDOW: You have heard the testimony over the last, or much of the testimony as I understand it, over the last couple of weeks about details of the water quality case that has been put on by Delta Wetlands and the evidence of the CUWA witnesses. Is that correct?

DR. WOLFE: That's correct.

MR. MADDOW: Dr. Wolfe, I want you to pull back from the details of what you've heard over the last couple of weeks, what I call the dueling experts, if you will, and I would like you to tell us in your capacity as the chair of

1222

the water quality function of this statewide organization that is concerned about water quality, from the perspective of the twelve largest urban water suppliers in the state, what's your opinion as to the net water quality impact of the proposed Delta Wetlands Project on CUWA member agencies which divert water from the Delta.

DR. WOLFE: I think that it has been clearly shown that the impact is negative and it will effect the water agencies and the ratepayers and the public health quality of the water. This project would knowingly, willingly, and

intentionally increase the level of total organic carbon in the water.

Why that is important? Total organic carbon is a surrogate for cancer causing chemicals when you disinfect it. So we would be opposed to any project which would intentionally increase the level of cancer causing chemicals in the water without adequate mitigation.

The purpose of a water utility is to provide water that is both microbiologically and chemically safe to drink, and to provide it at a reasonable cost. We are the stewards of public health. It's the water utility objective really to be the last line of defense in providing wholesome water quality to the consumers.

We have learned time and time again, and recently, that treatment alone is not the answer. So treating the water to

1223

remove constituents, as regulations become more and more stringent, is no longer the option, as was learned in Los Vegas with cryptosporidium outbreak where they had state of the art water treatment. Source protection is absolutely critical to meet the future regulations.

And here is a perfect example of where source protection would protect and provide a higher water quality. That is one of the new initiatives by EPA in their Safe Drinking Water Act reauthorization. That is to protect drinking water at its source.

MR. MADDOW: Dr. Wolfe, were you here this morning when Mr. Krasner talked about the proposed disinfectant disinfection by-product results?

DR. WOLFE: Yes, I was.

MR. MADDOW: I would like you to talk for a moment from the standpoint of your position as an executive with the Metropolitan Water District of Southern California. Can you describe Metropolitan's current treatment strategy for coping with those proposed new rules?

DR. WOLFE: We propose to go to ozone as our treatment solution for meeting the state's two regulations. However, with this project, it could push the total organic carbon level above four. And the importance of that is it would require us to implement another treatment process layered on top of ozone. So the net effect could be that we have two

1224

additional new treatment processes instead of one. And, as Mr. Krasner pointed out, the costs for enhanced coagulation are fairly high, and that cost would be borne by the consumers, by the rate payers, with resultant degradation of water quality that they would bear, bear the risk.

MR. MADDOW: Thank you, Dr. Wolfe.

If there are others who which to cross-examine Dr. Wolfe, that is my last question of him and if someone else wanted to ask him questions --

HEARING OFFICER STUBCHAER: Thank you. It's very kind.

Mr. Sutton.

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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES

BY STAFF

MR. SUTTON: Dr. Wolfe, I am confused on this whole thing about addition of total organic carbon in the system. Let me walk you through a scenario and explain to me how it increases the loading on export.

Let's say Delta Wetlands is diverting water of, say, 3 milligrams TOC in December, January. Okay?

DR. WOLFE: Onto the island?

MR. SUTTON: Onto the island. It meets your criteria there. They would not be -- would they be diverting water that would be of better quality than would be at Banks?

1225

DR. WOLFE: I am not sure I follow the question.

HEARING OFFICER STUBCHAER: At the same time?

MR. SUTTON: Assuming that they are diverting out of the Delta, let's take for example Bacon Island. They are diverting out of Old and Middle River. They are diverting water that part of that stream goes onto the island and part of it goes down to Banks. So, presumably, the water quality they are diverting is essentially the same as the water quality at Banks; is that correct?

DR. WOLFE: I see your point.

MR. SUTTON: Would that be correct?

DR. WOLFE: In one scenario that would be correct. That is correct at that time.

MR. SUTTON: Now, they would be diverting water that, since they are a junior water right appropriator, they would be diverting water only when the State Water Project, let's for simplicity here limit it to the State Water Project as the other senior diverter, would not be taking. If the system was in balance, for example, State Water Project would be taking all the water that it could and Delta Wetlands would not be diverting.

So, they are diverting surplus water by definition; is that correct?

DR. WOLFE: I don't know.

DR. DENTON: Yes, that is part of the Biological

1226

Opinions of the Operations Criteria.

MR. SUTTON: Now, so the water that is going on the island is essentially the same water that the State Water Project is taking, in terms of quality. But it is a quantity of water which they, for whatever reason, presumably limited capacity or limited storage, cannot take. Correct?

MR. BUCK: Or limited demand at that time.

MR. SUTTON: Or limited demand. For whatever reason, they are not taking it.

Now let's shift to August. Assuming that there is some degradation of the water quality, let's say in terms of TOC, on the island. Let's say we start out at three. Let's say it goes to eight. The requirement that you have or that you are proposing, that Mr. Buck proposed in his testimony, says that Delta Wetlands cannot release water that is worse than the ambient water quality.

Is that correct?

DR. WOLFE: I think that is correct.

MR. SUTTON: So let's say that the ambient water

quality is eight. Delta Wetlands' water is eight. You are concerned about an additional increment of total organic carbon.

Where is that additional increment if the water is the same TOC as the water that is going to the pumps already?

DR. WOLFE: I don't think there is.

MR. BUCK: Under that condition, there wouldn't be any increase. That is what we are trying to make; we don't want an increase of over ambient.

DR. WOLFE: Typically, the ambient is not eight, though.

MR. SUTTON: You said that CUWA is concerned about an increase in TOC.

DR. WOLFE: That's right.

MR. SUTTON: As long as the release water cannot be higher than TOC and ambient, how can you ever get an increase in TOC and a cost that gets passed on to your rate payers?

DR. WOLFE: Well, if you're discharging and your TOC is eight and the ambient water quality is three, are you not increasing the TOC?

MR. SUTTON: If the requirement here says that it doesn't, it can't be above ambient --

DR. WOLFE: Absent that requirement, that is true. That would provide protection; that is correct.

MR. SUTTON: So your concern about TOC increases is only if Delta Wetlands is allowed to release water that is greater than ambient receiving water?

DR. WOLFE: That is correct.

MR. SUTTON: Other than that, there is no net increase in TOC?

DR. WOLFE: That is correct, the net increase.

MR. SUTTON: Thank you.

HEARING OFFICER STUBCHAER: Anyone else have questions for Mr. Wolfe?

Seeing none, then. Mr. Roberts.

You're finished with Mr. Wolfe, Mr. Maddow?

MR. MADDOW: Yes, I am.

HEARING OFFICER STUBCHAER: He may be excused.

Mr. Maddow.

MR. MADDOW: I have a couple questions for Dr. Shum.

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CONTINUED CROSS-EXAMINATION
OF CALIFORNIA URBAN WATER AGENCIES
BY CONTRA COSTA WATER DISTRICT
BY MR. MADDOW

MR. MADDOW: I want to refer back to the previous discussions of CUWA's Exhibit 7A and 7B. For this discussion I don't think there is any need to put them up. I just want to make sure that I recall the discussion that I've got.

In the first place, Dr. Shum, is it true that the Fischer Delta Model uses area-wide averages of salinity?

DR. SHUM: That is correct.

MR. MADDOW: Is it true that the claimed -- it was your

1229
testimony that the claimed water quality benefits related to the proposed Delta Wetlands Project may have been exaggerated by reliance upon the Fischer Delta Model for purpose, as opposed to looking at the salinity of specific Delta islands? Is that correct?
DR. SHUM: That is correct.
MR. MADDOW: I want to talk a little more about salinity. Again, this focuses back on your direct and cross-examination earlier today.
In determining impacts to M&I water users, the focus, the important factor is salinity, salt concentration; is that correct?
DR. SHUM: That is important aspect.
MR. MADDOW: If we are in a situation in which the salinity is relatively low, we have very large flows, the mass loading of salt could be quite large; isn't that correct?
DR. SHUM: Yes, despite a low salinity.
MR. MADDOW: Now, so in a situation where flows are very large, but the salinity is low, the mass loading can be large, but nonetheless it might not raise salt concentration if the receiving water is at a higher salinity; is that correct?
DR. SHUM: That's correct.
MR. MADDOW: So, we are talking about water that is
1230
being discharged to Bacon island. Whatever the flow off Bacon Island is, if the concentration of salt is exaggerated or is overestimated, then does that result in an overestimation of the benefits to Delta water quality?
DR. SHUM: Salt flow would be saturated and, therefore, is limited, and would be exaggerated.
MR. MADDOW: Regardless of the flow rate?
DR. SHUM: Yes, that is correct.
MR. MADDOW: So it is a question of whether we are going to keep the same level of degraded water or increase the level of degradation -- Strike that. I am sorry.
And, finally, in regard, again, to the Fisher Delta Model and agricultural drainage, would it be fair to say that the Fisher Delta Model does not do a particularly precise job in regard to assumptions concerning agricultural drainage?
DR. SHUM: I think we need to put into proper context. Because of the present knowledge, all models are required to make assumptions. The Fisher Delta Model is designed to look at primarily seawater intrusion and also in project operation, and, so, the agricultural drainage is simulated in a model in a way, in my opinion, sufficient for this purposes. But not sufficient if we are talking about the specific simulations of ag drainage from one particular island.
1231
For example, the Fischer Delta Model simulates the ag drainage by dividing the Delta into three areas. I can put up a slide, which was not originally prepared for this purpose. All we need to look at are the --

MR. MADDOW: Excuse me, Dr. Shum. Can you identify -- this is not a part of CUWA's testimony?

DR. SHUM: This has not been introduced before. This is just an illustration of how the Fisher Delta Model does to simulate agricultural drainage.

MS. LEIDIGH: Could you identify where this is from and what it is?

DR. SHUM: This is -- the map itself is from a municipal water quality investigation report. All I am referring is a map of the Delta and the three lines that I drew.

MR. MADDOW: You drew the lines across the face of that map?

DR. SHUM: Those three lines. That divides the Delta into three parts. For each part an average over the entire area, the salinity value of the ag drainage was used for all those islands.

For example, Bacon Island belongs to the lower right-hand corner. And the salinity used for the entire region was averaged over all the islands. We note that most of those islands would be taking water from San Joaquin

1232

River, which has usually a higher salinity than, say for example, in the northern part. And if you apply irrigation water of a high salinity, you will get a drainage of a high salinity. So for that part of the Delta, in general, we have a pretty high salinity in the ag drainage.

Bacon Island, on the other hand, even though it belongs to that general area, would be taking water from Middle River and Old River, and at times would have quite a low salinity. As a consequence, the salinity of the drainage may be lower. That is why, even though the Fischer Delta Model adequately simulating seawater intrusion, when we are getting up to simulating ag drainage from specific islands in the Delta, they may not be -- the assumptions may not be adequate.

HEARING OFFICER STUBCHAER: Let's pause here a moment.

What were we going to do about this exhibit?

MS. LEIDIGH: I think somebody needs to identity this as their exhibit and give it a number, either CUWA or Contra Costa.

MR. ROBERTS: We'd be glad to offer it as CUWA-7D, I believe.

MS. LEIDIGH: 7B?

MR. ROBERTS: Let's call it CUWA-12.

MS. LEIDIGH: Do you have copies for the parties?

MR. ROBERTS: We can have copies for everybody.

1233

MR. SUTTON: With regard to that as Number 12, are you -- the Delta Island Drainage Investigation Report would be 11; is that correct? You were proposing to offer that earlier.

MR. ROBERTS: I think Delta Wetlands was going to. I could be mistaken on that.

MR. SUTTON: Delta Wetlands was going to submit -- you haven't offered the other one yet; so this will be 12. You will offer the other later.

Thank you.
HEARING OFFICER STUBCHAER: We will rule on it later.
All right, Mr. Maddow.
MR. MADDOW: I have just two more questions, and these are for Dr. Denton. It's just in regard to one minor point that came up during his cross-examination earlier.
You stated that -- excuse me, I beg your pardon.
In developing a cross-examination question to you, Dr. Denton, I believe the attorney for Delta Wetlands stated that certain work done by Dr. List was done at the request of Contra Costa Water District. And I just wanted to make the record clear at this point, when it is in response to that cross-examination matter. Was that work done under Contra Costa's direction or supervision?
DR. DENTON: No, it wasn't.
MR. MADDOW: Would you have -- are you familiar with

1234

the work that Dr. List did?
DR. DENTON: We received copies of his report and data from his modeling studies.
MR. MADDOW: Can you tell us whether you, in your capacity as one of the Contra Costa's water quality experts would have done that work in the same way as Dr. List, particularly with respect to agricultural diversions?
DR. DENTON: That is our major concern with it, is just the way that the agricultural diversions ended up -- reduction in agricultural diversion ended up in outflow rather than being reoperated within the Central Valley system and ending up as additional exports or as water stored in upstream reservoir.
MR. MADDOW: Mr. Stubchaer, that is all that I have.
Thank you.
HEARING OFFICER STUBCHAER: Mr. Moss, do you want to take care of -- you want to take care of some carry over business from your direct testimony the other day before we cross-examine this panel? Now would be a good time for that.
MR. MOSS: Thank you.
HEARING OFFICER STUBCHAER: I guess that is a yes.
MR. MOSS: Yes, sir. Richard Moss for Pacific Gas & Electric.
Mr. Stubchaer, there were two matters dating from

1235

direct testimony last Tuesday. The first one was a question to Mr. Clapp, relative to whether any substantial work in the nature of pipe replacement has taken place on line, gas transmission line 57B as a process of Bacon Island since it was installed. And the answer to that is, no.
Maintenance has occurred, but Mr. Clapp informs me that no section has been replaced or otherwise subject to that level of maintenance. So I pass that along.
Secondly, you requested copies of PG&E's actual documents for gas and electric facilities in the subject islands. I just brought up with me two sets. I have a box back there with a few more. So I want to tender these, obviously, to Delta Wetlands a set. And, of course, I am not sure how many the staff would like. I have another four

in the box, and I will be happy to give them to the staff, if they like.

HEARING OFFICER STUBCHAER: How many do we need, do we need for ourselves and not other parties?

MR. SUTTON: We have been getting 13.

MR. MOSS: I can order 13; it is not a question.

HEARING OFFICER STUBCHAER: In addition to the --

MS. LEIDIGH: That is not in addition to the copies for the other parties.

MR. MOSS: I would be happy to provide copies for any party that would like a set. We will have them printed at once.

HEARING OFFICER STUBCHAER: How many parties represented here want copies of these easements.

MR. MOSS: If you see me, I will happy to.

HEARING OFFICER STUBCHAER: One in the back.

Did you wish to identify?

MR. MOSS: I would just as a group, as a whole, identify those as PG&E 5.

HEARING OFFICER STUBCHAER: PG&E 5.

MR. MOSS: Exhibit 5, yes.

HEARING OFFICER STUBCHAER: Is there any objection to receiving PG&E 5 into the record? I can't imagine there would be.

MS. BRENNER: No.

HEARING OFFICER STUBCHAER: Thank you Mr. Moss.

MR. MOSS: Thank you, sir.

HEARING OFFICER STUBCHAER: Are you ready to proceed with your cross?

MR. MOSS: Yes, I am. Again, Richard Moss for PG&E.

I just have a couple of questions, I think, for Mr. Buck.

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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY PACIFIC GAS & ELECTRIC
BY MR. MOSS

MR. MOSS: In your mind, is there anything that Delta Wetlands can do to the project in terms of reoperation or physical change or something else, basically, that you can think of that would basically satisfy your water quality concerns?

MR. BUCK: I can't really offer an opinion on how they might reoperate. What they're faced with is kind of just the basic science that is going on with storing water on open islands in the hot summer Sacramento Valley, San Joaquin Valley sun. That is going to do certain things to the water quality. Those are the things we are worried about. And we can only offer that we want conditions and monitoring put on that would prevent injury for us.

Aside from treating the water as it comes off the islands, there is nothing that can be done because it's pretty much driven by biology.

MR. MOSS: You mentioned that you would be potentially open to considering monetary mitigation. In a ballpark sense, have you quantified that?

MR. BUCK: Dr. Krasner, or Mr. Krasner gave indications of some of the costs that we might incur. We haven't entertained that we could be compensated for this. We want

1238

to prevent the injury. I was merely clarifying what the term mitigation could mean. It could be beyond just preventing impact to negating the impacts or compensating the impact.

MR. MOSS: I understood that, for instance, as to quantifying the cost of the additional treatment that would be required. And while Mr. Krasner gave some acre-foot numbers, I didn't have a sense of what the totality of that would mean to CUWA members and the bottom line.

MR. BUCK: We haven't totaled it for CUWA's members. One of the members, it was about $300,000 a year for just Contra Costa's impact alone from, I believe, the TOC. And that is only one of the smaller members. That was on 20,000 acre-feet of water. Overall demand is about a million five.

MR. KRASNER: This is Stuart Krasner.

That information was just on the impact. If you pushed into a different removal requirement for total organic carbon. But as I always indicated, an ozone plant as well, you will have higher energy costs for providing additional ozone to meet the demand of the additional organic carbon. We haven't quantified it; we just gave some examples for illustration today.

MR. BUCK: As Dr. Wolfe pointed out, we are at the point where treatment alone is not an option. We have to

1239

have better source water quality so we can be reasonably assured of meeting the future drinking water regulations. So, we have to deal with both sides of the equation. We are not looking for any projects that will continue to degrade water quality.

MR. MOSS: Have CUWA attempted to reach a settlement of their issues of concern with Delta Wetlands?

MR. BUCK: There have been discussions with Delta Wetlands. They have never been in the context of a settlement.

MR. MOSS: Could you tell us a little more, what were the results of those discussions?

MR. BUCK: They were discussions around the technical merits of what is going on with islands, what are the operational issues. So, they were really only of a technical nature of what is happening, what we see happening, what they see happening.

MR. MOSS: Am I correct in saying that Delta Wetlands has never made an offer to CUWA in the nature of settlement?

MR. BUCK: Not to CUWA, per se. I am not aware of them making any offer to any individual district or member of CUWA.

MR. MOSS: That is all the questions I have.

HEARING OFFICER STUBCHAER: Thank you, Mr. Moss.

Mr. Etheridge, do you wish to cross-examine?

MR. ETHERIDGE: Yes, I have ten minutes. A few brief questions for Mr. Nuzum.

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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY EAST BAY MUNICIPAL UTILITY DISTRICT
BY MR. ETHERIDGE

MR. ETHERIDGE: While being questioned by Mr. Nelson on the Delta Wetlands' impacts on juvenile salmon, I believe you were asked if the Delta Wetlands' operations criteria prohibited discharges from January through June; is that correct?

MR. NUZUM: Yes. I think that was his question.

MR. ETHERIDGE: Isn't it your testimony in part that the potential Delta Wetlands' impacts on salmon juveniles are caused by Delta diversions to storage?

MR. NUZUM: Yes. I think that would be the major impact period.

MR. ETHERIDGE: I believe you testified that some of those impacts would be from entrainment caused by the Delta Wetlands' diversions.

MR. NUZUM: That is what I testified to.

MR. ETHERIDGE: The fact that there are no Delta Wetlands' diversion from January through June, would not really address problems caused by Delta Wetlands' diversions; is that correct? In other words, talking apples and oranges.

MR. NUZUM: It's apples and oranges.

MR. ETHERIDGE: I believe you were also questioned on the issue of olfactory queues and salmon's ability to pick up a relatively small amount of its home stream's water; is that correct?

MR. NUZUM: That is correct.

MR. ETHERIDGE: Isn't it your testimony that one of the problems from the proposed Delta Wetlands' operations is that by diverting east side tributary water to storage and later releasing it, essentially places that water in various places throughout the Delta?

MR. NUZUM: Yes, that is the major impact. I could characterize it as having two or three buckets. The fish does know what bucket he is headed for; he just knows he is headed for the olfactory queue. You confuse that when you divert to the islands and store that water and later release it, where's the fish suppose to run to? Go to Bacon Island?

He is going to be confused by the cross-currents and the way the Delta is operated right now.

MR. ETHERIDGE: In other words, you have olfactory queues for a given river spread throughout various places in the Delta?

MR. NUZUM: That is the concern, yes.

MR. ETHERIDGE: One last question that has to do with predation, predation of juvenile chinook salmon. You were

asked by Mr. Nelson at times when salmon fry may be in the Delta, sometimes maybe in times of high flow turbidity; is that correct?

MR. NUZUM: Yes, that is correct.

MR. ETHERIDGE: Is it your opinion that predation may still occur during those times?

MR. NUZUM: Absolutely.

MR. ETHERIDGE: Thank you.

I have no further questions.

HEARING OFFICER STUBCHAER: Thank you.

Mr. Turner, you are with us today. Do you have any cross-examination questions?

MR. TURNER: No, I have no cross-examination, Mr. Stubchaer. I would just like to point out that it was brought to my attention --

THE COURT REPORTER: Please come to the microphone.

MR. TURNER: Jim Turner from the Office of the Regional Solicitor, representing the Bureau of Reclamation.

It was brought to my attention that when I had made my opening statement we introduced the stipulation and the testimony, in the written testimony by Bureau witness Lowell Ploss, that I overlooked to refer to another exhibit that we

1243

had previously filed with you, which was Mr. Ploss's qualifications statement. So I wanted to see if we can -- to go ahead and get the numbering of those exhibits straightened out at this point before I forget. I would suggest that we could identify Mr. Ploss's testimony as Bureau 1, BOR-1, and his qualifications statement as BOR-2.

MR. SUTTON: The other way around.

MR. TURNER: Number 2 would be the stipulation?

MR. SUTTON: No. Qualifications, 1; testimony 2.

MR. TURNER: And stipulation, 3. If we can go ahead and just renumber them that way, that way we would have everything officially in the record.

HEARING OFFICER STUBCHAER: All right. Then there was a request, a late request, to cross-examine the Bureau on the stipulated agreement from Mr. Schulz.

Is Mr. Schulz here?

MS. DIGNAN: I will get him.

(Discussion held off record.)

HEARING OFFICER STUBCHAER: Mr. Schulz, do you wish to repeat your request now that you are up here?

MR. SCHULZ: What our request was, as the Bureau's stipulation is introduced in their time slot, which is just before the department and right after, I believe, East Bay Mud, that they present a witness who can answer some questions with respect to some of the factual matters that

1244

are laid out in the stipulation.

HEARING OFFICER STUBCHAER: If my memory serves me correctly, they offered the first day when you weren't here, and we accepted it. You want to reopen now at their normal time?

MR. SCHULZ: Yes. I had not seen the stip at that time. I had a chance to review it the following day and found out that there were certain questions that I thought

were relevant to the hearing regarding what their position is with respect to -- there is a statement in their stipulation that says they will make a statement with respect to the -- I don't have it in front of me. The Delta Wetlands Project has certain benefits blah, blah, blah, which is very factual statement rather than a stipulation on eliminating a protest.

The other thing is there are some implications in there with respect to the capacity of the DMC to wheel water, which I thought needed to be clarified. Quite frankly, it is my view that the Bureau doesn't have capacity to wheel. What we are really talking about is a wheeling agreement, a wheeling situation that applies to the State Project facilities only.

I wanted to get that clarification on the record. I felt that the Bureau was the best ones to answer the questions about wheeling capacity within the DMC.

1245

HEARING OFFICER STUBCHAER: Mr. Turner.

MR. TURNER: Mr. Schulz and I talked about this yesterday, and I told him that I would go ahead and arrange to have Mr. Ploss available. That is one of the reasons I am here today, is to try to get an idea of precisely which day we would be appearing so that I can arrange to have Mr. Ploss here. And depending on his schedule, I had talked to -- I don't know at this point precisely when Mr. Ploss would be available, so we may want to do some juggling around the dates on which we would be called or I could present John Renning from the Bureau as a substitute, depending on how you would prefer to handle it.

MR. SCHULZ: I indicated to Mr Turner that Mr. Renning was certainly satisfactory to me.

HEARING OFFICER STUBCHAER: Looking at the schedule --

The reason I hesitate, we have heard already how much time people have requested in advance, and then it goes far beyond. So that is why I was hesitating. I was going to say, I doubt if we'd get to you tomorrow. Maybe we can specify a time certain first thing Thursday morning, if that would facilitate your getting your witness here.

MR. TURNER: I would appreciate that, just set a definite time. I will then run out and make sure that Mr. Ploss can be available, or let you know if that somehow he would for some reason be scheduled for something else.

1246

HEARING OFFICER STUBCHAER: Does anyone have any comments on scheduling the Bureau for first thing Thursday morning?

Ms. Schneider.

MS. SCHNEIDER: Mr. Stubchaer, first thing Thursday morning would be fine. We are very anxious that we have an opportunity to cross Mr. Ploss since he is the one who is intimately involved in the negotiations.

HEARING OFFICER STUBCHAER: You want Mr. Ploss, not Mr. Renning?

MS. SCHNEIDER: Yes.

HEARING OFFICER STUBCHAER: Could you check, Mr. Turner, and advise us of his availability? We can squeeze

him in tomorrow, too, if tomorrow was --
MR. TURNER: I will check on that right now and report back immediately.
HEARING OFFICER STUBCHAER: We will take care of your exhibits, those that we have already identified, we will take care of them on your direct.
MR. TURNER: I will formally introduce at that point.
HEARING OFFICER STUBCHAER: You don't want to cross-examine?
MR. TURNER: No.
HEARING OFFICER STUBCHAER: Let's take our afternoon 12-minute break right now.

(Break taken.)
HEARING OFFICER STUBCHAER: We will come back to order. Cross-examination by Ms. Murray, Fish and Game.
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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY DEPARTMENT OF FISH AND GAME
BY MS. MURRAY
MS. MURRAY: This is Nancee Murray for the Department of Fish and Game. First, I have a few questions for Mr. Nuzum.
Mr. Nuzum, you testified on direct that you believed fall-run salmon fry are pulled into the South Delta by the Delta Wetlands Project.
Do you recall that?
MR. NUZUM: I believe they could be, yes.
MS. MURRAY: Do you believe that fry may be more susceptible to project operations due to poor swimming ability even though they are not actually out-migrating?
MR. NUZUM: Yes, I do.
MS. MURRAY: You testified that the outmigration of fall-run salmon fry from the east side tribs and San Joaquin River peaks in February and March.
Do you recall that?
MR. NUZUM: Yes, I recall that.
MS. MURRAY: You also testified that diversion

restrictions in the April and May will not sufficiently protect these fry; is that correct?
MR. NUZUM: That is true. It is a especially true in a normal and a wet year. Usually not the case in a very low water year.
MS. MURRAY: Do you believe screening Delta Wetlands' diversions will sufficiently protect these fry?
MR. NUZUM: I do not.
MS. MURRAY: Why not?
MR. NUZUM: I don't think that the fear of the Delta Wetlands Project is to entrain it to the screen or impingement and, therefore, a loss that would result. I think that the main problem is that they are going to entrain the fish and other invertebrates to the area of that screen or screens.
MS. MURRAY: Delta Wetlands testified earlier that fry are associated with shoreline habitat because they are rearing and not actively immigrating.

Do you believe that this might make fry even more vulnerable than smolts or yearlings to the indirect effects of the project, specifically entrainment at unscreened diversions along the stream bank and interest of the predator congregation, as you testified?

MR. NUZUM: Yes. That is exactly correct.

MS. MURRAY: In your testimony you stated, in fact, the

1249

Delta conditions for salmonid are widely acknowledged to worsen in June and July due to elevated water temperatures, great fish predators, entrainment rate, and consequent higher feeding activity.

Do you recall that?

MR. NUZUM: I do recall that, yes.

MS. MURRAY: Is it your professional opinion that the Delta Wetlands Project could impact juvenile out-migrating chinook salmon in June and July?

MR. NUZUM: It is.

MS. MURRAY: Are you familiar with the term chinook criteria in the Final Operations Criteria?

MR. NUZUM: Yes.

MS. MURRAY: Given that you testified that temperatures over 60 degrees Fahrenheit could be harmful to gravid adult salmon females carrying eggs, do you believe that allowing stream channel temperatures to increase by another four degrees temperature could significantly impact migrating gravid adults?

MR. NUZUM: This is somewhat speculative, in my opinion. But I think it is going to depend on the condition of that female salmon and length of the delay. I believe that if they end up in southern channels, Old River and Middle River, or somewhere in and around one of those islands, not specifically the four Delta islands, but all of

1250

those islands between the southern part of the Delta and the northern part of Delta and delay ends up being several weeks, you could have a substantial problem with eggs within those female salmon.

I don't believe -- although I think it can be done, I don't know of any study that has looked at that particular impact.

MS. MURRAY: Would you agree that project induced temperature increases, given the initial receiving water temperature levels, can add additional stress, and even kill, juvenile salmon?

For example, under the Final Operations Criteria, at temperature of 65 degrees, you can have a four-degree increase of up 69.

MR. NUZUM: Frankly, I don't believe that 69 degrees is going to kill juvenile salmon. But I think you're certainly stressing them when you get up in elevated temperatures like that; and you make them more prone to a lot of other factors that are not going to be conducive to them being able to complete their life cycle and end up dying.

MS. MURRAY: Would one of those stressors be a decreased ability to fight off predators?

MR. NUZUM: Absolutely.

MS. MURRAY: Is it your opinion that this project could increase the predations on these juvenile salmon?

MR. NUZUM: Yes, it is.
MS. MURRAY: Number of predators?
MR. NUZUM: The number of predators? Well, I think a number of predators is going to be governed by the habitat that holds them, and it is going to governed by the food source that they find available.
I think that the project facilities and the way they have discussed the way it would operate, I think that those are dangerous conditions for small fish.
MS. MURRAY: If, as you testified, this would increase the stress, would that decrease their swimming ability?
MR. NUZUM: It would.
MS. MURRAY: If there are unscreened diversions, could that draw them into those unscreened diversions if they aren't able to swim away, like they might otherwise?
MR. NUZUM: Unscreened diversions at some other place?
MS. MURRAY: Right. Now that they have been drawn into that part of the Delta.
MR. NUZUM: Absolutely.
MS. MURRAY: You testified on direct that this Board should consider whatever additional corrective actions are necessary to protect the anadromous salmonid using the east tribs in the San Joaquin system.
Do you recall that?
MR. NUZUM: I do recall that.

MS. MURRAY: Is it your opinion that there should be a mechanism for altering Delta Wetlands' diversion and discharge criteria based on the results of the monitoring that you suggested?
MR. NUZUM: Yes, that is the idea.
MS. MURRAY: One last question.
Do you think that the Delta Wetlands Project could erode the environmental baseline gained by the Delta Accord even if it operates within the Water Quality Control Plan?
MR. NUZUM: That is a difficult question, obviously. I am afraid that it may, yes.
MS. MURRAY: Mr. Buck, I have one question for you.
In your direct testimony you stated that you believed that CUWA testimony had demonstrated that harm from the water quality degradation and fisheries impact is likely.
Do you recall that?
MR. BUCK: Yes.
MS. MURRAY: You then requested the Board to deny the permit or include the terms and conditions in CUWA Exhibit 2.
Is that correct?
MR. BUCK: That's correct.
MS. MURRAY: These terms and conditions do not specifically address fishery impacts. Is it your opinion that this Board should include those permit conditions

described by Mr. Nuzum during his direct testimony?
MR. BUCK: Yes.

MS. MURRAY: Thank you. I just wanted to clarify that.

If you could put up Exhibit 6E, the revised.

Dr. Losee, given your testimony on the timing of Delta Wetlands' discharges and the release of potentially higher levels of plant biomass in the summer, what is your opinion regarding the potential for increases in biological oxygen demand in the channel receiving waters during the summer discharges?

DR. LOSEE: Given that there will be higher levels of organic matter, there will be additional loading or demand for oxygen in that water.

MS. MURRAY: What effects on channel dissolved oxygen would you expect from the release of Delta Wetlands' discharges?

DR. LOSEE: It is likely that there would be some depression. How much, I can't say.

MS. MURRAY: In your direct testimony you stated that Delta Wetlands assumed constant biomass figure, and I think November through January, and that discharges would instead occur during the summer, resulting in potentially greater TOC impacts than previously assumed by Delta Wetlands.

Do you recall that?

1254

DR. LOSEE: That is correct.

MS. MURRAY: Would you similarly expect summer discharges to have a greater impact on the biological oxygen demands than previously assumed by Delta Wetlands?

DR. LOSEE: To be honest, I haven't assessed Delta Wetlands' assessment of that point. I can say, though, that I would expect there would be more biological oxygen demand as of result of that increase organic carbon loading.

MS. MURRAY: Would you say the same -- what would you say about dissolved oxygen regarding the --

DR. LOSEE: In that case, the dissolved oxygen levels would be decreased.

MS. MURRAY: And in recent years the Delta has been subject to large scale blooms of filamentous algae called melosira. Do large scale blooms cause increases in TOC?

DR. LOSEE: They can cause what are often short-term increases in TOC, yes.

MS. MURRAY: Could blooms be expected to occur in these reservoirs?

DR. LOSEE: Yes.

MS. MURRAY: What impacts -- Mr. Nuzum, you may help. What impacts to fishes might happen when the water is released back into the Delta?

DR. LOSEE: One point that we did discuss is that with increased organic carbon loading there will be increased

1255

oxygen demands, resulting in some decrease in the oxygen concentration.

MS. MURRAY: What impact might that have on fish?

MR. NUZUM: I believe that the biological oxygen demand is going to increase. We heard that described. I think that the Biological Opinions were quite factual when they talked about a concern of being 6 milligrams per liter as a

stressor. And the fact that in the discharge areas, in particular, there could be impacts associated with having DO levels that are below 6. And, in fact, it would be a stressor and you would put those fish in jeopardy.

I think the Biological Opinion felt that the way the project would operate it may not go as far as what they consider "jeopardy."

In my opinion, if you are going to put them at that particular level for any sustainable period of time, you put them in jeopardy.

MS. MURRAY: Thank you very much for your answer.

Dr. Shum, I have just one question.

You testified that water in the Delta Wetlands' reservoirs would increase the salinity because of the evaporation, and you also testified that the salinity in the Delta channels, during filling, would be higher than the salinity of the receiving channel in July and August.

Is that correct?

1256

DR. SHUM: That's correct.

MS. MURRAY: Could allowing topping off in the reservoirs in the months such as June, July, and August decrease the salinity increases?

DR. SHUM: Yes, it would.

MS. MURRAY: Thank you. No further questions.

HEARING OFFICER STUBCHAER: Mr. Jackson.

Yes, Mr. Turner.

MR. TURNER: Jim Turner for the Bureau of Reclamation.

I spoke to Mr. Ploss after our last conversation, and he would not be available on Thursday, but tomorrow afternoon he could make himself available, if we can give him some kind of approximate time. The later in the afternoon the better, so we would be able to establish some kind of time at this point.

HEARING OFFICER STUBCHAER: 3:00 late enough?

MR. TURNER: 3:00, I am sure that would be fine if that is acceptable to you and the other parties?

HEARING OFFICER STUBCHAER: Any objections to Mr. Ploss at 3:00 p.m. tomorrow afternoon?

We will do that.

MR. TURNER: Thank you very much.

HEARING OFFICER STUBCHAER: Afternoon.

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1257

CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY CALIFORNIA SPORTFISHING PROTECTION ALLIANCE
BY MR. JACKSON

MR. JACKSON: Michael Jackson, representing California Sportsfishing Protection Alliance. And we just saved a lot of time, Mr. Stubchaer.

Could we have that chart, that last one, back up again, 6E?

Mr. Nuzum, calling your attention to that particular chart and the end of the summer period, when the line begins to go down, what is present in the Delta at that point? Are there spring-run fry present in the Delta?

MR. NUZUM: Yes. There could be spring-run fry.
MR. JACKSON: There would be juveniles of other particular salmonid races in the system?
MR. NUZUM: Juveniles, yes. You could have other juveniles in the system.
MR. JACKSON: Some of them could be winter-run.
MR. NUZUM: Some could be winter-run.
MR. JACKSON: As this -- Dr. Losee, as this chart drops off, is the plant biomass, at this point, dying? Is that what is happening?
DR. LOSEE: Some plant biomass is dying at all times. When the biomass level decreases, what we are seeing is the degradation of the organic matter and newly formed organic

1258

matter exceeds the production rates.
MR. JACKSON: So, according to this chart, at the time, there would be spring-run fry in the system; and at the end of this discharge period, the water would be discharged into the channels and this is precisely the time that there would be more decay in the biomass content; is that right?
DR. LOSEE: That is essentially correct.
MR. JACKSON: That decay causes increase in oxygen demand?
DR. LOSEE: That is fair to say, yeah.
MR. JACKSON: And Mr. Nuzum, are there presently situations in which you know that an increased biological oxygen demand has caused fish kills?
MR. NUZUM: Yes.
MR. JACKSON: And those fish kills have resulted in major damage to fisheries in California at various times, in your experience?
MR. NUZUM: Yes, they have.
MR. JACKSON: Do we know exactly where the fish are in the channels at this discharge period of time? Did we know that, for instance, in the two islands in which the water is going to be released, do we know where the Delta smelt will be at that point?
MR. NUZUM: I don't know the answer to that.
MR. JACKSON: Do we know where the spring-run salmon

1259

would be at that point?
MR. NUZUM: I don't know the answer to that.
MR. JACKSON: Do you know that anybody does, where these fish are in the Delta?
MR. NUZUM: Well, I think the trawling would pick up the Delta smelt. I don't think anybody knows really where winter-run are at that particular time.
MR. JACKSON: Now, these algae blooms, do high temperatures have an additional effect on them?
MR. NUZUM: They can.
MR. JACKSON: And anybody else who wants to jump in.
DR. LOSEE: I am afraid you have to be more specific. Temperature can affect a lot of different things.
MR. JACKSON: What are the conditions that cause the algae blooms?
DR. LOSEE: There are some knowns that are clear. Those are nutrient availability and abundant life.

MR. JACKSON: Aren't these islands creating those conditions?
DR. LOSEE: I would say they are, yes.
MR. JACKSON: There are -- what is your understanding of the depth of the water on these islands?
DR. LOSEE: As I understand it, when the reservoirs are full, the depth will be, I guess, a mean of 20 or 22 feet, somewhere in that neighborhood.

MR. JACKSON: The light would be reaching, at that point, down pretty much all the way to the bottom?
DR. LOSEE: It probably will vary over time and depending on conditions. It can have a fairly deep penetration. There are other conditions where it wouldn't be deep. Depending on the, for example, the kind of alga bloom, it maybe taking place within the water column.
MR. JACKSON: So, if there is more of an alga bloom, they would reach less deep?
DR. LOSEE: Unfortunately, it's a little bit more complex than that. If there are blue-green algae like the called Apharazomenon, that algae tends to form kind of like flakes. In that case you may have very high biomass. But since the biomass isn't clumped together, there are a lot of open spaces between the particles of biomass. So you can have very deep penetration of light in that case.
In other cases you may have algae which are just single cells alone and high biomass of that material can be more uniformly distributed throughout the water column and have less penetration, in that case.
MR. JACKSON: When you release, when this water is discharged through the pumps or through the siphons, however they release it, the algae growth goes with it in the water column?
DR. LOSEE: The algae in the water column would, sure.

MR. JACKSON: Then it is out in the channels?
DR. LOSEE: Yes.
MR. JACKSON: If it is higher than the ambient release, would you expect the amount of algae to be higher than the ambient water that is released into it?
DR. LOSEE: The biomass that I am referring to in this diagram includes all sources of biomass. So it is not just the algae that are in the water column, the phytoplankton.
MR. JACKSON: That is what would be released?
DR. LOSEE: That's correct.
MR. JACKSON: Have you done any examination of whether or not that would result in increased levels of material, reactive material, that would need oxygen at the point of release?
DR. LOSEE: It would be organic matter, and that organic matter would be subject to degradation, and that degradation would consume oxygen.
MR. JACKSON: Now, Mr. Nuzum, when you release water into a slow moving channel, what do the fish do when all of a sudden there is water coming in?
MR. NUZUM: Usually, they are attracted to it, especially if it is high in nutrients.

MR. JACKSON: So you would expect the fish in the channel to approach the release point?
MR. NUZUM: I would.

MR. JACKSON: And if that water then is demanding more oxygen because of the amount of material, biological material, carbon material, that is in it, it would be taking water from the place where the fish were attracted to. Is that correct?
MR. NUZUM: Yes, that is correct.
MR. JACKSON: So, in other words, these release points will be a fish attractant -- by the way, it is not just the, say, spring-run fry, it would also attract all fish, right, the predator fish?
MR. NUZUM: Right.
MR. JACKSON: We have at these discreet release points something that attracts the fish, depletes the oxygen, and brings in their predators?
MR. NUZUM: That is correct.
MR. JACKSON: Would you expect that there could be site specific problems caused by such a release at a period of relatively high ambient temperatures, relatively high nutrient values, and relatively high predator counts that could affect chinook salmon fry and juveniles that are in the area?
MR. NUZUM: Yes. I believe my direct testimony was to that effect.
MR. JACKSON: Now, have these algae blooms taken place in the Delta just sort of normally, without the Delta

Wetlands Project?
MR. NUZUM: Yes. There are algae blooms in the Delta.
MR. JACKSON: Have they had effect on fish, to your knowledge?
MR. NUZUM: I can't answer that question.
MR. JACKSON: When you indicated to Fish and Game that there was certain standards which, in your mind, should be set for these releases, were you talking about the pH standards?
MR. NUZUM: I was not.
MR. JACKSON: Do you believe there ought to be pH standards for the released water?
MR. NUZUM: Well, I think the releases should certainly stay within the limit imposed by the Basin Plan.
MR. JACKSON: You do believe that the Basin Plan and its standards are important in this situation for the protection of winter-run, spring-run, fall-run chinook salmon?
MR. NUZUM: I think they are important for aquatic in general.
MR. JACKSON: Would you expect that they would be within the temperature limits of the Basin Plan?
MR. NUZUM: I don't know the answer to that.
MR. JACKSON: Would you expect that it would be prudent to have a biological oxygen demand limit so that we weren't

releasing water in a situation which we were going to cause

high BOD?
MR. NUZUM: My assessment was that that was what these biologists had in mind when they developed Biological Opinions. They talked about the dissolved oxygen levels and the fact that, in their Biological Opinions, they did not want to see it reach a stressor level of 6.
I thought that was what they were getting at. They want to see it at 6 or above, so that, therefore, becomes a standard of sorts.
MR. JACKSON: You think it ought to be a hard numerical standard?
MR. NUZUM: Yes, I think it should be.
MR. JACKSON: Thank you.
I have no further questions of Mr. Nuzum. I have one or maybe two for Mr. Buck.
Mr. Buck, if I understood your testimony correctly, you indicated that for quality and price reasons, you did not see the Delta Wetlands Project as a likely candidate to solve the CUWA water supply problems?
MR. BUCK: Or any portion thereof, yeah.
MR. JACKSON: Calling your attention to Section 1264 of the Water Code, these are the application requirements, it says that if, for municipal water supply, the application shall state the present population to be served, and as near

1265

as may be the future requirements of the city.
Are you saying that this application cannot use your populations as the populations to be served because there is no likelihood at all that you would be using this water in the future?
MR. BUCK: I don't think we can categorically state that. From our position at this time, we don't see the water quality being such that we would want to see it imported, and we don't see that it would be produced in a manner that would competitive with other transfer water that we might be seeking.
MR. JACKSON: If, in fact, this water was going to be used for municipal purposes, is there a time in which you would expect all 400,000 acre-feet of it to be used for municipal purposes?
MR. BUCK: The amounts and times would vary if the proper quality conditions were met and if the environment were such that this was the most competitively priced water out there. But I couldn't see moving that amount of water in any period of time.
MR. JACKSON: And you may not be the right person to answer this question. This may not be the right panel. But there was testimony originally, at the time Delta Wetlands put on their case, that this water was going to be wheeled through the State Water Project facility.

1266

If this water was not useful for you in terms of your municipal needs because of quality, would there be some indirect damage to your customers by the tying up of the wheeling capacity for water that was of insufficient quality to do you any good?
MR. BUCK: I don't know that the tying up of the

wheeling capacity would necessarily be a problem. What would be a problem is that water being introduced and it would degrade the water quality reaching the municipal users down line.

MR. JACKSON: Thank you very.

I have no further questions.

HEARING OFFICER STUBCHAER: Any other than staff who wishes to cross-examine this panel?

Seeing none, staff.

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CROSS-EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY STAFF

MR. SUTTON: Jim Sutton.

Mr. Nuzum, in your oral testimony you talked about the need for extensive monitoring and testing around the facilities. You didn't go into detail on that.

Can you describe some of the sorts of -- I assume you are talking primarily about fishery monitoring.

MR. NUZUM: That's correct.

1267

MR. SUTTON: What sort of monitoring programs would you envision this Board requiring should it issue a permit for the project?

MR. NUZUM: I think the diversion facilities and at points to be, hopefully, decided between the resource agencies and the project applicant, that the Board would request or require that they monitor before, during, and after all of the diversion points, diversion to the island diverse points; that they establish a monitoring program that would indicate predators; and that, in addition to the predators, I think, in fact, I know I recommended that they also do some stomach analysis to indicate the size of the prey and the numbers of prey, et cetera. So that we come up with quantitative assessments of what prey was being taken by what.

MR. SUTTON: Mr. Krasner, just clarification. You testified concerning sources of bromine in Silverwood Reservoir?

MR. KRASNER: Bromide.

MR. SUTTON: What are the sources of those bromides?

MR. KRASNER: The Delta.

MR. SUTTON: When you say "the Delta," do you mean it is only from the ocean?

MR. KRASNER: The saltwater intrusion is the major source of bromide in the Delta. There are some minor

1268

sources of bromide, but in terms of the mass loading, the majority of it is in the saltwater intrusion.

MR. SUTTON: Depending on the time of year, is there loading with return flows from, say, the agricultural return flows in San Joaquin River?

MR. KRASNER: I don't really know too much about the levels of bromide in the San Joaquin River. The databases that we have established in terms of studying the bromides have primarily been in the western Delta; and those sources have definitely been due primarily to saltwater intrusion.

MR. SUTTON: Thank you.

Mr. Buck, I would like to get a couple more clarifications on your proposed standards. You're proposing both the diversion limit and a discharge limit of water quality.

Is that correct?

MR. BUCK: Correct.

MR. SUTTON: If the discharge water quality requirement is such that it is never worse than ambient conditions, why do you need a diversion requirement?

MR. BUCK: Diverse requirement was to get the best water quality possible. But the bottom line, if you will, is the discharge and the triggering above ambient. That is where injury would occur, and that would be the definition. That is the most critical factor within there.

1269

DR. DENTON: I thought that -- this is Dr. Denton.

The idea is that if you do poor water quality you would reach that situation; you could reach that situation very quickly, where you wouldn't be able to discharge.

It was more protective of the Delta Wetlands' operations rather than protecting us from water quality.

MR. SUTTON: But you would require them to be restricted to taking water less often than, indeed, State Water Project or Contra Costa would take it under those conditions; is that correct?

DR. DENTON: That could have the effect or it might just delay the period of time. At the moment, they are tending to fill fairly quickly at the beginning of the wet season. They might have to delay a bit until some of the agricultural drainages had a chance to flush out and the water quality is that good.

MR. SUTTON: In your CUWA Exhibit 2, Pages 10 and 11, where you discuss those requirements, you have maximum limitations for both TOC and TDS. You explained the reason for the TDS maximum.

What is the basis for the TOC maximum of 10 milligrams per liter?

DR. SHUM: I think that is the upper limit of what we see at Banks. As shown in CUWA Exhibit 7, Figure 17, I believe, the TOC level at Banks can be up to ten and a

1270

half.

MR. SUTTON: So, there is no health basis or anything, simply a historical maximum, in essence?

DR. SHUM: I think Mr. Krasner is in a better position to answer that. But in Stage I and Stage II of the DBP Rule 10.5 is much higher than the removal requirement is.

MR. KRASNER: When I showed the -- this is Stuart Krasner. When I showed my CUWA Exhibit 5C, I actually only summarized some of the total organic carbon removal requirements. I actually in the full CUWA Exhibit 5 give the full range of requirements, and that is Table 2. And if the organic carbon level was above 8 milligrams per liter, then the TOC removal requirement actually goes up to 40 percent.

But I was, for purpose of that exhibit, just focusing on the lower and the median ranges of total organic carbon,

not the highest range. There are more significant health impacts because, even if you had, let's say for example, 10 milligrams per liter of organic carbon in the raw water and you could remove 40 percent of it, you would still have 6 milligrams per liter.

When you go to chlorinate that water, you would still form significant levels of disinfection by-products. The higher you are, even if you have a higher removal requirement, you still end up with a significant amount

1271

after coagulation.

So it is anticipated that utilities with that high of a level will probably have to put in other technology like granular activated carbon or membranes to meet the second stage. But in the interim, you would expose consumers to a much higher level of by-products.

MR. SUTTON: Granted all that, I don't think it answers my question.

MR. KRASNER: I'm sorry.

MR. SUTTON: My question was: What was the basis for the 10 TOC? And I believe Mr. Buck said, basically -- one of you said, basically, it was the -- I think it was Mr. Shum said it was the historical maximum, essentially.

And you are saying that the requirements change at 8. The obvious question: Why is it 10 and not 8?

DR. DENTON: I think we were tying it into the range of variability that is being experienced at Banks pumping plant. Anything outside of the range that is already experienced should not be discharged.

MR. SUTTON: Your proposal also says that if the ambient water TOC is above 10, that 10 becomes the limiting -- would become the limiting standard on your proposed requirement.

Would you want that to apply even if, given a situation, for example, if ambient water was 11 and Delta

1272

Wetlands' reservoir water was 10.5, you would still want the the prohibition against release?

DR. DENTON: The idea there was -- yes. At some stage the island is going to be full of water of very high TOC. And at that point, you could continue your analogy up and say at some point it might be 20 TOC in the Delta. Should Delta Wetlands be able to dump 20 TOC water back into the Delta? So at some stage you need to be able to cap it, and say it is not just that it should be relative to ambient; it is producing a source of TOC into the Delta, and we cap that at 10 TOC.

MR. SUTTON: We just went through this discussion with Dr. Wolfe, which is, there is an additional TOC loading if the ambient -- if the Delta water is not greater than the ambient what? What I am saying is, what is the reason for a 10 TOC milligrams per liter maximum limit for discharge even if the ambient water conditions are higher than 10?

DR. SHUM: I think when the Delta water gets to over 10 milligrams per liter TOC, the project may not be diverted at that time; and to the maximum extent, to wait until the Delta water quality improves.

I don't believe the 10 milligrams per liter TOC would last for an extended period of time in the Delta. And as a consequence, if we have Delta Wetlands discharging, if the Delta at Banks is at 15, just for example, that may last for

1273

a few days. And if Delta Wetlands' discharge up to 400, up to 4,000 acre-foot of water at that concentration, that would prolong the period of time when the project cannot divert.

MR. SUTTON: If the projects are not diverting because of high TOC, why would Delta Wetlands be discharging?

DR. SHUM: That is a good question.

MR. SUTTON: The argument doesn't follow as I understand, unless I missing something. Unless they are releasing water for environmental purposes, and that is your concern, if the water is for export and it is better than ambient quality, it should make no difference what the upper limit on it is.

DR. SHUM: I think the other possible, like for other customers.

MR. SUTTON: That is not covered under these permits or EIR?

DR. SHUM: I am referring to if Delta Wetlands is discharging for wheeling by the Banks and California aqueduct for other customers at other parts.

MR. SUTTON: Well, I think we are going to have to assume that we do something. I'm not totally clear on exactly what the restrictions would be under these things, as to which would control.

DR. DENTON: Let me just clarify. It seems to me what

1274

Dr. Wolfe was saying that if Delta Wetlands was discharging ambient conditions, then you wouldn't notice a change at the Banks pumping plant.

However, I don't think he was saying, necessarily, that adding from the island a discharge of water of a certain TOC was not a load into the Delta. As Dr. Shum was explaining, was if Delta Wetlands did start discharging water of a high TOC into the Delta, that would maintain the TOC higher, longer. It wouldn't necessarily increase it above 10 DOC. It is still a load.

MR. SUTTON: Presumably, would your standard apply on a monthly basis? On a daily basis? On a weekly average? What?

DR. DENTON: We hadn't gone into the complete details. We were thinking of it on a daily basis, that there could be some averaging.

MR. SUTTON: If it was on a daily basis, would you ever have the problem where you would be sustaining something longer than you would otherwise?

DR. DENTON: If it took a month to discharge water from the island of very high TOC, it could maintain that TOC at higher levels for longer periods of time. What we would ideally want is to have 4 TOC at Banks pumping plant. Discharging at 10 or higher would then maintain the TOC above 4 or at 10 for a longer period of time.

1275

MR. SUTTON: It wouldn't be discharging at any higher than what the ambient water quality was?
DR. DENTON: Right.
MR. SUTTON: So it wouldn't be sustaining anything?
DR. DENTON: The ambient water quality is not of the quality that we would be like to accept.
MR. KRASNER: Let me perhaps --
MR. SUTTON: If I understand it, there is a difference between what you would like to have as opposed to the actual requirements that you proposing for the operation of the project?
DR. DENTON: I think there is -- what we ideally would want to preserve is this 4 TOC that's been talked about a lot today. And what we are saying is that there will be times when the ambient water quality is above 4 and if at that time the water quality in the reservoir is equal or better than what is on the island, then that would be okay to discharge.
However, you can't just keep raising that ambient and raising and matching it against what is on the Delta Wetlands' islands, because after a while that becomes a significant load, additional load, TOC into the Delta.
MR. SUTTON: Thank you.
MR. CORNELIUS: Dave Cornelius, staff.
Focusing a little bit more on bromide and the problems

1276

that are associated with that when you are doing the ozonation.
What is the threshold in the Delta for when bromides become a problem?
MR. KRASNER: Well, I don't think we have actually had a chance to experience the threshold yet. Since we have been measuring bromides, they have always been relatively high. Typically, the values that we have been measuring tend to be of the order of around 150 to 500 micrograms per liter of bromide at H.O. Banks. And I know the data from Rock Slough can get up to something like about 700 or 800 mircrograms per liter of bromide.
We, over the many years that we have been measuring bromide, haven't really seen the low bromide levels. But in terms of what we can see when we ozonate, we can see significant amounts of bromate for all of these levels.
MR. CORNELIUS: Is it your testimony, then, that there is always bromides?
MR. KRASNER: Well, there is always bromide. It depends on whether you are -- one is complying with the existing maximum contaminate level that has been agreed to, the 10 micrograms per liter standard, which I showed in CUWA Exhibit Number 5C, or whether we are looking at the Stage II standard, which is proposed to be regulated to 5 micrograms per liter. Then those lower bromide levels will be more

1277

problematic.
Again, if I just answer in terms of current treatment, there are some of the lower levels of bromide that are easier to treat to meet the 10 micrograms per liter standard, but there are other times when there are higher

levels. That puts us over the 10; and with the 5 microgram per liter standard, that is generally always difficult to meet with the kinds of levels we see in the Delta.

MR. CORNELIUS: There isn't a possibility that a prohibition on discharge of Delta Wetlands' water for sale could eliminate your concerns for bromide?

MR. KRASNER: When I answered the question, I was thinking directly just in terms of bromide with the historical total organic carbon levels.

However, when we have, as I mentioned earlier, higher, levels of total organic carbon, that will increase the ozone demand. And because it increases the ozone demand to still meet disinfection, you will see higher bromate formation even at the same level of bromide.

So, it doesn't have to directly impact the bromide concentration, but indirectly, because it increases ozone demand, it results in higher bromate formation under those circumstances.

MR. CORNELIUS: Again, there is no trigger or there is no threshold that would --

1278

MR. KRASNER: The CUWA experts' panel, again Byron Buck might be able to comment on that, did make a recommendation on what bromate level they thought would be necessary. But this was also looking at future requirements for an enhanced water surface treatment where there would be additional disinfection requirements.

MR. BUCK: Looking long-term, we'll need, if the regulations go out to 5 micrograms per liter for bromate, we will need much higher quality water than we are currently getting out of the Delta. The point being, we've got a problem now. We can't accept any more degradation.

MR. CORNELIUS: So there would be a problem now, in your opinion?

MR. BUCK: If we go out to Stage II, yeah, we would be forced to technology we can't determine are feasible at this point or cost effective or not turn around and create other problems like with reverse osmosis. If we had to go to that technology, that would increase our water demand in the Delta by 25 percent. So, to have a project pushing us in that direction, the effect of the regulation and the implementation of technology would negate any water supplied through it.

MR. KRASNER: One of the points that was in the report from the CUWA report was looking for both lower bromide levels and lower total organic carbon levels. Even if you

1279

couldn't significantly reduce the salinity, you could significantly reduce the organic carbon levels. That would indirectly also include bromates. These two parameters are linked.

HEARING OFFICER STUBCHAER: Mr. Canaday.

MR. CANADAY: Mr. Krasner, the current standards for total organic carbon or THMs, is that the 1979 standard of a hundred micrograms per liter?

MR. KRASNER: Correct. The only requirement was trihalomethane in the 1979 rule.

MR. CANADAY: And these new proposed -- I am trying to understand what happened last week that you were testifying to that was agreed to or signed. If you can refresh my memory or explain what happened last week.

MR. KRASNER: CUWA Exhibit 5C is a summary of the Stage I requirements. The participants who negotiated the rule have all signed an agreement in principle, and they have finished developing all these standards. And that is going to -- that new rule will be promulgated by November 1998. Even though, strictly speaking, these are still proposed standards, all of the stakeholders in the negotiated rule making process have agreed to these numbers, so they are going to be the numbers that EPA plans to promulgate. That is just the column that is referred to as Stage I.

MR. CANADAY: What is the status of Stage II?

1280

MR. KRASNER: The Stage II, the 40 micrograms per liter standard for trihalomethane was also agreed upon in 1993, which was part of the 1994 proposed rule, is what is referred to as a place holder. The specific language that was agreed upon in 1993 is that if there are no new negotiations to come out, a new Stage II level, the 40 microgram per liter standard, will be automatically the new standard.

That had already been agreed upon as a standard that will be in place unless there is new negotiations between now and the time that is promulgated.

And then the other point that I made was there are certain places in Stage I where some of the requirements go beyond the 80, the 60 in terms of trihalomethane and haloacetic acid, that do touch upon the Stage II standards. One of the reasons was the EPA was actually deliberately trying to encourage some utilities to move forward and meet the Stage II standards at the same time they were meeting the Stage I standards, so they wouldn't have to do capital improvements twice. They could be rewarded by going to a one stop, meeting the requirements now.

MR. CANADAY: That brings me to point. You testified earlier, I believe, that if you were going to try to plan, as a water finisher to meet the Stage I 80 micrograms per liter criteria for trihalomethane, you, as a deliverer of

1281

water, would also add a 20 percent safety factor?

MR. KRASNER: Correct.

MR. CANADAY: That would give you around 64 micrograms per liter. As Stage II becomes effective and the criteria is 40 micrograms per liter, and with that 20 percent factor, roughly 32 microgram per liter will be the target for which you will shoot. Given the current technology of your finishing water, you won't be able to meet that criteria even without the Delta Wetlands Project, given the quality of the water you are accepting now; is that correct?

MR. KRASNER: You're referring to the data that I showed in the other CUWA exhibit?

MR. CANADAY: I can refer to an exhibit, we can talk about 5H. That happens to deal with the 90 percentile bromide.

MR. KRASNER: Or CUWA Exhibit 5B.

Well, let me answer that question. For utilities that install enhanced coagulation, they will be able to comply with the Stage I standard. But in most instances, especially for treating Delta water, that would not be adequate to meet the Stage II standards. You are correct in that.

And that is why some of the utilities in CUWA are looking at also ozone as another technology that could potentially meet Stage II requirements.

MR. CANADAY: And also, I guess, we can talk about 5B. We are talking -- the question I have is the trihalomethane representative for the H.O. Banks bar graph, that data represents without the Delta Wetlands Project?

MR. KRASNER: Correct.

MR. CANADAY: Given that data as well, either for bromide or trihalomethanes certainly will be a test of your facilities to meet Stage I. But the reality is Stage II, that you will have to incur capital costs in retrofitting to meet those standards without the Delta Wetlands Project. Is that correct?

MR. KRASNER: Well, perhaps. Maybe refer the question to Byron Buck.

One reason is while California Urban Water Agencies are currently putting in place technologies that comply with the Stage I standard, one of the reasons for preparing the CUWA experts' report and providing that information to different parties -- maybe Byron can finish what I am about to say.

MR. BUCK: All things being equal, nothing changes. There's going to have to be some additional investments to meet the future standards. We are simply looking at the CAL/FED project to provide better water quality that would forestall some of these investments that might be infeasible to put in.

So, what we are talking about here, though, is regardless of all that, we've got an incremental impact in the Delta Wetlands Project, essentially an uncompensated cost that is being put upon us, in any instance. That is a shift of cost onto someone else, away from the applicant.

MR. CANADAY: I am trying to understand how the cost of the Delta Wetlands Project is going to be shifted to the finishing of water. 2002 will be here shortly. Under the most opportunistic time frame, with a two-year buildout in permitting by this agency, 2002 seems like a pretty reasonable time that that project would possibly come on line. By the year 2002, you will already have had to have made a capital investment to finish these waters to meet treatment criteria already.

MR. BUCK: The capital costs, yes. But there is additional operational cost for higher TOC, which can be chlorine demand --

MR. CANADAY: I understand that.

HEARING OFFICER STUBCHAER: One at a time, please.

MR. BUCK: There certainly will have to be capital

investment, regardless of Delta Wetlands. But there will be an incremental impact on treatment costs, regardless of what that investment has to be.

MR. KRASNER: This is just an additional comment. In terms of, let's say for example, a system that installs

1284

ozone to try to meet those requirements, as I mentioned in my direct testimony last week, we had estimated at Metropolitan to install ozone at all five of our treatment plants. Our original estimate was capital cost of $750,000,000. We then went back with a new figure of $500,000,000 which involved a lower ozone dosage. The lower ozone dosage would be the minimum we would need to comply with the disinfection requirements with the historical water quality. If we had a higher organic carbon loading, we would have to go and probably need additional capital investment in more ozone equipment than with the latter figure.

So, there could be additional capital costs. Let me -- sometimes I find it helpful, and I will make it a brief example.

The City of Los Angeles put in an aqueduct filtration plant based on treating Owens Valley water quality, which is low in organic carbon. Back in the early nineties, when they reduced how much of their water they could use and they took large volumes of State Project water, that overwhelmed the capacity of their ozone system to meet the demand based on the equipment that they had in there for the Owens Valley. So that was an instance where they did not -- they couldn't just raise the dose; they had a capacity limitation.

1285

MR. CANADAY: Back to your Exhibit 5H. So I understand the graphic, the base condition is without Delta Wetlands; is that correct?

MR. KRASNER: Correct.

MR. CANADAY: From there on with 8 milligrams, 16, 30, is to represent certain loading that will take place with the Delta Wetlands Project?

MR. KRASNER: Correct.

MR. CANADAY: Is 8 milligrams per liter statistically different from the base condition?

MR. KRASNER: In terms of the 90th percentile, it is significant in that -- was it significantly? Was that the question?

I haven't done the rigorous statistical analysis.

MR. CANADAY: Is the 8 milligrams per liter statistically different from the 16 milligrams per liter?

MR. KRASNER: Yes.

MR. CANADAY: At the uppermost part of the line?

MR. KRASNER: I believe also there are other parts of the cumulative probability distribution that are significantly different as well, such as the 75th percentile.

MR. CANADAY: I would like to go to some of the other exhibits so we have a better understanding of what they mean or what they are trying to represent.

1286

I would like you to put up Exhibit 6E, the new 6E. This graph was derived from Exhibit 6. It states at the bottom -- Exhibit 6 is basically a narrative. It doesn't provide a data set, to my knowledge, to generate a graph like this; is that correct?

DR. LOSEE: I was able to do it.

MR. CANADAY: So there is a data point that represents the peak?

DR. LOSEE: This is a conceptual graph.

MR. CANADAY: So, conceptually, is there a reason why the discharge period would be above the line?

DR. LOSEE: I am sorry, do you mean, is there a reason why in the cross-hatching, the top of the cross-hatch is above the top of the --

MR. CANADAY: I am trying to understand the reason for how this graph is, what it is trying to represent. And other than a statement that late in the summer there is an increase in plant biomass in the water column and that that happens to coincide with the proposed discharge of the Delta Wetlands, is it trying to say anything other than that?

DR. LOSEE: It trying to say that, yes.

MR. CANADAY: Other than that, nothing else. The fact that we have plant biomass there with no data points or reference points to the Delta Wetlands' line as it

1287

represents how far it is below the peak, all this is is a cartoon, if you will, of a narrative; is that correct?

DR. LOSEE: I would say that is correct. It represents the change, the level of biomass and how that changes over time. And that is the difference between conceptually what happens in a real system versus what is assumed under the Delta Wetlands model. The Delta Wetlands model doesn't account for that time variability.

MR. CANADAY: I would like to refer you, the panel, to Exhibit 6B. I am not sure who created this particular one. The title is "Factors Influencing Water Column TOC."

Referring to the pore water circulation and the bioturbation, where we have the answer no and check marks as for relative importance.

My recollection is I heard testimony from Dr. Kavanaugh regarding pore water circulation and bioturbation, that that is very difficult to measure. Would that be -- in your opinion, would that be true?

DR. LOSEE: I wouldn't term it very difficult to measure. You have to do the proper experiments to measure it.

MR. CANADAY: That could be on island?

DR. LOSEE: You could do it there, yeah. Do you want me to design an experiment, I guess that is --

MR. CANADAY: That is not my question. I am trying to

1288

understand how difficult it is. This is a representative of a criticism of that they didn't do it. I am trying to understand how difficult it really is.

So, it's been weighted heavily in its importance. I am

trying to understand, as a staff, how we would get at that information or how we might consider that information.

DR. LOSEE: Well --

DR. SHUM: For the test of bioturbation, there are quite a number of papers that have been in the literature for the past ten or twenty years to correlate the transport of that -- due to that mechanism. To say compared to what molecular diffusion, both actual measurement and theoretical population.

MR. CANADAY: That leads me to a question, part of the testimony, there was an example of an experiment in Florida that was a shallow flooding of approximately 30,000 acres. And it was looking at productivity of algae, if I my recollection serves me right.

Is that correct?

DR. LOSEE: Algae was a major component.

MR. CANADAY: Were there any replicates of that study?

DR. LOSEE: To be honest, I don't remember the details of the study.

MR. CANADAY: I'm just curious. There were criticisms of the Delta Wetlands' study for the lack of replications.

1289

But yet studies are cited to support a position, yet there is no, necessarily, there is no replication of those studies, as well. I am just trying to understand how the playing field is.

DR. LOSEE: I actually answered that in some detail in my testimony, my written testimony. For example, if you have -- if you are not going to go to the expense of dividing up that wetland into smaller sections, so you can replicate, then, at the very least, you could have taken the samples that were collected and composited for measurement of organic carbon loading in the water column. The samples were collected. They could have been measured individually. Then there would have been some measure of error. There would have been an error term in there, value for organic carbon loading.

It is the common practice. In none of these estimates that were produced in the EIR is there a way of determining what the level is and at some determined level of significance to know plus or minus how much. That wasn't provided.

You asked earlier about the importance, where that may have come from. I can read to you the summary of the introduction to one of Dr. Kavanaugh's citations, talking about flux rates. And in that, they very clearly indicate what -- they discuss these different modes of transport.

1290

May I take a moment to do that?

HEARING OFFICER STUBCHAER: I think Mr. Canaday was thinking about the next question. And so you were just volunteering this information. So I am going to allow Mr. Canaday to go ahead.

DR. LOSEE: Okay.

HEARING OFFICER STUBCHAER: You have the opportunity on rebuttal and on redirect.

DR. LOSEE: Thank you.

MR. CANADAY: Dr. Shum, one of the things that was striking about the testimony was some of the assumptions made in the example of Bacon Island. And is it true that, by any panelist here, that your estimate or assumptions of organic, total organic loading or organic carbon loading was based on the fact that the island was a hundred percent peat or, in fact, if it isn't a hundred percent peat, was that taken into account of your estimates of the loading factors?

DR. SHUM: Are you referring to Dr. Losee's written exhibit? I think that was on Page 11 of the exhibit. Are you referring to that particular equation?

MR. CANADAY: I just have it in my notes that it is a question. I am trying to understand if, and when you are doing your analysis, if, in fact, it could be Dr. Losee, that you took into account that Bacon Island is not represented as a totally peat island and, therefore, how did

1291

you account for the differences in a potential loading, mass loading?

DR. LOSEE: I believe what you are saying is that if you were to look at the island on an aerial basis, the sediments on that island are not all what would be classified as peat soil. Is that what you are saying?

MR. CANADAY: Yes.

DR. LOSEE: No. We didn't make any effort to account for that distribution of soil types. We didn't do that.

MR. CANADAY: Thank you.

Mr. Krasner, lets pose a hypothetical. Let's assume that at the pump that you do have a TOC of 4. I want to understand there is no loading that is going to occur in the canal that is going to transfer that water 400-some odd miles and end in one of your terminal reservoirs. There is loading, additional loading, that takes place?

MR. KRASNER: Well, the data that we have collected, where we have collected samples at H.O. Banks, check point 13, and samples coming out of the reservoirs, we have not seen the organic carbon levels go up.

MR. CANADAY: At all, significantly?

MR. KRASNER: At all. I think maybe Dr. Losee --

DR. LOSEE: I am sure that you would expect it to either -- those systems, where you have flowing water, most of the time the aqueduct itself, you wouldn't expect to see

1292

large increases in the reservoirs. The terminal reservoirs in the systems are deep.

So there is opportunity for oxidation of organic matter in those reservoirs.

MR. CANADAY: In the shallow portions of those reservoirs, are they very steep banked so you could --

DR. LOSEE: As a matter of fact, they are.

MR. CANADAY: So there is no source control that the parties, the CUWA agencies, can take within their own systems to help source control? The example would be the Etiwanda Reservoir that you used in Exhibit 18A where you have the Cladophora problem. What other types of source control do you need to take for your own facilities, or are there any?

DR. LOSEE: I can say that in the case of Etiwanda Reservoir they use management practices to control the Cladophora as best as possible.

MR. BUCK: I would like to add, certainly there is local source control measures at local watersheds that need to be paid attention to. What we are saying, the numbers don't change too much down the aqueduct. Further, there are a number of CUWA agencies that are virtually directly connected. They have no attenuation from reservoirs, so they are going to deal with whatever is coming out of H.O. Banks is what they are getting in their treatment plant.

1293

MR. CANADAY: Mr. Krasner, could you explain what the Malcolm Pirnie Model is or that was used for the Delta Wetlands' analysis?

MR. KRASNER: Yes. There have been many models developed to predict trihalomethane formation, and they rely on all the different parameters that impact the by-product formation, the organic carbon loading, the ultraviolet absorbance, which is a indication of a reactive fraction, bromide, temperature, pH, and how much chlorine is applied. Previously, Dr. Gary Amy had developed a model that had been used by the EPA, a nationwide model, that was based primarily on low bromide waters. That was not a good indicator or predictive model for predicting THM formations in the Delta.

We ran a series of experiments in Delta water for many years to establish a database for them to develop a new set of predictive equations that predicts trihalomethane formations in Delta waters.

MR. CANADAY: Wasn't it the recommendation of you, or other members of the water quality group, to use the Malcolm-Pirnie Model in the analysis for the EIR?

MR. KRASNER: If my memory is correct, we had recommended that their model or equation be used. However, the model that was used in the EIR was actually the EPA model using the equations that Dr. Amy had developed which

1294

had to underestimate THM formation in high bromide waters.

MR. CANADAY: But at the time, that is the model that is recognized in protocol and recognized by EPA; is that correct?

MR. KRASNER: For analysis of the central tendency where in the United States most waters tend to be low bromide water.

MR. CANADAY: That was the model that was recommended to be used by you and others to the --

MR. KRASNER: No. I recommended they consider using the Malcolm Pirnie equations, would be more robust. What I did suggest is, if they wanted to use the full EPA model with equations that Dr. Amy had developed, that they do an analysis on a Delta user and look at what was the underestimation, using that model. Perhaps at least evaluate the data in context of that underestimation.

MR. CANADAY: In the range of underestimation, what are we talking about percentagewise? How significant is that underestimation? Do you know?

MR. KRASNER: I haven't looked at that in awhile, so I don't remember. It tends to -- I think the central tendency tends to be something like at least 20 or 30 percent.
MR. CANADAY: But you don't know for a fact what it is?
MR. KRASNER: I know it is at least that much.
MR. CANADAY: Thank you.

HEARING OFFICER STUBCHAER: Ms. Leidigh?
MS. LEIDIGH: I'm not going to ask any questions.
HEARING OFFICER STUBCHAER: Ms. Forster, any questions?
That concludes the cross-examination of this panel.
Mr. Roberts, do you have any redirect?
MR. ROBERTS: Mr. Stubchaer, I think I have two questions.

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REDIRECT EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY MR. ROBERTS

MR. ROBERTS: Dr. Losee, was it your intent in your testimony in exhibits to demonstrate a precise level of primary productivity to be expected in the Delta Wetlands' reservoirs?
DR. LOSEE: No, it wasn't at all. My intent was to analyze, to assess, the analysis that was done and see if there are any shortcomings. If there were, that -- may not be the best way to address it. Was to assess how well they did in estimating biomass in that case.
And my assessment was that because of the number of problems with their experimental protocol or some oversights, that they underestimated the amount. I don't have that calculation for the precise amount, I can see that because they overlooked some things that they underestimated

the amount of photosynthetic production of organic carbon.
MR. ROBERTS: The types of things you looked at, then, you weren't intending to put them out as the number?
DR. LOSEE: No, not at all. Because there -- I felt there wasn't an adequate consideration of many factors. For example, with the biomass I just provided some of the values from the literature for habitats that are likely to occur in the Delta islands.
MR. ROBERTS: Thank you.
Mr. Buck, has CUWA taken a position and participated in other proceedings regarding the proposed projects which could degrade the Delta and the source of drinking water quality?
MR. BUCK: Yes, we have. In the past few years we have been active in a number of projects, primarily at the EIR phase. Sacramento Regional Sanitation District expansion, we have been active with them wanting to limit TOC and TDS impacts. We were very active in the West Sacramento Wastewater Treatment Plant and Bloedel Wastepaper Recycling Plant. Again, primarily a TDS. In some cases there was a TOC impact. That project was not pursued, primarily based upon our interests in that.
We also have certainly water quality interests in the toxics issues related to ecosystem water quality.

MR. ROBERTS: I think that would conclude our direct case.

HEARING OFFICER STUBCHAER: Anyone wish to recross examine on these questions?

Mr. Nelson. Limited to the redirect.

MS. SCHNEIDER: What about the redirect that came in with other people's friendly cross?

HEARING OFFICER STUBCHAER: Well, you had your opportunity right then.

Are you talking about the answers, the lengthy answers that you got when you were cross-examining?

MS. BRENNER: No, I am talking about the other people's cross-examine?

HEARING OFFICER STUBCHAER: Please come up to the mike.

MS. BRENNER: What I am referencing is other parties' cross-examination, which I would characterize as more a redirect than cross.

HEARING OFFICER STUBCHAER: Speaking specifically of Mr. Maddow?

MS. BRENNER: Mr. Maddow wouldn't do that.

I will refrain from naming any particular party, but, in general, we have very, very few recross, a couple questions is all we are asking.

HEARING OFFICER STUBCHAER: My question is, do you have -- you have recross, but not limited to the redirect?

MS. BRENNER: Correct. I have one question limited to the redirect, specifically, yes. But we have some other questions that are based on some of the cross developed by other parties. That was actually utilizing some of our cross questions, so I consider it redirect. Just didn't happen to come from CUWA counsel, came from some other members.

HEARING OFFICER STUBCHAER: I don't know. Time out.

(Discussion held off the record.)

HEARING OFFICER STUBCHAER: Back on the record.

It was a apparent that some parties, that some of the questions which were asked on cross-examination were in the nature of redirect. So, we will allow the recross examination on questions asked by parties that were aligned with CUWA.

MS. MURRAY: Can I have point of clarification as to who might be --

HEARING OFFICER STUBCHAER: I started to name names, and I probably shouldn't have done that. I would say Contra Costa Water District, East Bay MUD --

I think a lot of people asked questions that they thought were helpful to the cases they were making, so there is almost no end to it.

I know there will be an end to this.

Not you.

MS. MURRAY: For the Department of Fish and Game, I object to the Board going beyond its own rules and allowing recross on issues that were not brought up on redirect.

HEARING OFFICER STUBCHAER: Your objection is noted.

Mr. Maddow, sorry I picked on you.
MS. BRENNER: We have conversed, and we would be happy to limit our recross to redirect.
HEARING OFFICER STUBCHAER: Why didn't you say that to begin with? Okay.
MR. MADDOW: Thank you.

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RECROSS EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY DELTA WETLANDS PROPERTIES
BY MS. SCHNEIDER

MS. SCHNEIDER: I have just several questions related to the terms that CUWA has requested. Again, there seems to be a certain amount of confusion.
Mr. Buck, could you turn to Page 11 of CUWA Exhibit 2?
MR. ROBERTS: Mr. Stubchaer, I am not sure this is redirect. I don't believe I asked Mr. Buck any questions about the permit terms and conditions.
HEARING OFFICER STUBCHAER: You know, I didn't take notes on the four questions you asked.
Let's look at that exhibit and see if you can tie it to the redirect, Ms. Schneider.
MR. ROBERTS: I would like to have the question read back.
(Record read as requested.)
MS. SCHNEIDER: I will go to the first question I asked. I believe Mr. Losee intended to show a precise level of primary productivity different on Delta Wetlands. My question is:
Mr. Krasner, did you rely on Dr. Losee's imprecise analysis to justify your 32 milligrams per liter assumption?
MR. KRASNER: I used his precise 32 milligrams per liter level as one of the values that I used. I also used --
MS. SCHNEIDER: That is all I asked.
HEARING OFFICER STUBCHAER: Does that conclude your recross?
MS. SCHNEIDER: Yes.
HEARING OFFICER STUBCHAER: Now the exhibits.
MR. NOMELLINI: Other parties on recross?
HEARING OFFICER STUBCHAER: I am sorry, I didn't see you raise your hand.
MR. NOMELLINI: I don't remember you asking.
HEARING OFFICER STUBCHAER: Sorry.

RECROSS EXAMINATION OF CALIFORNIA URBAN WATER AGENCIES
BY CENTRAL DELTA WATER AGENCY
BY MR. NOMELLINI

MR. NOMELLINI: Dante John Nomellini, Central Delta Water Agency, et al.
I believe on redirect the question was raised as to what efforts were being made to avoid further degradation, and there was talk about the Sacramento Wastewater Treatment Plant and things of that type.
Am I correct that as part of your redirect I notice there is no mention if any efforts to clean up the San Joaquin River, remove the degradation on the San Joaquin

River?
Is there a reason you are not looking at that alternative?
HEARING OFFICER STUBCHAER: Where is that tied to?
MR. NOMELLINI: They were talking about the steps they were taking to minimize TDS in their water supply. And they mentioned working with treatment. I wanted to know why they are not taking these others --
HEARING OFFICER STUBCHAER: You can ask what they did.
MR. NOMELLINI: This is cross, right?
HEARING OFFICER STUBCHAER: Recross.
MR. NOMELLINI: I have a broad latitude.
HEARING OFFICER STUBCHAER: Start, Mr. Nomellini.
MR. NOMELLINI: Maybe I better shut up. This is cross-examination, as I understand it, of the redirect, and I have some broad latitude in that regard to go in those other areas --

1302

MS. LEIDIGH: No.
HEARING OFFICER STUBCHAER: Recross examination, and it's strictly limited to the redirect; and so I think an appropriate question would be, "Did you look at San Joaquin River?" but not, "Why didn't you look at the San Joaquin?"
MR. NOMELLINI: Did you look at the San Joaquin River as an opportunity to avoid degradation in your water supply?
MR. BUCK: What we stated, we have been involved in a lot of projects that have been proposed and put forward. I didn't list the complete litany of them. We are involved in the Grassland Bypass Project. CUWA quality exists to deal with both projects down the line, about a year and a half. We always are looking at programs, like I mentioned in my testimony, the concept to reverse the degradation of water and are very interested in all sorts of degradation and bringing water quality on the San Joaquin and other places.
DR. NOMELLINI: Have you looked at increasing outflow at times, have the criteria to reduce salinity and intrusion into the Delta?
MR. BUCK: That is an unknown component. Reducing salinity intrusion as the issue per se, we haven't. It is certainly part of CAL/FED solution, to increase more storage and provide outflow to help the salinity intrusion problems. That is a known fact, yes.
MR. NOMELLINI: Have you looked at reverse osmosis as a

1303

selective process for particular treatment plants to create a water source that could be blended with the raw Delta supply?
MR. BUCK: Not in that sense, no. We certainly looked at reverse osmosis as a technology. We might have to go with using that on Delta water. That one has tremendous redirected impact. There is rejection water. Reverse osmosis loses 20 percent, and if we borrow that water, that increases our demand tremendously. I don't think that increased demand on the Delta is what anyone is looking for.
MR. NOMELLINI: Would you have to RO all the water --
HEARING OFFICER STUBCHAER: You have gotten beyond the

scope, Mr. Nomellini.
MR. NOMELLINI: Thank you.
HEARING OFFICER STUBCHAER: Anyone else, recross?
Staff?
Okay. Now to get to the exhibits.
MR. ROBERTS: I would like to introduce 1 through 9. Exhibits 5A through H, 6A through 6E. That would be the revised 6E that we brought today. 7A through 7C. I believe CUWA 12 would be the overhead that Dr. Shum used on his cross-examination. CUWA 13, which I would propose be submitted by reference, would be the DWR report, Delta Island Drainage Investigation Report, June 1990.

HEARING OFFICER STUBCHAER: Objections.
Regarding the exhibits that go beyond the original exhibits, those are, in my view, illustrative of some concepts, but not hard evidence, and we will accept them in the record as that and give weight to them considering that fact.
And with that, are there any other objections?
The exhibits are received.
Thank you for your participation.
MR. ROBERTS: Thank you for your patience.
HEARING OFFICER STUBCHAER: I think we will go over the procedure.
Tomorrow we will get into the direct testimony of Contra Costa Water District, followed by East Bay Municipal Utility District. We have the Department of the Interior for time certain 3:00 p.m. California Department of Water Resources, State Water Contractors, Fish and Game. We can't do all three tomorrow, I don't think. Cal Spa, and on Thursday we will be recessing at 3:30 to enable a couple of us to catch our planes.
And so, I announced when we began this hearing that we have the 29th 30th and 31st reserved, if necessary. That is a week from today; Tuesday, Wednesday, Thursday of next week.
Staff. Do you have any announcements? Comments?

Anyone have any questions about our procedure?
Okay. We are recessed until 9:00 a.m.
(Hearing adjourned at 4:45 p.m.)
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REPORTER'S CERTIFICATE

STATE OF CALIFORNIA)
) ss.
COUNTY OF SACRAMENTO)

I, ESTHER F. WIATRE, 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 1058 through 1305 herein constitute a complete, true and correct record of the proceedings.

IN WITNESS WHEREOF, I have subscribed this certificate at Sacramento, California, on this 12thday of August 1997.

_____
ESTHER F. WIATRE
CSR NO. 1564