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 8, 1997
9:00 A.M.
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Reported by: ESTHER F. WIATRE
CSR NO. 1564

APPEARANCES

BOARD MEMBERS:

JAMES STUBCHAER, HEARING OFFICER
JOHN CAFFREY
MARC DEL PIERO
MARY JANE FORSTER
JOHN BROWN

STAFF MEMBERS:

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0003

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0004

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0005

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INDEX

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SACRAMENTO, CALIFORNIA
TUESDAY, JULY 8, 1997
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HEARING OFFICER STUBCHAER: Good morning. Welcome to the Delta Wetlands Water Rights Hearing. I am going to read an opening statement.

This is the time and place for a hearing on the water rights applications and change petitions of Delta Wetlands Properties for water storage in Webb Tract, Bacon Island, Bouldin Island, Holland Tract in Contra Costa and San Joaquin Counties, which, of course, is located in the San Joaquin and Sacramento Delta. This hearing is being held in accordance with the Notice of Hearing dated March 11th, 1997.

I am Jim Stubchaer, Vice Chair of the Board. I will serve as Hearing Officer for this proceeding. With us today, proceeding from my far left, is Board Member Marc Del Piero and Board Member Mary Jane Forster. To my immediate right is Chair John Caffrey, and to his right is Board Member John Brown.

Due to other important matters, the Board Members, other than myself, may not be present at all times during this hearing. To keep up on the hearing, each Board Member has a complete copy of the documents the parties have submitted and will have transcripts as soon as they are

available.

I believe I can speak for all other Board Members in saying that this hearing raises important issues and that we will all give it our full attention.

Assisting the Board this morning at the staff table are Barbara Leidigh, Staff Counsel; Jim Sutton and Jim Canaday, Staff Environmental Specialists; Dave Cornelius, Staff Engineer.

The purpose of this hearing is to afford the applicant, protestants, and other interested parties an opportunity to present relevant oral testimony, maps, charts, studies, and other materials which may assist the Board in determining whether the Board should approve or deny the water right applications for the Delta Wetlands Project. If the water right applications are approved, this hearing will serve as the basis for any terms and conditions that the Board may place on the appropriation of water from the project.

Please be aware that there are some aspects of the Delta Wetlands Project that must be approved by federal, state, or local government entities other than the Board. For example, the recreational facilities will require local approval, but do not appear pertinent to the water right applications.

The key issues for this hearing are presented in the Notice of Hearing.

Are copies of the hearing on the table?

MR. SUTTON: We have them here.

HEARING OFFICER STUBCHAER: They are available from Mr. Sutton at staff table. I thought I would read the key issues for those of you who may not be familiar with them.

One, is there adequate, unappropriated water for appropriation for applicant's proposed projects?

I am going to paraphrase these.

Two, will the issuance of water right permits in this project best serve the public interest?

Three, will the applicant's proposed project be consistent with water quality plans?

Four, what are the likely effects of the applicant's proposed project on water quality?

Five, how will the applicant's proposed project affect fish, wildlife, and other public resources?

Six, regarding the habitat islands, what permit terms should the Board adopt to ensure that the Habitat Management Plan is implemented on long-term basis?

Seven, what impacts may occur on adjacent islands, tracts, levees, utilities, and other properties?

Eight, should all the points of diversion and rediversion requested be approved? If not, what should be approved, and what should be the maximum capacity of each?

And nine, what terms and conditions should the State

0010

Board authorize the applicant -- under what terms and conditions should we authorize the applicant's proposed project to redivert stored water at the pumping facilities?

As I stated, I paraphrased the key issues. They are fully stated in the Notice of Hearing.

Regarding the order of proceeding, our order of proceeding in this hearing will be to first hear a brief staff presentation, then non-evidentiary policy statements from those who wish to present only a policy statement. The Board will accept written policy statements. If a policy statement is a non-evidentiary statement, it is subject to limitations as listed in the hearing notice.

After oral policy statements, we will hear testimony from the witnesses called by the applicant, followed by cross-examination by other parties, Board staff, and Board Members. If the party wishes to introduce additional evidence at that time, they can have redirect and recross.

Numerous parties with many witnesses will be appearing within the time allotted. To try and make sure we can hear from everyone in a timely manner, I encourage everyone to be efficient in presenting their case. Except where a variation is approved, we will strictly follow the procedures set forth in the Board's regulations and in the attachment to the hearing notice entitled, Information Concerning Appearance at Water Rights Hearing.

0011

A timer to keep track of the time will be used. It is located on the podium. When you have one minute to go, the light will change from green to yellow, and, at the conclusion of your allotted time, it will change from yellow to red.

It is our practice to stop the timer during interruptions, objections, Board questions, and things like

that. So the time you get will be enough time. Each day of the hearing is scheduled to begin at 9:00 a.m. and conclude at 4:45 p.m. with one hour for lunch and two twelve minute breaks during the day. I do not anticipate any evening sessions.

We will try to announce any changes in the schedule at least a day in advance. We intend to complete the hearing during the days that are listed in the hearing notice. If additional days are needed, the Board and the staff have reserved July 29th, 30, and 31.

Following the applicant's testimony and related cross-examination, the other parties' witnesses may testify and be cross-examined. We would now like to invite appearance by the parties. This is for purposes of identification.

First we will hear from the applicant, then the Delta parties, municipal parties, the state and federal water projects, the parties interested in fish and wildlife

0012

interests and issues, and two other parties. Will those of you making appearances, please state your name, address, and whom you represent so that the Court Reporter can enter this information into the record.

Who is representing Delta Wetlands Properties?

MS. SCHNEIDER: Thank you, Mr. Chair. My name is Anne Schneider with the law firm of Ellison & Schneider, representing Delta Wetlands Properties. Also with me are Barbara Brenner and Joe Nelson. They are also with the law firm of Ellison & Schneider. Our address is 2015 H Street in Sacramento.

HEARING OFFICER STUBCHAER: Thank you.

Who is representing Reclamation District Number 2059, Robert C. and Jean Benson, Brent L. and E. E. Gilbert, and Delta Water Users Association?

No one at this time. Maybe they are out in the corridor. I don't know.

Regarding folks standing in the back. We will try and find some additional chairs. We will do the best we can. We know this hearing room isn't adequate for audiences of this size.

Who is representing Central Delta Water Agency Reclamation District 38, 2027, 2036, 2038, and 2072 and M & T, Inc., CCRC Farms, LLC, and Palm Tract Farms?

MR. NOMELLINI: Dante John Nomellini with the firm

0013

Nomellini, Grilli & McDaniel; P.O. Box 1461, Stockton, California.

HEARING OFFICER STUBCHAER: Who is representing the North Delta Water Agency?

MR. ALADJEM: Good Morning, Mr. Stubchaer.

David Aladjem with Downey Brand Seymour & Rohwer, 555 Capitol Mall, here in Sacramento.

Mr. Stubchaer, in the interest of facilitating these proceedings, as you know North Delta has entered into a settlement agreement with Delta Wetlands. If it is possible, at this point, I would like to enter that settlement agreement into the record as North Delta Number

1, and thereby conclude our appearance this morning.
HEARING OFFICER STUBCHAER: Mr. Aladjem, we will get to you during the normal course of proceeding. We will, and expedite it, but right now we just want to identify the participants.
Who is representing Pacific Gas & Electric Company?
MR. MOSS: Good morning, Mr. Stubchaer. Richard Moss, Post Office Box 7442, San Francisco, 94120.
HEARING OFFICER STUBCHAER: Thank you.
Who is representing California Urban Water Agencies?
MR. ROBERTS: James Roberts, Deputy General Counsel with Metropolitan Water District. I will be presenting witness for the California Urban Water Agencies. My address

0014

is 357 South Grand Avenue, Los Angeles, 90071.
HEARING OFFICER STUBCHAER: Who is representing Contra Costa Water District?
MR. MADDOW: Good Morning, Mr. Stubchaer. My name is Robert Maddow from the law firm of Bold, Polisner, Maddow, Nelson & Judson. I supplied a card to the reporter for the spelling. Our address is 500 Ygnacio Valley Road, Suite 325 in Walnut Creek; and I will be representing Contra Costa Water District in these proceedings.
HEARING OFFICER STUBCHAER: Who is representing the East Bay Municipal Utility District?
MR. ETHERIDGE: Good morning, Mr. Stubchaer. My name is Fred Etheridge. Our address is 375 Eleventh Street, Oakland, California.
HEARING OFFICER STUBCHAER: Who is representing Diablo Water District?
MR. BOLD: Mr. Chairman, my name is Frederick Bold. I am the attorney for the District, and my address is 1201 California Street, San Francisco, 94109.
HEARING OFFICER STUBCHAER: Thank you.
Who is representing the City of Stockton?
MS. CAHILL: Virginia Cahill of the law firm of McDonough Holland & Allen. Our address is 555 Capitol Mall, Suite 950, Sacramento, 95814.
HEARING OFFICER STUBCHAER: Thank you.

0015

Who is representing the Bureau of Reclamation?
MR. TURNER: Morning, Mr. Stubchaer. Jim Turner, Office of the Regional Solicitor, Pacific Southwest Region, 2800 Cottage Way, Sacramento, 95825.
HEARING OFFICER STUBCHAER: Thank you.
Who is representing Department of Water Resources?
Ms. Crothers: Good morning, Mr. Stubchaer. My name is Cathy Crothers; 1416 Ninth Street, Sacramento.
HEARING OFFICER STUBCHAER: Thank you.
Who is representing the State Water Contractors?
MS. DIGNAN: Good morning. My name is Mary Dignan. I am with Kronick Moskovitz Tiedemann & Girard, here in Sacramento. Just like to announce that Cliff Schulz, who will be lead counsel for the State Water Contractors, is late; he is at a Calaveras County Water District meeting, you are very familiar with. He will be here before noon, and will therefore act as lead counsel.

Also, for the benefit of parties in this room, you may notice that I am wired up and that means you guys are too. This is my hearing attachment so that I can hear. I am not doing anything weird, like recording you guys surreptitiously. I would like to, but I don't think I can get away with that. For your information, I don't see very well either. I have a very narrow visual field. So, if I bump into you, it is not because I am trying to be mean to

0016

you; it's because I really am, seriously, trying to ignore you and keep you out of my visual field.

That is my statement, thank you.

HEARING OFFICER STUBCHAER: Thank you, Mary.

Who is representing the Department of Fish and Game?

MS. MURRAY: Nancee Murray, 1416 Ninth Street, 12th Floor, Sacramento, 95814.

HEARING OFFICER STUBCHAER: Thank you.

Who is representing the Bay Institute of San Francisco?

No one at the present time.

Who is representing the California Sportfishing Protection Alliance/Committee to Save the Mokelumne?

MR. JACKSON: Michael Jackson, Post Office Box 207, Quincy, California, 95971.

HEARING OFFICER STUBCHAER: Thank you.

Who is representing Peter M. Margiotta.

MR. MARGIOTTA: I am. Good morning.

HEARING OFFICER STUBCHAER: You are Mr. Margiotta?

MR. MARGIOTTA: I am Mr. Margiotta.

HEARING OFFICER STUBCHAER: Will you please state your address, Mr. Margiotta?

MR. MARGIOTTA: 122 Castle Crest Road, Walnut Creek, California, 94595.

HEARING OFFICER STUBCHAER: Thank you.

0017

Who is representing Amador County?

MR. LILLY: Morning, Mr. Stubchaer. Alan Lilly of Bartkiewicz, Kronick & Shanahan, 1011 Twenty-Second Street, Suite 100, Sacramento, California. Appearing for Amador County. I will submit a card to the reporter.

HEARING OFFICER STUBCHAER: Thank you.

Who is representing the California Department of Transportation?

MR. COWELL: Morning, Mr. Stubchaer. My name is Dana Cowell. California Department of Transportation, District Office in Stockton, District 10, 1976 East Charter Way in Stockton, 95201.

HEARING OFFICER STUBCHAER: Are there any other persons who wish to participate?

Seeing none, I'll go back.

Who is representing -- is there anyone here representing Reclamation District 2059, the Bensons, the Gilberts and the Delta Water Users Association?

I am sorry, did I miss someone? Did someone stand for that?

And the Bay Institute?

Please stand.

MR. SHIMASAKI: My name is Kyser Shimasaki. My address is 4412 Mallard Creek Circle, Stockton, California 95207.

HEARING OFFICER STUBCHAER: Thank you.

At this time Ms. Leidigh will cover a few procedural items and introduce the staff exhibits.

MS. LEIDIGH: Thank you.

First of all, I want to announce that the Board's Division of Water Rights did send notice by certified mail to all parties who had undismissed protests on file at the time the notice was issued. The Division of Water Rights have received certified mail return receipts from all except one of the parties to whom it sent notices via certified mail. That party was 99 Sportsmen's Club, which has disbanded and has sold its land since it filed its protest. The Division of Water Rights is sending notice via regular mail to the current owner of the land.

Next, I would offer into evidence by reference the documents listed in the State Water Resources Control Board staff exhibits. The list of staff exhibits is on enclosure two of the hearing notice. The staff exhibits in that enclosure are numbered from 1 through 14. I am adding an additional exhibit to the list to be numbered SWRCB-15.

SWRCB-15 is a cover letter dated June 26, 1997, addressed to Jim Monroe at the U.S. Army Corps of Engineers, and it's enclosed Final Conference Opinion issued by the National Marine Fishery Service regarding steelhead trout for the Delta Wetlands Project. Copies of that document are available at the staff table.

If no one has an objection, I will dispense with reading the list of staff exhibits into the hearing record.

HEARING OFFICER STUBCHAER: Does anyone object?

MS. LEIDIGH: Hearing no objection. The Court Reporter will have a copy of the hearing notice with the original list of staff exhibits enclosed.

With the addition of SWRCB-15, I offer into evidence by reference the documents that are listed in the SWRCB staff exhibits. Are they accepted?

HEARING OFFICER STUBCHAER: Are there any objections to the acceptance of the staff exhibits into the record?

Hearing none, they are accepted.

MS. LEIDIGH: Finally, I would like to point out that any party who wants a copy of the hearing transcript must make separate arrangements with the Court Reporter.

That is all I have.

HEARING OFFICER STUBCHAER: Esther, the Court Reporter, do you have your business card for those who wish to contact you?

MS. WIATRE: I do.

HEARING OFFICER STUBCHAER: Thank you, Ms. Leidigh.

We will now go to the oath of affirmation.

Will all those who may testify during this proceeding, please stand?

(Oath administered by Hearing Officer Stubchaer.)

HEARING OFFICER STUBCHAER: You may be seated.

Ms. Leidigh, would you please provide a brief orientation regarding the proposed project in the water right applications?

MS. LEIDIGH: Certainly.

First thing I want to do is point out the location of this project. It is in the Delta, and there are four islands in the Delta. Webb Tract over here. Bacon Island. Webb Tract just north of Franks Tract, and Bacon Island down next to Mildred Island are the two reservoir islands.

Bouldin Island and most of Holland Tract are proposed for wildlife habitat mitigation under the proposed project. Holland is here, just south of Franks Tract, and Bouldin is up a little bit to the north and east of Webb Tract.

Now, we are going to look at this other display board over here because it is a little easier to see. This shows the islands in better detail. Bouldin and Holland as wildlife habitat. There is a part of Holland Tract that is not going to be part of the project, and that is shown in white on there. Then Webb Tract and Bacon Island are the reservoir islands.

Delta Wetlands has filed water right applications to divert water from the channels of the Delta onto all four of these islands, and the applications are summarized in Tables 1A and 1B in the hearing notice.

0021

Under Delta Wetlands current proposal, it may not be necessary to approve all the applications for the habitat islands or to approve them for the full amounts requested since these islands are not expected to store water. However, Delta Wetlands are not withdrawing its applications, so they remain under consideration.

One of the things that you should notice here is the proposed discharge pump stations on two reservoir islands are located on the south side of the island. And you also see intake siphons, and those are the yellow dots there on the northern side on Bacon and on the south and north on Webb Tract.

Delta Wetlands, under its proposed alternative, would store water on the two reservoir islands during the season of diversion and would discharge the water from the reservoirs when it could sell it, either for consumptive uses or to meet requirements on other water right holders who provide Delta outflow.

Up here you have a little map, and you might want to look at it at some point. It shows some of the routing on how the water might be transferred to the bank pumping plant and to the Tracy plant for export.

Now I am going to go back to my desk.

The purpose of this hearing is to determine whether, and under what terms and conditions, the water right

0022

applications filed by Delta Wetlands should be approved. Some parts of the Delta Wetlands Project are outside the water right permitting authority of the State Board, and must be approved by other governmental agencies before the full project, as described in the Draft EIR/EIS, can go forward.

For example, the SWRCB will be not be issuing permits for construction of the recreational facility planned by Delta Wetlands. Those facilities will require approval by a local agency and by the Corps of Engineers. Under the state and federal laws requiring environmental documentation, the lead agency for the Delta Wetlands Project are the State Board and U.S. Army Corps of Engineers. Jim Munroe is the representative of the Army Corps of Engineers who has worked on the environmental documentation.

To meet their statutory obligations, the State Board and the Corps have jointly prepared a Draft EIR/EIS and biological assessments for the Delta Wetlands Project, using the consulting firm of Jones & Stokes Associates, and they are present here today.

The Draft EIR/EIS has been circulated, and comments have been received on the Draft EIR/EIS. Comment period is closed at this point and responses to the comments will be prepared after this hearing as part of the final EIR/EIS.

0023

Accordingly, this is not a hearing on the draft environmental document.

The draft environmental document, however, is a piece of evidence in this hearing and subject to the same considerations as any other piece of evidence in this hearing. The final environmental document will be available at or around the time when the State Board releases the draft water right decision for the Delta Wetlands water right application.

I also would like to point out, finally, Delta Wetlands has subpoenaed several of the staff of the EIR/EIS consultants, Jones & Stokes, to testify in this hearing.

Pursuant to agreement executed by the two lead agencies, Jones & Stokes and the applicant, the Jones & Stokes' witnesses will testify only regarding the environmental documentations, and their testimony will not include advocacy of the project. Witnesses for Delta Wetlands, other than Jones & Stokes' employees, will testify regarding project matters other than the environmental documentation and may engage in advocacy of the project.

That is all I have. If there are questions, I will be happy to answer them.

HEARING OFFICER STUBCHAER: I think we will only ask Board Members questions at this time.

All right. I would like to take just, maybe, a couple

0024

of minutes and move these chairs out there in that empty space so maybe we can accommodate a couple more standees.

We will now proceed with policy statements. Will those who wish to make policy statements please raise your hand.

Just two? All right.

Is it Shimasaki?

MR. SHIMASAKI: Yes, it is.

HEARING OFFICER STUBCHAER: Please come forward.

MR. SHIMASAKI: My name is Kyser Shimasaki. I reside at 4412 Mala Creek Circle, Stockton, California, 95207.

I would like to take this opportunity to provide some general comments on the Delta Wetlands Project.

Our family has been farming in the San Joaquin Delta for many years and specifically on Bacon Island as tenant farmers since 1918, shortly after it was reclaimed, and as landowners since 1974. Over the past 39 years that I have personally been involved in farming on Bacon Island, I have observed cumulative subsidence of the land, and it's becoming a serious threat to the integrity of the levees.

Until approximately ten years ago, 90 percent of Bacon Island's surface was peat soil, and high income crops justified reclamation assessments to improve and maintain the levees surrounding the island. Now, within the same farm fields, we can have several types of soil, which makes

0025

farming very difficult.

Presently, we on Bacon Island, like other farmers in the Delta, are constantly struggling to find a new profitable crop to justify more revenues to buttress our levees. We have made a good living from farming, but have seen signs that the land cannot be farmed forever in the manner that we are used to. Because of increased seepage, parts of the ranch are now too wet to manage as farm lands. The levees have become increasingly tall and expensive to maintain. The risk of a flooded island from levee breach increases each year.

The Delta Wetlands Project seems to be a good way to profitably use the land on a long-term basis. I hope that you favorably consider the project.

It is not easy for me to see the land that my family has farmed for so many years go out of agricultural production. But the reality of it is that the combination of water storage and wetlands creation seems an economically feasible way of returning the land to a more natural state before mother nature itself reclaims the islands without economic or environmental benefit.

I thank you for considering these comments.

HEARING OFFICER STUBCHAER: Thank you, Mr. Shimasaki, for your participation. Your comments will be part of the record.

0026

MR. SHIMASAKI: Thank you.

HEARING OFFICER STUBCHAER: Mr. Bold, do you wish to present a case in chief or just a policy statement?

MR. BOLD: Thank you, Mr. Chairman. I am Frederick Bold, the attorney for Diablo Water District.

HEARING OFFICER STUBCHAER: Mr. Bold, are you going to do anything other than present a policy statement during this proceeding?

MR. BOLD: Yes. I have been authorized by the Board of Directors of the District to read the following brief statement.

HEARING OFFICER STUBCHAER: Yes, Mr. Bold. We would appreciate it if you could do that as the part of your opening statement for your case in chief, if I understood your statement correctly?

MR. BOLD: I don't think we will have a case in chief.

HEARING OFFICER STUBCHAER: That is my question.
Proceed with your policy statement.
MR. BOLD: Thank you.
The Delta Water District is a county water district in Contra Costa County, and it is in the Sacramento-San Joaquin Delta. Its territory comprises the portion of the Contra Costa Water District that is east of the City of Antioch. It contains approximately 11 square miles, extending from the San Joaquin River south to Brentwood.

0027

Delta Water District is the purveyor of potable water for municipal and industrial use to approximately 20,000 people. Its sole source of water, except for a single well for emergency use, is Central Valley Project water, which it purchases from Contra Costa Water District and which is delivered through the Contra Costa Canal.
Delta Water District protested the applications for the Delta Wetlands Project because of its apprehension that the project will cause a deterioration of the quality of DWD's water supply. Delta Water District has two concerns:
First, that diversion of water onto the Delta islands will reduce Delta outflow which may increase saltwater intrusion and deteriorate the quality of water at the intake of the Contra Costa Canal and in the future at the intake of Los Vaqueros Project.
Second, that the water released from the reservoirs may contain contaminants which will further deteriorate quality at those intakes. Any permits issued for the Delta Wetlands Project must be conditioned to provide positive assurance that there will be no measurable degradation of water at the sources of Diablo's water supply. If such assurance cannot be given, the applications should be denied.
Thank you, Mr. Chairman.
HEARING OFFICER STUBCHAER: Thank you, Mr. Bold.
MR. MADDOW: Mr. Chairman.

0028

HEARING OFFICER STUBCHAER: Yes.
MR. MADDOW: Robert Maddow appearing on behalf of Contra Costa Water District. The general manager of Contra Costa Water District, Walter J. Bishop, was identified in our Notice of Intent to appear, both as an expert and for the purpose of making a policy statement. At the time we submitted the evidence on behalf of the water district on June the 3rd, the statement submitted by Mr. Bishop is actually in the nature of a policy statement. It is an overview of the relationship between the Delta Wetlands proposed project and the Contra Costa Water District, and we believe that it is an appropriate policy statement to begin our case in chief.
We may run into a little problem with scheduling. Mr. Bishop, unfortunately, is only able to be here during the last week of the hearing. I would ask the Board's indulgence to permit Mr. Bishop to deliver that statement out of order in the event you get to our case in chief at an earlier time when he, unfortunately, will be out of state and unable to appear.
HEARING OFFICER STUBCHAER: I think that is a

reasonable request. We can do that, subject to your overall time limitations.

MR. MADDOW: Thank you very much. Again, if the timing works out that we are going in that last week, we will do it

in the more orderly way.

Thank you.

HEARING OFFICER STUBCHAER: Other policy statements?

Bay Institute, National Heritage Institute.

Morning. State your name and address for the record.

MR. BOBKER: My name is Gary Bobker. I am the Acting Executive Director of the Bay Institute of San Francisco. I apologize for not being here for your calling of the parties. This is a timely entrance.

HEARING OFFICER STUBCHAER: Glad you got a seat.

MR. BOBKER: I am going to make a policy statement. I may be participating in cross-examination at some point, and if not myself then either Alise Hollands, our fisheries program manager, or Peter Vorster, our staff hydrologist at the Bay Institute, may also do that.

The reason we are making a policy statement is that there are, believe it or not, some other things happening concurrent with Delta Wetlands Water Rights hearing, particularly the CAL/FED Bay Delta Program and its ambitious schedule and the Central Valley Improvement Act, which periodically threatens to be implemented. Those somewhat divert us from our original intent, which was to submit testimony. But that doesn't betray a lack of interest in our part, in that we are restricting it to a policy statement.

So if I go a little long on the policy statement, perhaps you will indulge me with that in mind.

We filed a protest of the original Delta -- I guess it wasn't the original; it was one of the iterations of Delta Wetlands water rights application a couple years ago. We continue to be a party of interest and continue to have reservations about the applications.

Before I state some of the details of why we continue to have reservations about that application, I would like to say that I think that proponents of Delta Wetlands Project have tried very hard to take and incorporate many measures to mitigate the impacts of the project. They worked in good faith and outreached to environmental and fishery interests; and that is really appreciated in my community.

If they failed to go as far as we think they should, I think that comes down to, one, the fact that it is a project that is, perhaps, inappropriately considered isolation from some other things. And partly because, understandably, as a private enterprise, they are bound by certain economic viability interests, which may not be the ultimate considerations that you, as a Board, should consider in looking at the water rights application.

The three major issues that we continue to be concerned about with regard to Delta Wetlands are, first of all, the concern we have about the basic premise, which is that Delta

Wetlands would divert storage and then discharge for later rediversion available surplus water. We think that that undermines the environmental benefits we gain from the Bay-Delta Accord and has a potential for seriously impacting a wide range of Bay-Delta fishery resources and other applied resources.

Secondly, we are concerned that moving ahead with Delta Wetlands at this time may be inconsistent with a long-term solution that is being worked on by the CAL/FED Bay-Delta Program.

Third, we are concerned that the benefits aren't great enough. We are actually, I think, over the last few years setting a new threshold, a new bar to cross when we consider new projects in terms of the environmental and reasonable and beneficial use, benefits that they have to provide.

That is what I would like to talk about, is those three concerns.

About the first concern, the available surplus in the system which provides the basis for the new developed water that Delta Wetlands would provide. I think that that is based on a drastic misunderstanding of what the Bay-Delta Accord provided us. As you know, the Bay Institute was a signatory to that Accord. Many in this room were involved in the development of the Accord. The export criteria are not inherently biologically protective. No one who was

0032

involved in the development of the Accord ever claimed that they were.

What we did in looking at how the system would be operated, using current storage conveyance capacity of the state and federal water projects, was determined that those expert criteria would be limiting in drier years, and that the current capacity of the system would be limiting in wetter years; in that those two characteristics together provided an adequate level of protection that actually well exceeded the direct regulatory requirements of the export criteria and the other operational criteria.

In fact, our agreement to the accord was premised on that. The documentation with which the federal agencies based their acceptance of the Accord is a substitute for their either existing or proposed actions at that time was based also on that State Water Board's environmental documentation for the '95 Water Quality Control Plan was also based on that.

HEARING OFFICER STUBCHAER: Mr. Bobker, how much more time will you need?

MR. BOBKER: I would say five to ten minutes.

The fact that the project could divert 50 to 90 percent of that available surplus could cause dramatic adverse impacts to a wide range of species. That is acknowledged even in the biological opinions for this project. In the

0033

February-March period, out of that critical late winter and spring period, we identified as being very important for a wide range of species. Diversions of that magnitude would cause a general degradation of estuarian habitat and would cause particular impacts in February and March to longfin

smelt and to out-migrating winter-run and, depending on the timing of rediversion, to striped bass and to Delta smelt during the November-January period when a number of 90 percent of -- up to 90 percent of available surplus could be exported.

We since have identified, since the signing of the Accord, and your adoption of on the Water Quality Control Plan, some very serious concerns about potential impacts to spring-run and steelhead as the result of just the status quo operations of the water projects.

We need, in fact, to look more seriously at improving protections during that period. This would go potentially in the other direction. We are very concerned about those impacts; therefore, and this is -- I am summarizing in my comments. We believe that there should be very stringent requirements on any water rights application, which would, essentially, until you have re-examined the impacts of the Water Quality Control Plan and done some other things, would not allow additional diversions during February and June, would place some very strict restrictions outside of that to

0034

avoid jeopardy conditions to species like spring-run and steelhead.

In terms of CAL/FED, CAL/FED is working to look at a comprehensive plan. That is a plan that doesn't just look at a water supply project. It looks at restoration. It looks at flow. It looks at demand management. All those together, hopefully, will make up a long-term plan that everybody can live with.

The problem is that, taken in isolation, the Delta Wetlands Project could preclude some major components that are being considered by CAL/FED from being implemented. For one thing, CAL/FED has identified the need for major flow increases during the late winter and early spring, a period when, in fact, Delta Wetlands would be removing much of the available surplus from the system. That seems to be a conflict. We are not sure how exactly the Delta should be reconfigured to be better habitat. Until we do, it might be premature to establish a major water project right in the heart of that. We are, also, not sure how extensive demand management in this system will affect the need for new projects, like Delta Wetlands.

This doesn't mean that Delta Wetlands doesn't have a role to play; it just means that we don't really know what, if any, role it has to play until CAL/FED goes through that process. And we strongly urge you to defer consideration of

0035

the application until the completion of the programatic EIR/EIS.

The final point is just about threshold requirements; and that is, as I was saying, over the last few years I think we have reached kind of a turning point. We no longer look at projects in terms of what it takes to mitigate their environmental impacts, or assume that they will provide water for reasonable and beneficial uses. I think you have to prove it.

In the case of Delta Wetlands, although I think they've

made an attempt to try and provide some benefits, those benefits are not commensurate with the kinds of projects we are looking at in this system. Congress authorized the CVPIA reallocated yield, had major fee placed on water use, did some other things in terms of conservation and land requirement to ensure that that project would provide significant new environmental benefits. Similarly, CAL/FED has identified restoration of ecological health and some major programs to achieve that as integral to any long-term comprehensive plan. I don't think, though, Delta Wetlands passes that kind of bar. Perhaps, after we've gone through the planning process, it could be made to be consistent with that, but we don't know the answer to that yet.

HEARING OFFICER STUBCHAER: Mr. Del Piero.

MEMBER DEL PIERO: Gary, I must have misunderstood you.

0036

You were indicating that the plan that hasn't been produced yet should be the criteria by which the application which is before us should be judged?

MR. BOBKER: I am saying that the plan which is in progress, which is consistent with other large scale restoration plans that have been undertaken in this country are setting some very high thresholds for what success is in terms both of what the new environmental benefits that are created are and in terms of the kinds of water management strategies that ought to be included in any overall water management scheme.

Now, admittedly, the CAL/FED long-term plan is not complete yet, which I think reinforces my previous point that it may be premature to evaluate and make final decision on this project until that plan is in place and we see whether it is consistent with that. I am suggesting, all that the indications would indicate that it does not provide benefits commensurate with where CAL/FED is going and where other initiatives have.

I think, actually, that was my final point, Mr. Chairman. Thank you for indulging me.

HEARING OFFICER STUBCHAER: You're welcome. Thank you for your participation.

MR. BOBKER: I believe that David Fullerton from the National Heritage Institute would like to make a policy

0037

statement. I don't know if he returned to the room yet.

HEARING OFFICER STUBCHAER: He is there, and I understand that Mr. Wolf has arrived, also.

Mr. Fullerton.

MR. FULLERTON: Morning, Mr. Chairman and Members of the Board. I am David Fullerton from the National Heritage Institute at 114 Sansome Street in San Francisco. I can be very brief. Most of my comments are very consistent with what Gary Bobker said, except that I think NHI is more sympathetic to looking at the project as an isolated project, as a separate stand-alone project.

The main criterion that we look at when looking new projects in kind of the modern era is: Do they provide significant net benefits to the environment? That is the fundamental rule that, at least, NHI uses; and we look at

all the projects that way, including South Delta Facilities and anything else that comes down the pike.

We believe that this is the way water management in California is moving, toward integrated projects. We are no longer looking at water extraction from the environment, simply as a way to grow the economy. But changes in water management in the future should benefit both the environment and the economy.

So our question is: How well does Delta Wetlands do that? It clearly provides water for whoever can afford the

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price, but does it, in fact, assure that we are going to get environmental benefits. Our answer is a qualified no. We think that there are some real advantages to the project; in particular, the terrestrial program we think is quite first rate. We are very happy with that. We are happy with the likelihood that these Delta islands will become more sustainable in the future as a result of the new investment that the Delta Wetlands plans to make.

Our main concern has to do with fisheries. You don't see advantages to the fisheries from this project. We see possible negatives from the project. We are going to be seeing a lot of diversions. Let me put it this way, given the operational plan that is before you, we are looking at a lot of diversions at the wrong times of the year. We are looking at diversions of flows that are just barely above minimum standards. So, we are going to taking a variability out of the system, which, I think, is probably a bad thing ecologically. The most likely scenario for delivery of the water is to the export pumps. So we are going to see double diversions of export water so fish will have twice the opportunity to get pulled in and killed.

We basically look at the operational plan as one-sided; that it doesn't provide enough for us to be able to claim that there are fishery benefits. We are quite prepared to support the Delta Wetlands Project and see it go forward,

0039

but only if the operational rules are modified so as to provide clear fishery benefits. This would require that more stringent conditions be placed on wind diversions being allowed; and we think, also, a greater dedication of the water diverted to environmental purposes so that some greater percentage would be under the control of, perhaps, Fish and Game, for release on an environmental schedule.

In fact, we think that the California Department of Fish and Game opinion is a reasonable direction for the Board to go in in trying to come up with a plan that allows Delta Wetlands to go forward, to make the profit that they need to justify the project, but also providing fishery benefits.

So, we would ask either that the State Board deny the petition or place appropriate conditions on the project to assure fishery benefits.

Thank you.

HEARING OFFICER STUBCHAER: Thank you, Mr. Fullerton.

Is Mr. Wolf present?

Please state your name and address for the record.

MR. WOLF: My name is Kevin Wolf. I live at 724 N Street in Davis, California.

Thank you for the opportunity to speak in support of Delta Wetlands Project. For the last 18 years I have been working in the area of rivers and watersheds. During the

0040

first ten years, I worked for Friends of the River, helping protect rivers from the threats of new dams. Over the last ten years, operating primarily as an independent consultant, I have been working with traditionally antagonistic water stakeholders to help find new solutions to old problems; solutions which meet the interests of all parties, but not necessarily the positions that they come into the discussions with.

I am here as a citizen volunteer only, and I am not representing any project, client, or organization with whom I work. I am speaking today because I have been an enthusiastic supporter of the Delta Wetlands Project since I first heard it almost ten years ago.

I advocate in support of their water rights application because I believe that the Delta Wetlands Project will meet the basic interests of all the stakeholders, though it may not satisfy their positions, positions that are based on their understanding that the project might hurt some component of their existing efforts or future plans.

The benefits the project provides, in my opinion, far outweigh the positions of concern and problems that it might cause. No matter what future options CAL/FED comes up with for fixing the Delta, it is in everyone's interest that the Delta islands and their levees are not abandoned to the waves. The loss of Delta island levees will have disastrous

0041

impacts on resident and migrating fish species. Yet, without significant investment from as yet unidentified sources, most Delta island levees will be ruined within my lifetime because the hydrostatic pressure on the levees will continue to increase as the islands continue to subside.

The Delta Wetlands Project, on the other hand, significantly upgrades critically important levees in the heart of the Delta without public expense. Without Delta Wetlands what will happen to these islands over the next 50 years and who will pay for levee upgrades?

Another interest almost everyone shares is that more water supply is needed for Californians and for the San Francisco Bay Delta. Most new storage projects, whether on or off stream, face strong opposition from the environmental community because they cause the loss of scarce terrestrial habitat and usually end up harming the natural flow and timing of water through the system.

For example, both in Auburn and Sites Dam would each inundate thousands of acres of land. The Delta Wetlands Project, though, converts reservoir land that have little environmental value and are currently degrading Delta water quality through its farming and irrigation practices. And because the reservoir store water at the end of the river system, just before it makes its way to the ocean, during high water flow months, the impacts to the natural river

0042
system upstream are dramatically reduced.
From the environmental point of view, the conversion of almost 10,000 acres of historic agricultural lands to new wetland habitat in the heart of the Delta provide an enormous ecological benefit. These two islands are in the center of the historic waterfowl habitat range in the Central Valley, an area that presently has relatively little substantial waterfowl habitat. What other projects can provide as much water with as many substantial environmental benefits?
The Delta Wetlands Project also fits well with the Natural Heritage Institute's proposed Delta Restoration and Management Authority vision on a long-term solution to the dilemma facing the Delta islands. It envisions Delta landowners willingly selling their land to this authority for conversion to habitat and reservoirs. In time, as restrictions on non point water quality pollution gets stricter and as levees get weaker, landowners will see DRAMA as an excellent solution to their problems.
By now, I have not heard anyone else proposing a realistic plan for solving this long determined disaster facing the Delta. We have here, with the Delta Wetlands Project, a private business, is willing to make a significant investment in exactly what DRAMA proposes to do.
A decision by the Board in favor of the Delta Wetlands
0043
Project will be a positive, significant step towards addressing the long-term problems facing the Delta islands. It is not a commitment to NHI vision, but it certainly shows that the Board is thinking of long-term problems facing the islands and the Delta, overall.
During almost two decades of action in the water arena of California, I have no other project which goes to the lengths of the Delta Wetlands Project to forthrightly work to resolve all the concerns brought to it. No project has done such an extensive effort in their EIS/EIR and in their work preparing for their water rights hearing. The Board faces a possible unintended consequence if it denies the water rights application. What other water storage project has any chance of being approved if this one isn't? What message will the Board be sending in a denial?
Thankfully, I trust that the benefits of the Delta Wetlands Project to the fundamental long-term interest of the stakeholders and the state are so strong that the Board will vote in support of the application and send a positive message to everyone.
Thank you for the opportunity to speak on this.
HEARING OFFICER STUBCHAER: Thank you, Mr. Wolf.
Do you have copies --
MR. WOLF: Yes, I do.
HEARING OFFICER STUBCHAER: Is there anyone else who
0044
wishes to make a policy statement?
Is the Farm Bureau represented?
MS. LEIDIGH: The Farm Bureau has sent us a letter saying they would not appear, but they gave us their policy

statement in writing.
HEARING OFFICER STUBCHAER: All right. Written policy statement.
That concludes policy statements. We will next go to cases in chief. But before we do that, let's go back to Mr. Aladjem's issue.
Please come forward.
MR. ALADJEM: Thank you very much, Mr. Stubchaer.
As I indicated earlier, North Delta Water Agency has reached a settlement with Delta Wetlands. In essence, this calls for the addition of a proposed term to the permit or license, if the Board chooses to issue a permit, which would require Delta Wetlands to maintain water quality to North Delta Water Agency. What we would like to do, if it is acceptable to the Board, is to offer that settlement agreement as North Delta Number 1, and I have provided copies to Ms. Leidigh yesterday of the agreement, and I have copies here for all the other parties.
With that introduction of the North Delta Number 1, we would conclude our presentation before the Board.
HEARING OFFICER STUBCHAER: We will accept that as part

0045

of the record. Of course, we won't rule on whether we are going to accept it or not because this is an evidentiary hearing.
Ms. Leidigh, do you have an additional comments on this issue?
MS. LEIDIGH: I don't think there is anything else that really needs to be said. We do have the copies that Mr. Aladjem had delivered yesterday, and they will be distributed to the Board Members. Apparently, they haven't been distributed yet.
HEARING OFFICER STUBCHAER: Thank you. That means that we won't be hearing from you during the rest of the proceeding?
MR. ALADJEM: Yes.
HEARING OFFICER STUBCHAER: Is that correct? Maybe you want to cross-examine. I don't know.
MR ALADJEM: I think in this case, Mr. Stubchaer, we will forego that pleasure.
Thank you very much.
HEARING OFFICER STUBCHAER: Thank you.
Yes, Mr. Turner.
MR. TURNER: May I make a similar presentation to facilitate, as well?
HEARING OFFICER STUBCHAER: I was just going to ask. All settlement agreements will be heard first.

0046

MR. TURNER: Good morning. I am Jim Turner, appearing on behalf of the Bureau of Reclamation. As each of you Board Members knows, we did, in fact, submit some protested testimony by Bureau official, Lowell Ploss, to be presented at this particular hearing in protest of the Delta Wetlands applications.
However, since that time, the Bureau of Reclamation and Delta Wetlands have entered into a settlement agreement, copies of which were sent to all the parties and to Ms.

Leidigh on July 2nd. And one of -- the only condition that was included in the agreement that we reached with Delta Wetlands is that we did ask that we be permitted to participate in the hearing, simply to cross-examine the witnesses, if that would be necessary. Presumably, as an interested party, but we would not be presenting any direct evidence on behalf of the Bureau.

So what I would like to suggest, if I might, is the testimony that was submitted on of Lowel Ploss for the Bureau constitute, what I feel is, a good explanation as to the background for the settlement agreement. So, I would offer that into evidence, if that can be done, or we could just have Mr. Ploss appear and present the summary as any other witness would. I would just leave it to the discretion of the Board as to how they would want to handle that testimony as an exhibit, and then also have the

0047

settlement agreement introduced as the second exhibit on behalf of the Bureau.

HEARING OFFICER STUBCHAER: One question we will have to ask the participants is if anyone wishes to cross-examine Mr. Ploss on his statement? Also, are there any objections to receiving the settlement agreement and Mr. Ploss' testimony into the record? Please raise your hand if you have objections.

MS. MURRAY: I have one question.

Would Mr. Ploss be testifying as to the settlement agreement?

MR. TURNER: My proposal, Nancee, is that Mr. Ploss would not be testifying at all, would simply admit his written testimony, admit the settlement agreement, and we would simply participate in the cross-examination of any witnesses, if we felt that was necessary. But we would be presenting no direct evidence on behalf of the Bureau.

MS. MURRAY: No person to present the settlement agreement?

HEARING OFFICER STUBCHAER: We can't hear you.

MS. MURRAY: That is all right.

One minute.

HEARING OFFICER STUBCHAER: Anyone else have any comments while Fish and Game is conferring?

We will wait a minute.

0048

MS. MURRAY: Fish and Game has no objection.

HEARING OFFICER STUBCHAER: Then the settlement and Mr. Ploss' testimony will be accepted into the record.

MR. TURNER: Thank you very much. And then I would simply be in attendance to cross-examine, if necessary, but no direct testimony will be presented.

HEARING OFFICER STUBCHAER: Thank you.

Any other settlement agreements?

MS. CAHILL: Good morning. On behalf of the City of Stockton, I would like to inform the Board and the parties that we believe we have reached a settlement agreement with the Delta Wetlands. It needs to go to the Stockton City Council tonight for approval.

So, with your permission, what I would like to do is

bring in tomorrow the agreement between Stockton and Delta Wetlands after it has been approved and signed by both parties.

HEARING OFFICER STUBCHAER: That is fine. Take it up first thing in the morning.

MS. CAHILL: Thank you.

HEARING OFFICER STUBCHAER: Anyone else?

Seeing none, we will proceed to the case in chief of the applicant. Case in chief will include the opening statements, the identification of exhibits, the testimony, which will be followed by cross-examination, redirect

0049

testimony, recross examination on the redirect, if there is any, and then the consideration of the acceptance of the exhibits.

Does Delta Wetlands need a few minutes to set up for their testimony?

MS. SCHNEIDER: Good morning, Mr. Stubchaer, Mr. Chairman, and Members of the Board. My name is Anne Schneider, representing Delta Wetlands Properties, the applicant in this proceeding. We have a number of witnesses who will provide testimony today. I would like, first, to make an opening statement. I think it will provide something of a road map for the testimony that we will be providing.

Delta Wetlands is very pleased to have reached this point of being before you in this hearing on its water rights applications. It first applied for permits from you and from the Corps of Engineers in 1987. The last 11 years the Delta Wetlands Project has persisted through extensive regulatory changes that have profoundly affected how a project, located literally in the middle of the Delta, will be able to operate.

The Delta Wetlands Project itself is a very simple project in concept, but it has had to be designed and redesigned to fit in the complex hydrodynamic and ecological world that is the Delta.

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Barbara Leidigh has briefly described the project, and Delta Wetlands witnesses will explain project elements in much more detail. She also indicated, and I would like to note again, that there are two groups of Delta Wetlands' witnesses, basically. Some are employees or consultants to Delta Wetlands and the others are Jones & Stokes staff who will been testifying upon subpoenas, which you have issued at Delta Wetlands' request.

A large measure of the fact that the Delta Wetlands is here today is because of the persistence and determination that is possible, perhaps, because Delta Wetlands is a private enterprise undertaking. As a private undertaking, Delta Wetlands has been able to respond immediately to the many issues that have come up all these years.

Once it has received permits as required, it can proceed immediately with project implementation; it can construct its project, once it has the necessary permits and approvals, within two years.

I would like to introduce the moving force behind Delta

Wetlands all this time; its president, Mr. John Winther. He, more than anyone else, has been the creative, optimistic force behind the Delta Wetlands Project for over a decade.

There are problems, as well, with being a private enterprise undertaking. One is that it's taken a very long time for the water industry to accept the fact that private

0051

enterprise can successfully provide water supply. Another ramification is that Delta Wetlands, as a private enterprise project, can't be the lead agency for CEQA and NEPA purposes. And so, as a result, the Board and the Corps have rigorously proceeded as lead agency, and has just as rigorously restricted Delta Wetlands' role in the preparation of that document.

This has been frustrating at times, but it is Delta Wetlands' view that there is no question that the Draft Environmental Impact Report and Statement, that the Board and the Corps have produced, is an excellent and comprehensive document.

An enormous amount of work has gone into preparing all these years for this proceeding today. Since it filed its application in 1987, two full Draft EIR/EIS's have been prepared, both under the direction of the Board and the Corps. The first was in 1990 and the second is the one before you now, which was prepared in December 1995.

It is interesting, the 1990 document assumed for purposes of operating constraints only that the Decision 1485 applied. The 1995 Draft EIR incorporates a much more elaborate set of regulatory constraints. Those include compliance with the '95 Water Quality Control Plan, the '91 salinity plan, and the Fish and Wildlife NMFS biological opinions for the Bureau for the OCAP.

0052

Since 1990, Delta Wetlands has radically changed the project design, from a four-island reservoir project to a two-island reservoir and two-island habitat project. The new regulatory environment, created during this period of time plus this change in the project itself, have dramatically affected the original project yield. Under the 1990 document, the yield is 235,000 acre-feet. By the time we got to the yield in the 1995 document, it had decreased to 188,000 acre-feet.

So Delta Wetlands has been very flexible and flexible enough to accommodate the regulatory changes, but its yield has declined very significantly in that process.

The refinement of the project operations did not end with the preparation of the Draft EIR. In May 1994, the Delta Wetlands began a series of over 40 endangered species consultation meetings with Fish and Wildlife Service, National Marine and Fishery Service, California Department of Fish and Game, as well as Board and Corps of Engineers' personnel. These meetings resulted in what we now refer to as a final operations criteria. These were completed in January of this year. And in May, Fish and Wildlife and NMFS issued final, nonjeopardy biological opinions and incorporated the final operations criteria.

The final operations criteria even further restrict

Delta Wetlands yield. With those criteria, yield has been reduced to a barely feasible 154,000 acre-feet from the original 235,000 acre-feet.

During this hearing, Delta Wetlands will present testimony regarding final operations criteria and the Fish and Wildlife and NMFS biological opinions, which will demonstrate that the fishery resources in the Delta, both listed and non listed species, will be been comprehensively protected by the final operations criteria.

In June, Fish and Game issued a final nonjeopardy opinion for this project.

Delta Wetlands' testimony will show that Fish and Game has attempted, through its June opinion, to impose many additional operational restrictions, restrictions that were considered and rejected in large part as inappropriate in the joint federal and state consultation process. During this hearing, Delta Wetlands' testimony will analyze Fish and Game's measures and demonstrate that they are unnecessary to protect listed or non listed species, and that they are not reasonable and prudent under CESA. And, in particular, Delta Wetlands' testimony will support the Board's findings that Fish and Game's measures are neither reasonable nor prudent, are not based on the best scientific information available, and would render the Delta Wetlands Project economically and operationally infeasible.

Our testimony will show that the Fish and Game's measures would reduce project yield so drastically that the project would be infeasible.

It is our view that the Board must consider this evidence that we will present and inquire into the feasibility of the project if Fish and Game's proposed measures were to apply. This is a fundamental task for the Board in this proceeding. Fish and Game has acknowledged to us that it does not, and cannot itself, assess the feasibility of its proposed restrictions and that it relies upon the Water Board to do just that.

There are other very important measures that will be addressed in this proceeding. In particular, the fact that the Delta Wetlands' diversions and discharges will have a water quality, particularly the parameters of salinity and dissolved organic carbon, and issues related levee stability and seepage.

JSA, Jones & Stokes, has addressed all of these issues in very great detail in the Draft EIR/EIS. A huge amount of work has gone into defining and redefining the project, assessing and reassessing potential effects of the project. In addition to Jones & Stokes' work, however, and the extensive work of both your staff and Corps of Engineers' staff, Delta Wetlands has, from the beginning, insisted that every effort be made to learn from others and refine this project to reflect their concerns.

Metropolitan Water District, Contra Costa Water District, and Department of Water Resources have been extremely helpful over the years in providing detailed

feedback and data to Delta Wetlands on water quality issues, for example. Delta Wetlands has been responsive.

Dr. List's testimony, which you will hear, for example, is the direct result of Contra Costa Water District's insistence that his analysis be done of the effect of Delta Wetlands operations on Los Vaqueros delivered water quality.

Delta Wetlands has also fostered the creation what was called The Seepage Committee. Central Delta Water Agency and neighboring reclamation districts invested a huge effort to help revise the Seepage Control Program that Mr. Hultgren would testify about. The Habitat Management Plan involved over a hundred meetings, and the detail of that plan reflects the dedicated effort of your staff, Fish and Game staff, and Jones & Stokes.

The endangered species consultations lasted a full three years. In the process of analyzing the effects of an in-Delta storage operation, Jones & Stokes had to develop new analytical tools. These were pioneered by Jones & Stokes under your staff and Corps staff's direction, and they are now being used in many other contexts, in CVPIA-related work and in the CAL/FED process. So they were

0056

pioneering efforts, but they have gained wide acceptance.

It is important to note, though, that in the EIR/EIS analysis very conservative assumptions were made. The benefit of that is that the effects are analyzed in the fullest possible extent. But a downside of that is that the benefits are not highlighted. It's crucial not to lose sight of the fact that a significant new water supply of over 9,000 acres of habitat will be created by this project.

Delta Wetlands will provide testimony that will address each of the issues set forth in your Notice of Hearing. We will establish that there is water supply available for appropriation, that Delta Wetlands' diversions and discharges can occur without the adverse unmitigable effects, that our operations will not adversely affect the rights of prior right holders, that Delta Wetlands will be successful in coordinating its operations with the Central Valley Project and State Water Project, and that Delta Wetlands does indeed fit well with the CAL/FED process, that it won't disrupt or be incompatible with that process, and, in fact, fits well with CAL/FED's efforts, no matter what the final outcome of that process may be. Again, attesting to the incredible flexibility of this project.

Delta Wetlands has to establish that water is available. Dr. Brown will testify that there is water

0057

available, and that it is available, even considering all demands being met, including all the demands of the Central Valley and State Water Projects. In large part, as you will see, this is because Delta Wetlands' diversions are most likely to occur during or immediately following major storm events.

There are, however, even once availability is determined, many additional constraints that will be imposed

on Delta Wetlands' diversions, and testimony of several witnesses, including Mr. Forkel and Dr. Brown, will describe the multiple layers of restrictions that constrain Delta Wetlands' diversion operations. These include the Water Quality Control Plan; the 1995 plan will apply as well as elements of the Accord.

The restrictions set forth in the Fish and Wildlife and NMFS biological opinions included in the final operations criteria contain numerous restrictions. There are additional restrictions that apply that are mitigation measures identified in your EIR/EIS. And finally, Delta Wetlands has agreed voluntarily in protest dismissal agreements to further restrictions.

These restrictions serve several functions. But they also assure that Delta Wetlands will only be diverting water which is truly available for diversion.

A remarkable aspect of this project, because it is in

0058

the middle of the Delta and because it is producing yield for export, is that it is the only entity, other than the Central Valley and State Water Projects, that will be directly constrained by limitations in your '95 Water Quality Control Plan. This is unique. Like other appropriators, Delta Wetlands will be subject to a modified term '91 condition. So that the state and federal projects, once they have declared that the Delta is in a balanced condition, will not be able to divert.

However, no other appropriators will be restricted, for example, by the export inflow ratio. Delta Wetlands' diversions are treated as if they were part of those ratios. So that, if the federal and state projects had to use all of the 35 or 65 percent allowed, Delta Wetlands will not be able to divert. Just as an example of how stringent the requirements placed on Delta Wetlands are, both Delta Wetlands' diversions onto the islands and discharges for export are considered export for purposes of calculating the export inflow ratio.

Since Delta Wetlands is more like the Central Valley and state projects and any other appropriator, because its water will be exported, coordination with those projects is absolutely essential, and we recognize that. Delta Wetlands' testimony from Mr. Paff, who used to run Central Valley Project, and Mr. Forkel will describe what we call

0059

the Delta Wetlands Operating Criteria Plan, DW-OCAP. The DW-OCAP is another example of the coordination and cooperative efforts we have undertaken with both federal and state projects. Both the Bureau and the Department of Water Resources have given us extensive comments on these DW-OCAP provisions; and as a result of that, as Mr. Turner indicated, we have reached a protest dismissal agreement with the Bureau. We believe continuing discussions with others are still very promising, as well.

Our testimony will show that Delta Wetlands' operations will not injure any legal user of water. As Mr. Aladjem noted, we have reached protest dismissal agreements with North Della Water Agency; and we believe, as Ms. Cahill

indicated, that we will have an agreement in place with the City of Stockton by tomorrow morning.

In those agreements, we have agreed to urge the Board to include in the permit terms the provisions of those dismissal agreements, and we urge you to do that.

A keep term that we have agreed to with the Bureau is the special Delta term with language as included in the Los Vaqueros Decision 1629. Under that term, of course, Delta Wetlands would not divert if the projects declare the Delta to be in balanced conditions.

One of the most important aspects of the project is its overall conception is centrally focused on being consistent

0060

with and serving the public interest. Delta Wetlands will be acting in the public interest by contributing significantly to water supply and to the protection and enhancement of ecological resources in the estuary. It is unquestionable that the Habitat Management Plan and dedication of Bouldin Island and Holland Tract property to habitat use is in the public interest.

Our testimony will also establish that the fish protections provide in the extensive measures in the federal biological opinions will operate and ensure that the Delta Wetlands will operate in the public interest insofar as fish and wildlife are concerned.

Some parties have raised the question about whether there is demand for Delta Wetlands water. It is astounding to suggest that there might not be demand for new water supply. Once permits are issued to Delta Wetlands, which are subject to reasonable terms and conditions, Delta Wetlands will proceed. The permit issuance itself will greatly expedite Delta Wetlands marketing efforts. And Delta Wetlands believes strongly that its water will be put to reasonable and beneficial uses for municipal, industrial, and irrigation purposes, as well as for fish and wildlife enhancement and preservation and water quality uses.

The Delta Wetlands Project will be consistent with your Water Quality Control Plans, including your '95 plan and

0061

'91 salinity plan, your thermal plan, and the relevant basin plans. In certain instances, Delta Wetlands protections are more protective than any of those plans require. And to the extent that terms and conditions are necessary to ensure compliance with any or all of those plans, those measures should be imposed in the Section 401 certification process.

Separate from the fact that Delta Wetlands will be in compliance with your various Water Quality Plans, Delta Wetlands has several water quality issues that don't directly come within those plans. Some of the main issues in that regard are salinity issues and dissolved organic carbon issues in the water quality of water exported from the Delta.

Water quality issues will be addressed by our witnesses, Dr. Brown, Dr. Kavanaugh, and Dr. List. Their testimony provides extensive information and analyses related to DOC and salinity and other water quality parameters. And each concludes that the project will not

significantly, adversely affect export water quality, and more often than not, will positively affect certain water quality parameters.

The Board, in the Accord's EIR/EIS, proposes mitigation terms related to salinity and DOC. Most of those terms address the issue by extensive monitoring. This is appropriate where the anticipated impacts are so small and

0062

mitigable as the evidence will show. Delta Wetlands' testimony will support the conclusion that the EIR/EIS mitigation measures will provide adequate protection and will adequately address the uncertainty issues that have been raised by various parties.

The Board is also urged to impose terms and conditions that restrict diversions and discharges so that it will have no impact at all on DOC or salinity. Some parties insist on these no effect restrictions. And those kinds of positions are reminiscent of historical arguments that have been heard for years, that a new appropriator can have absolutely no effect on natural conditions or flows of water.

We are confident, however, that the Board will impose reasonable limitations and will not restrict Delta Wetlands from operating when it is expected to have only an environmentally insignificant effect on salinity and DOC.

As to fish, Delta Wetlands' testimony will be extensive. There are various types of approaches that are included in the Delta Wetlands Final Operations Criteria and other provisions. Fixed design measures, such as fixed screen requirements with low approach velocities, are included. In addition to fixed design, there are operational measures that range from absolute prohibitions on diversions in certain periods to limitations on the rate, amount, timing of diversions and discharges.

0063

Mr. Forkel will describe the many layers of restrictions that apply in a single month, as an example of how the layered restrictions apply. Finally, there are adaptive measures that are required to be imposed on Delta Wetlands related at times to the presence of fish, for example, and those add yet another layer of limitations on the project operations.

In its biological opinion, Fish and Game states that there are more measures that should be implemented by the Board, and the Board should make them binding conditions on the water right permits issued to Delta Wetlands. It is argued that the Board need not, and should not, issue specific permit terms to reflect any of Fish and Game's proposed restrictions. Instead, we think a general permit requirement, such as you included in the Los Vaqueros permits, that would require Delta Wetlands to comply with all legally binding requirements of ESA and CESA opinions is sufficient and proper. This is consistent with your historical practice and reflects the fact that for a variety of reasons the reasonable prudent measures, for example, in Fish and Game's opinion could change in the future.

As to terrestrial species, no-jeopardy opinions have been obtained from all three agencies. The Habitat

Management Plan provides tremendous benefits and is far more than a mitigation project. Under the guidance of the HMP,

Delta Wetlands will convert the islands, Bouldin Island and Holland Tract, to permanent wetland habitat. As described in the EIR and in the testimony that Mr. Rawlings and Mr. McLandress will provide, the HMP will result in great habitat diversity, particularly habitat for species of concern such as Swainson's hawk, greater sandhill crane, and other wintering waterfowl, and other species that are of concern.

There are other issues the protestants have raised. They're what we might consider to be private property questions. They follow seepage, levee disturbance, Mokelumne River Aqueduct concerns, PG&E gas line issues, and right-of-way requests by Caltrans.

Delta Wetlands would like to reserve the right to address whether the Board is properly exercising jurisdiction if it addresses these issues raised particularly by PG&E and Caltrans. Historically, the Board has declined to exercise jurisdiction over matters solely related to private property issues.

In any event, Delta Wetlands will be presenting the testimony of Mr. Egan that address the concerns raised by PG&E. As explained by Mr. Egan, there will be no adverse effect on the PG&E's maintenance and operations of its downed lines as a result of using Bacon Island for reservoir operations.

As to seepage and levee stability issues, Delta Wetlands' testimony will discuss the extensive program that has been developed to ensure that there is no net seepage from the reservoir islands once Delta Wetlands begins operations. The extensive monitoring and interceptor well system will be described by Mr. Hultgren. It's already described in detail in the EIR/EIS.

This isn't a novel approach. The use of seepage interception facilities is a standard practice in the construction industry and involves the use of engineering principles which are well understood.

As I noted earlier, the Reclamation District's neighboring Delta Wetlands islands and Central Delta Water Agency put a great deal of effort with their own experts in the development of the details of the seepage program.

The neighboring landowners have asked for additional financial assurances, however. We will address this issue, as well, in our brief, but, again, we have found no instance where the Board, in this type of situation, has imposed the type of financial assurances term that is being requested by these parties.

One last area that is very important in this area of issues is levee stability. As set forth in the EIR/EIS and Mr. Hultgren's testimony, Delta Wetlands' levees will be improved to Bulletin 192-82 standards in that riprap on the

inside slopes of the levees. It is expected that these efforts will significantly increase what is called the

factor of safety for all of Delta Wetlands' levees, including the levees on both reservoir and habitat islands.

As to the requested water rights, Mr. Easton's testimony will explain that these have been changes in these last 11 years with the result that there changes in water rights we now request from the Board. In particular, under the Habitat Management Plan, we have concluded that appropriative license 1922 rights and riparian rights will be adequate to meet the combined irrigation and habitat management needs on the habitat islands; and, therefore, all applications and change petitions pertaining to Bouldin Island and Holland Tract will be withdrawn.

As to the applications and change petitions for the reservoir islands, Mr. Easton will testify as to what is actually required by the project at this time. His Table 14 in his testimony contains a summary of the requested provisions in the permits that we now seek, as compared to the applied, for amounts.

On the discharge side of Delta Wetlands' operations, Delta Wetlands has agreed in a Bureau protest dismissal term that addresses rediversion of Delta Wetlands' discharges at the Central Valley Project and State Water Project export facilities.

0067

We will be required to enter into formal agreements with the Bureau and the Department to use any surplus CVP and SWP export capacity. Those agreements by this protest dismissal provision must incorporate the operation coordination procedures contained in DW-OCAP, as well as limitations that reflect Endangered Species Act requirements, the CVPIA, the 1995 Water Quality Control Plan, and a Coordinating Operating Agreement, or COA, that governs the operations between Bureau and the state.

In conclusion, Delta Wetlands respectfully requests that you issue permits with reasonable terms and conditions that are required for water storage operations on Bacon Island and Webb Tract. The storage of water on Delta islands is not a new idea. As far back as the 1950s, in-Delta storage was considered as a potential element of the State Water Project. Not only did it offer water supply potential, but it was recognized at that time that an in-Delta supply could be integrated with state and federal project operations in ways that would be very beneficial to the projects. Water could be released for either export or outflow without the multiple days of delay that it takes for releases from existing reservoirs to reach the Delta now.

Now the CAL/FED process is evaluating in-Delta storage as a logical element of its overall plan. It's Delta

0068

Wetlands' view that the persistence of the idea of in-Delta storage reflects the fact that a project like the Delta Wetlands Project will have great utility. Delta Wetlands has at times met with resistance from many quarters because it is a private enterprise undertaking. It's a private enterprise operation in a public water agency industry. At the same time that we have had to make all the refinements

and redefinitions of the project, I think it is important that perhaps this has been able to occur simply because Delta Wetlands is private enterprise.

That concludes our opening statement. We are also providing a written opening statement that we will give you copies and other parties copies of. It is more extensive than the remarks that I have just made. I was trying to be brief.

I would like to introduce into evidence the exhibits submitted by Delta Wetlands on June 6th. In addition, we want to introduce three additional exhibits into evidence and assign exhibit numbers to the three of the resumes that were submitted with our Notice of Intent to Appear. Those resumes are for Dana McGowan. That will be Exhibit DW-26. For Wayne Shijo, that is Exhibit DW-27; and for Phillip Lindsey, that would be DW-28.

The three new exhibits include DW-7B, which is a summary of David Forkel's step-by-step Scenario of a Day in

0069

the Life of Delta Wetlands Project. Exhibit 10B, a slightly modified version of a figure that Dr. Brown uses in discussing supply and hydrodynamics. That is Figure II-5. And finally Exhibit DW-10C. Again, a slightly modified version of a figure, Figure II-6, that Dr. Brown refers to in his hydrodynamics and supply testimony.

HEARING OFFICER STUBCHAER: Ms. Schneider, have copies of these exhibits been provided to the other parties?

MS. SCHNEIDER: We have copies for the Board, and we have copies for all other parties today.

We are now prepared to proceed with our oral direct.

HEARING OFFICER STUBCHAER: Before we do, we are going to take a 12-minute break.

Before you rise for the break, I would like to ask those people who have identified themselves in the appearance of parties, who have business cards, who haven't already given them to the Court Reporter, to provide them to the Court Reporter during the break.

We will now take a 12-minute break.

(Break taken.)

HEARING OFFICER STUBCHAER: The hearing will reconvene. We are going to proceed with the testimony of Delta Wetlands Properties. We have allowed four hours for their presentation.

MS. SCHNEIDER: Thank you, Mr. Stubchaer. We will

0070

proceed with, first, Mr. Bogdan and Dr. Brown; followed by, the next three after that, to give you some sense of order, will be Mr. Forkel, Mr. Easton, and Mr. Paff. So the first five will be in this order: Mr. Bogdan, Dr. Brown, Mr. Forkel, Mr. Easton, and Mr. Paff.

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DIRECT EXAMINATION

MS. SCHNEIDER: Mr. Bogdan, would you please state your name and briefly summarize your professional expertise?

MR. BOGDAN: I am Kenneth M. Bogdan, B-o-g-d-a-n. I am a project manager and legal counsel at Jones & Stokes Associates.

MS. SCHNEIDER: Did you prepare Exhibit DW-6, which describes the environmental review of the Delta Wetlands Project conducted by Jones & Stokes Associates on behalf of the State Board and the United States Corps of Engineers?

MR. BOGDAN: Yes, I did.

MS. SCHNEIDER: Would you please summarize your written testimony?

MR. BOGDAN: Certainly. I am going to give a quick overview of the role Jones & Stokes Associates played in assisting the Corps and State Board staff in preparing the environmental documentation on the Delta Wetlands Project.

As I mentioned, Jones & Stokes Associates has been going with the State Board and the Corps, and we have been

0071

acting as the extended staff of the Board and the Corps. Jones & Stokes Associates, and my role as project manager in the last five years, has focused on five different areas of assisting the Corps and the State Board.

We have assisted the Corps and the State Board on the CEQA and NEPA compliance documentation, on the HMP development, the Habitat Management Plan development; on the compliance documentation for Section 404 of the Clean Water Act; on the compliance documentation for Section 106 of the National Historic Preservation Act; and also assisting the Board and the Corps with compliance with the federal and state and Endangered Species Acts.

For CEQA and NEPA compliance, as was mentioned already, an additional document was prepared by the State Board and Corps with Jones & Stokes assistance in 1990 on the Delta Wetlands Project. Due to revisions in the project description, the State Board and Corps, along with Jones & Stokes Associates' help, put together a revised Draft EIR/EIS that was released in September of 1995.

We worked with the staff of the State Board and the Corps in an iterative process to develop the information that went into the Draft EIR/EIS. The information that was presented for the affected environment, the significance criteria development, the impact analysis, and also development of the mitigation measures. We met with the

0072

State Board and the Corps many times, making recommendations to them; and through meetings and review, developed what was approved to be included in the Draft EIR/EIS.

As part of this, the State Board and the Corps worked with us to develop mitigation measures that set up programs for certain resources to focus on the significant effects associated with the Delta Wetlands Project. These mitigation programs for certain resources anticipated future regulatory developments, further refining the mitigation in the EIR/EIS. We expect to be working on the response to comments, for the comments that were submitted on the Draft EIR/EIS, and also developing a final EIR/EIS sometime in the future, after the water right hearings have finished.

The second task that Jones & Stokes Associates did was work with the State Board and the Corps in developing the Habitat Management Plan. As part of the Delta Wetlands Project, Delta Wetlands proposed to dedicate two of their

islands, that you have already heard about, to habitat management for compensating the water storage effects of the Delta Wetlands Project.

Jones & Stokes Associates and their wildlife experts worked with State Board staff and Frank Burnett for Department of Fish and Game in consultation with Fish and Wildlife Service and the Corps in developing this Habitat Management Plan, which, by consensus, at the end of the

0073

process, everyone agreed, did actually compensate for all of the effects of the water storage operations.

Pete Rawlings from Jones & Stokes' staff will be speaking on this a little bit later today.

The third task, Section 404 assistance focused on preparing wetland delineations and obtaining verified delineation for compliance with Section 404 from the Corps of Engineers and also the Natural Resources Conservation Services. Additionally, Jones & Stokes Associates worked with the Corps of Engineers in developing an alternative analysis that complied with EPA Section 404 (b) (1) guidelines. That is an appendix in the draft EIR/EIS. EPA has signed off on that as complying with their 404 (b) (1) guidelines.

For Section 106 of the National Historic Preservation Act, Jones & Stokes Associates worked with the State Board and the Corps' archeologist in developing a programatic agreement which set up a mitigation program defining the responsibilities of the agencies and the applicant involved in the project. Dana McGowan from Jones & Stokes staff will be speaking on this later on today.

Finally, the compliance with the federal and state Endangered Species Act, Jones & Stokes worked with the U.S. Army Corps of Engineers for their compliance with Section 7 of the Endangered Species Act. We were the nonfederal

0074

designee in that process; and Jones & Stokes Associates assisted the Corps in preparing a biological assessment.

This biological assessment focused on fish species, as you will hear later on, the terrestrial species, it was determined there would be no affect to listed federal species.

Jones & Stokes Associates assisted the Corps in facilitating numerous meetings with the fisheries resource agencies, Fish and Wildlife Service, National Marine Fisheries Service, and the Department of Fish and Game, in making sure that the impact analysis that went into the biological assessment was appropriate and that all of the fisheries resources agencies approved of that methodology and approved of the science that was submitted prior to formal consultation request.

During the formal consultation process, Jones & Stokes Associates additionally went through and analyzed the operation criteria that was proposed by the Federal agencies, and this is in a December 20, 1996 memo, as well as additional measures that the Department of Fish and Game suggested; and that was in a March 25th, 1997 memo.

Warren Shaul, from Jones & Stokes Associates' staff,

will be presenting more information on that process and the analysis that went for the fish species.

To summarize, Jones & Stokes Associates supported the

0075

State Board and Corps through all of the environmental documentation that I have described. Lead agency approval happened throughout the entire process prior to any issuance of the documentation that Jones & Stokes Associates worked on. As a prelude to the Jones & Stokes' staff presentations, I just wanted to introduce our staff that are sitting to the left of me and in back of me, and then they will be giving additional testimony on some of the stuff I just went over.

Dr. Russ Brown was responsible for the impact assessment and the modeling that went into the water supply, hydrodynamic, and water quality analysis in the EIR/EIS.

I mentioned Warren Shaul was responsible for preparing the biological assessment, as well as all of the impact analysis and modeling analysis that went into the fisheries chapter of the EIR/EIS.

Pete Rawlings, who was assisted by Jim Easton and Steve Chaney, was responsible for development of the HMP, the Habitat Management Plan. And Pete also was responsible for putting together the vegetation and wetlands chapter, the wildlife chapter, and mosquitoes and public health chapter.

Dana McGowan, as I mentioned, was responsible for putting together the programatic agreement with the lead agencies; and she was also responsible for the cultural resources chapter in the EIR/EIS.

0076

Aimee Dour was responsible for summarizing the technical information that went into the flood control chapter, utilities and highway chapter, also the land use and recreation chapter. I should just note that Aimee Dour has been gracious enough to assist on the overheads, so you will see her come up and help out some of the Jones & Stokes' staff on doing their presentations.

Finally, Wayne Shijo was responsible for traffic, the traffic analysis that went into the EIR/EIS, and he's available for cross-examination.

This concludes the summary of my testimony.

Thank you.

MS. SCHNEIDER: Thank you, Mr. Bogdan.

I would like to move on to Dr. Brown.

Dr. Brown, would you please state your name and briefly summarize your professional expertise?

DR. BROWN: My name is Russell T. Brown. I finished my formal education with a Ph.D. from MIT. My research was conducted at the Corps of Engineers Waterways Experiment Station on reservoir modeling.

My first job was with the Tennessee Valley Authority, where I worked on reservoir and power plant issues. I then taught and directed graduate research at Tennessee Technological University. And I came to California at the beginning of water year 1990 and began working on the Delta

0077

Wetlands Project.

MEMBER DEL PIERO: There was no water in 1990.
DR. BROWN: We had the year, nonetheless.
MS. SCHNEIDER: Thank you, Dr. Brown.
Did you prepare Exhibits DW-10 and DW-11 that describe potential water supply and hydrodynamic effects of the Delta Wetlands Project?
DR. BROWN: Yes, I did.
MS. SCHNEIDER: Would you please summarize your written testimony on water supply and hydrodynamics?
DR. BROWN: I would like to begin with a brief review of the water supply assessment methodology that we used in conjunction with your staff for the EIR/EIS.
We used a combination of the monthly water planning models. DWRSIM is the model that we began with, and then we added to that an analysis of the Delta Wetlands Project operated on top of, or in addition to, the results of the DWRSIM model. So the analysis I am going to go through will show how this monthly water budgeting is used to determine these two important questions: Is there, indeed, any unallocated water available for potential diversions by the proposed project? And secondly, are there periods with unused pumping capacity at state and federal pumps that could be used during the discharge from the Delta Wetlands islands for export.

0078

I will begin with the first overhead. That is simply a way to refresh our memories that we are going to be using a combination of historic hydrologic data as well as simulated conditions. This particular diagram is just showing superimposed on the historic exports and diversions by Contra Costa, which, of course, began around 1950 and increased up to recent total export values of around 6,000,000. Overlaid by the results of the DWRSIM, run Number 409, which was used by your staff to describe the 1995 Water Quality Control Plan.
And so the simulations, using a repeat and assumed repeat of the 1922 to 1991 hydrology, simulates a much higher exports than occurred historically in that period.
MS. LEIDIGH: Could you identify the figure and where it is from, for the record?
DR. BROWN: This is Figure A1-22 from the draft document. All of the figures I am showing come from the draft document.
Move to the next. All of the analysis is then conducted on a month-to-month basis, moving through 70 years of hydrology. Using the 70-years hydrology, the intent is to cover the full range of hydrology that might be experienced in the Delta in the future.
MS. SCHNEIDER: You are referring to Figure 3A-8 from the Draft EIR?

0079

DR. BROWN: Yes. Now I am on 3A-8.
This is simply an annual summary of the results of the DWRSIM modeling, which is comparing total Delta outflow with the required Delta outflow under the 1995 Water Quality Control Plan. The units are in millions of acre-feet, and, in general, the required Delta outflow is in the order of

5,000,000 acre-feet. It varies as hydrologic conditions change.

The line that is slightly above the shaded required outflow actually is often right on the Delta outflow. There are years when all of the Delta outflow is required by the 1995 Water Quality Control Plan; that is, there is no additional water available in the Delta. You will see there are many years when there is additional water beyond the outflow requirements; and this is just by way of introduction to the purpose of the water supply assessment, to look at this not on an annual basis, which I am showing here, but on a month-by-month basis.

I want to just introduce briefly the capacity of the Delta Wetlands Project, which will reservoir islands totaling 238,000 acre-feet.

In our monthly analysis, a diversion capacity of 4,000 cfs is sufficient to completely fill those two reservoir islands in one month. So for the monthly analysis, an assumed average diversion of 4,000 cfs is the maximum

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capacity. Similarly, when the project is discharging, if there were to be 4,000 cfs of available pumping capacity, the project could completely empty in the period of one month, again, with a discharge capacity of 4,000.

The Delta Wetlands reservoir islands are necessary as you will see because the months with available water for diversion are not the same as the months with available pumping capacity. They are separated in time. Available water is generally in the late fall and winter. Available pumping capacity does not occur under current operations and regulations until the summer-fall period. So in-Delta storage is necessary to connect or bridge between the available water and available pumping.

Next overhead is a slightly modified Figure II-5 from the environmental document. They're also up here as charts. There are two important questions that we are answering with the water supply analysis: Is there available water for diversion is the first question. This figure simply illustrates how the monthly model, that we called Delta SOS, looked for opportunity to divert water in the Delta. In the example on the left, I am using the month of February with an assumed inflow of 40,000 cfs, with a required outflow of 7,000 cfs. Leaving 33,000 of potentially available water.

However, the Delta Wetlands Project, under State Board

0081

staff direction, is limited by the export to inflow ratio that governs the state and federal pumps. So, available water for diversion must fit within the export to inflow ratio, which in February would be 35 percent. It is shown by the second column.

The export limit, 35 percent of 40,000, is 14,000. The permitted pumping capacity of the state and federal pumps is approximately 11,000. Leaving 3,000 cfs as valuable water for Delta Wetlands diversion under the Water Quality Control Plan, regulating both required outflow and limiting the percentage of the inflow that can be exported. Just as a

second example, perhaps representing a fall month of October with an inflow of 20,000 and a required outflow of 4,000, there is 16,000 of available water for export.

However, the 65 percent limit, again in this case, is 13,000. With a permitted pumping capacity of approximately 11,000, there is perhaps 2,000 available for Delta Wetlands diversion within the requirements for both outflow and the export to inflow ratio.

The Delta SOS model, which is used in conjunction with results from the DWRSIM model, simply looks through the whole period of record, month by month, and finds these opportunities for diversion. However, before the Delta SOS model could do that, it was necessary to make the following adjustment to the DWRSIM model results. I am showing Figure

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3A-6, which is illustrating the last 24 years from the 70-year record at a monthly time scale; and I am illustrating the adjustments to export that were made by Delta SOS.

At times the DWRSIM model does not export all water that could be exported from the Delta. It leaves water in the Delta for a variety of reasons. The two major ones being -- that is, the model finds that all demands for that year have been previously satisfied, or it finds that there is no available seasonal storage in San Luis Reservoir. In either of those cases, it does not pump water that might be pumped at some future condition with either new facilities or new demands.

So, State Board staff directed us to make the following adjustments. The Delta SOS. Before it looks for opportunities for this new, potential project to divert water, brings exports up to their full either permitted capacity of around 11,000 or up against the export to inflow ratio, or up against the outflow limits. So that all water that could be potentially be pumped by state and federal project or contractors is already pumped before we look for Delta Wetlands' opportunities for diversion.

Next figure, please.

I am now showing the same 24-year period. This comes from Figure 3A-5 of the draft, showing the required Delta

0083

outflow as shaded and the Delta outflow on a monthly basis, remaining for the no-project alternative. In this particular simulation, all available exports that can be taken under the Water Quality Control Plan have been taken, and the outflow has been reduced. So, this does represent, that is the unshaded portion of the outflow, is what is sometimes called surplus Delta outflow, in excess of the requirements.

The Delta Wetlands certainly has to maintain or protect the Delta outflow under the Water Quality Control Plan. But as I mentioned, Delta Wetlands is limited not only to surplus Delta outflow, but it is also limited to fall within the export to inflow ratio.

Next diagram.

This is the same 24-year period. This is Figure 3A-7 from the document, and this figure illustrates that this is

actual water available for Delta Wetlands' diversions after required outflow and the export to inflow limits are applied, following bringing up the state and federal pumps to their full possible pumping each month.

The scale here is in thousands of cfs. So I mention that the Delta Wetlands' capacity for diversions or discharges are 4,000. This means that one of those months with a capacity available water of 5,000 is sufficient to fill the project in one month. So, the simulation moves

through time looking for diversion opportunities illustrated by this diagram, assumes that that water would divert to storage and then looks to the second step: Is there an opportunity to export this water?

So the second major calculation in this very simple operation of simply diverting available water once it has been calculated, and then exporting, using available pumping capacity once it is calculated. This is the second step. This is a modified Figure 2-6. It is modified only because the two alternatives selected by the State Board staff for the document preparation have now been modified; and the rules by which Delta Wetlands would be allowed to export its water have changed slightly. And let me go through that.

In this example I have assumed the inflow of 20,000, with a required outflow of 14,000, which might apply to -- we'll use Jim. Because the assumed export limit is still at 35 percent. In that case the 14,000 would be the combination of outflow requirements plus in-Delta riparian diversions, which must be protected. And so the combination of required use of inflow is illustrated here with the 14,000. That leaves only 6,000 of available water for export.

However, the 35 percent limit of 20,000 is 7,000, which means that 1,000 cfs of pumping capacity under the 35 percent limit will go unused because the combination of

outflow and in-Delta diversion requires more than is allocated under the export to inflow rule. This 1,000 cfs export capacity within the 35 percent limit, but beyond what the projects can take by themselves is the only export capacity presently allowed the Delta Wetlands Project under final operating criteria.

So, in this particular example, 1,000 cfs of diversion and export would be made from the project islands if they had at least, in this case, 60,000 acre-feet of waters remaining on the reservoir. You can certainly see from this example that the diversion opportunities are more likely to occur in months with the 65 percent limit; that is, beginning in July.

In those cases, the 65 percent limit is often a higher allowed pumping than the actual remaining water available for export. So the seasonal storage from Delta Wetlands will fit into that difference between allowable export and water that they can actually take, until they are up against the outflow and in-Delta diversion restrictions.

Next figure.

I'm now simply summarizing the results of these

calculations. They, of course, have to be made on a month-by-month basis. But once we've made them, we can summarize them on an annual basis to just get a view of how the project's operational criteria allowed it or, perhaps,

restricted it from operating over the full range of hydrology that we used to test future project operations.

I am showing both adjustments to the initial export that was simulated by DWR 40. I am sorry, did I mention it was Figure 83-9?

The dotted line, in this case, a million extra acre-feet in 1940 was found to be exportable if we relaxed the normal constraints in DWRSIM requiring available storage in demand. If we simply took all possible water under the Water Quality Control Plan rules, there would have been 1,000,000 extra exported that year.

The shaded, which is a maximum of about 200,000, is the simulation of the Delta Wetlands Project. In this case, under Alternative 1 rules which are slightly different as to when the export can occur, but normally there is opportunity for exporting this same amount of water, that the constraint is often on the available water for diversion early in the season. And we can see that there are some years when the Delta Wetlands Project did not find available water for diversion. But in the majority of the years it did.

The final operations criteria, which we will be describing in more detail later, has added additional constraints on the operation of Delta Wetlands Project beyond the Water Quality Control Plan criteria which were assumed in the draft document. These final operations

criteria involved additional constraints on when diversions will be allowed. And also on the amount of the available unused pumping capacity that can be used by the Delta Wetlands Project.

I just wanted to end by introducing those numbers. Once we have simulated the project with these additional final operating criteria, the average annual diversion number comes in at 192,000 acre-feet. There are 3,000 acre-feet on average required releases to Delta outflow which is one of the requirements in the biological opinion; and average evaporation during the seasonal storage from this relatively large surface reservoir to two reservoir islands of 35,000 acre-feet, leaving an average of 154,000 acre-feet export for beneficial uses in the export areas.

This concludes my brief introduction or review of the water supply assessment methodology, and I am proceeding on, just catching my breath, with a second brief introduction to the hydrodynamic assessment methods that were used in preparing the draft document.

For the water supply, we are conducting our entire analysis at the monthly time scale. For the hydrodynamics it's more important to look at more detailed time scale where we consider the tidal flows, velocity and stage or elevation changes that occur within the Delta channels. In our analysis, we always favor direct field measurements when

they are available. But in the case of hydrodynamics, there is only a limited amount of direct measurements of the channel flows and mixing that occurs in the Delta. And so it is a combination, again, as in water supply, of actual historic measurements of conditions in combination with the assessment model that is our basic methodology.

There are two major effects in terms of hydrodynamics of the proposed project. During the diversion period, Delta outflow will be reduced by the diversion amount and the channel flows between, let's say, the main San Joaquin River and the siphon stations on either Webb or Bacon. The flows between those locations will increase in response to operating the siphons. And so we analyze the maximum potential hydrodynamic effects of those diversion operations.

The second type of hydrodynamic effect of the project would be during discharge periods. And during those discharge periods, again, hydrodynamic conditions between the pump stations, one on each of Webb and Bacon, moving down Old and Middle River towards the state or federal pumps, the hydrodynamic conditions in those channels must change with the project operation. So, we analyze what were the maximum possible hydrodynamic effects during that discharge period.

There is extensive -- I will use my first

0089

diagram. There have been extensive measurements in the Delta. In particular, there are several stage recorders measuring the fluctuations in surface water throughout the Delta. There is also a whole -- I am introducing Figure B1-52 from the environmental document.

There have also been over 25 years measurements of electrical conductivity data. And the electrical conductivity provides an excellent way to calibrate the hydrodynamic model because the hydrodynamic model is what governs the mixing of salinity within the Delta and coming, as we call, salinity intrusion from the Bay. But only recently have there been direct measurements of the tidal hydrodynamics. By that we mean the tidal velocities and the tidal flows.

This is simply an illustration of a half a month of record from the USGS and DWR measurement sites or measurement stations on Old and Middle River directly opposite the proposed projection Bacon Island, and illustrating channel flow in units of 1,000 cfs, where zero represents calm water, slack tide conditions. The flows are both positive towards the ocean and negative towards the export pumps on this regular repeating basis. There is variation within the half month period. Spring tides, being the greatest magnitude difference and neap tide, but the basic fluctuation back and forth in the channel is the

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dramatic, the characteristic feature of all Delta channels.

In this particular case, just to further orient you, the flows observed in both Bacon and Middle River are nearly identical. You can hardly tell the difference between the dotted line and the solid line. These two channels are

approximately equal in size and carry, at this point opposite Bacon Island, approximate equal flow, moving either towards the export pumps or, on the ebb tide, moving out towards the ocean.

For this particular period, happens to be 1987 October, there was approximately 5,000 cfs of pumping and that 5,000 cfs of net flow towards the pumps is what is represented by those two lines. The two channels, in this case, approximately splitting that total net flow towards the export pumps. The question we are asking the hydrodynamic analysis is: Will the Delta Wetlands Project affect this very strong tidal dynamic in Old and Middle River Channel or in any of the channels in the Delta?

Using the Delta hydrodynamic model, in this case using the model that we are calling or is referred to as the RMA Delta hydrodynamic model, we are -- I now switched to Figure 3B-5. We used the 25 year historic Delta conditions observed between 1967 and 1991. We did this in order to use the historic conductivity measurements of salinity. That is, if the hydrodynamic model was operating properly, it

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should be able to reproduce the observed salinity records in addition to reproducing the observed stage records throughout the Delta.

As I mentioned previously, a major difference between the no action, which is shown no-project shown by the shaded and the historic conditions, is that the no-project export is characteristically higher during the last 25-year period than the historic exports were. These would be the no-project alternative; that is, that would be adjusted beyond what DWRSIM simulated with 409 to the maximum possible export each month of the record.

The top two figures simply illustrate that, in general, San Joaquin River inflows and the Sacramento River inflows are quite similar, whether we examine the historic record or examine that the no action or no-project alternative conditions. There are certainly differences simulated by the models from historic. But the major fluctuations in hydrology from very wet to very dry conditions are retained in the historic record.

Using the hydrodynamic model, we really wanted to come up with basic relationships to use in the assessment, rather than the, literally, millions of numbers that come out of the hydrodynamic modeling.

And there are two basic relationships that I am wanting to emphasize in this preview or overview. The first is the

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tidal velocities and stages. I showed you the actual measurements from Old and Middle River. What are the tidal dynamics in all the rest of the Delta channels? So we want to know that from the hydrodynamics model.

The second thing we want to learn from the hydrodynamic model is: How do inflows to the Delta split at the different channel junctures that occur? So I am going to go through these two basic relationships that we learned from the hydrodynamic model. First I am showing Figure 3B-1. And you need your one copy of this to read it. The

idea here is that we have simply used the hydrodynamic model to describe what the tidal flows are at each of the channels. And I am just going to help you with the numbers.

Here at Chipps Island, if we just consider the average flood tide, that it is during periods when the flows are moving upstream from the Bay, and average that approximate half of each day, we get an average flow of 200,000 cfs moving past Chipps Island and then reversing as the tidal cycle changes.

At the confluence, we get approximately 100,000 cfs moving upstream during the flood tide and upstream the San Joaquin in equal amount. As we get to the vicinity of Webb Tract, we have around 50,000 cfs remaining in the San Joaquin Channel, moving upstream and then downstream with the tide. And by the time we get to Bacon Island, there is

0093

a gradient of flows along the Old and Middle River Channels; we'll use a number of 10,000 cfs, characterizing the tidal flows in Old and Middle River.

At the downstream end, the southern end, actually the upstream end of Bacon Island closest to the pumps, the flow is approximately 8,000, we'll say. This is just the tidal flow. And when there is a net flow towards the exports, that would get added to the flood tide and be subtracted from the ebb tide movement. But if we just look at the tidal characteristics, it would be relatively large flows moving in the Old and Middle River Channel, even without any discharges or diversions from the project islands.

I have lost track of time, but I am sure I am almost out.

The second major characteristic that we learned from the hydrodynamic model is the channel flow splits. I have illustrated, using Figure B-126, the flow split that occurs at Delta Cross Channel and Georgiana Slough. As the Sacramento River flow increases to approximately its channel capacity of 80,000 cfs, the flow moving down Cross Channel and Georgiana also increases, and these flow splits or relationships are called hydraulic -- what are they called? We will just call them hydraulic relationships. There is pretty much a single line describing the split. And the only thing it depends on is the total inflow in the

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Sacramento River.

This is a very convenient relationship that allows us to understand how much flow will move down Cross Channel and Georgiana if the Cross Channel is open or closed. If the Cross Channel is closed, which has to occur at higher flows, then this amount of water in thousands of cfs, moves down Georgiana Slough.

If the Cross Channel is open, a slightly curved curve shows that this is the total flow in Cross Channel and Georgiana, and the X's represent the flow in Georgiana, splitting the flow, that is, between Georgiana and Cross Channel.

The second half of the diagram simply shows the same relationship on a percentage basis, if that is more convenient. Running the hydrodynamic model, we've learned

these basic features of Delta hydrodynamics in terms of the tidal flow and in terms of these net channel flow splits. And it is actually these relationships, rather than the direct model results, that were used in the impact assessment.

HEARING OFFICER STUBCHAER: Pardon me, did you identify that last exhibit?

DR. BROWN: I may not have. It was Figure B1-26 from the draft document.

HEARING OFFICER STUBCHAER: Thank you.

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DR. BROWN: I want to finish my hydrodynamic presentation then, showing the results of the final set of runs that were made to identify what were the maximum possible hydrodynamic effects during the initial diversions, which would be the maximum. The other one first. And then during periods of maximum discharge.

The assumed -- I am now showing Figure B147 with an assumed initial diversion onto the project islands of 9,000 cfs. The 9,000 cfs is simply the maximum possible diversions that would occur with all siphons running, with the reservoir at empty; and that initial flow would be declining as the reservoir fills. The siphons are gravity devices, and as the water difference between the channels and the reservoir islands declines, the flow moving through the siphons, will decline. And, remember, I was telling you that 4,000 cfs is simply the flow needed over the month. In the initial days of filling, it could be as high as 9,000. What would happen to the hydrodynamics during this 9,000 cfs diversion?

Here I am showing the Middle River at Columbia Cut, and this would be water moving down Middle river supplying the siphons on Bacon Island. There would be flow moving through Old River Channel, as well. In fact, that is one of the results that we find. The hydrodynamics are such that a diversion will actually create flows in several channels to

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feed that. All of the diversion flows will not move down a single channel, so the effects are distributed or evened out throughout several Delta channels.

In this particular example, we are showing this approximate 15,000 maximum flow towards the Bay. A little bit more of a flow; 20,000 is the maximum moving towards the diversions because there is 5,000 cfs net flow assumed already moving down Mill River supplying relatively high export pumps. One of the results I didn't mention is that the Delta Wetlands Project is never allowed to divert water unless the state and federal pumps are at their full permitted capacity. Because, only when they are at their full permitted capacity, is there any available water for diversion. So, whenever Delta Wetlands is diverting, there would be a high flow moving towards the pumps, 5,000 of which is assumed or is modeled to be moving down Middle River.

The increment of the Delta Wetlands diversion, you see, is enough for the hydrodynamic model to detect. But it is not enough to create a significant hydrodynamic impact. It

is relatively similar to what would occur in this channel under no-project conditions. And the velocities which are simply related to the channel area, in this case approximately 20,000 square feet, then a maximum flow of perhaps 20,000 cfs would translate into a maximum velocity

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of one feet per second, which is what the hydrodynamic model results show.

There is, in the impact assessment, a significance criteria that was looked for under velocity as an assessment variable, where at three foot per second is just assumed a rule of thumb for possible scour effect. So that looking for an increase of beyond three feet per second was one of the things we were tracking with the hydrodynamic modeling.

In this particular channel, the change in velocity, which is actually increased in magnitude on the flood tide moving towards the exports, was not enough of a change to warrant a significant finding.

And a similar result finishes my presentation for the discharge. During discharge, we are assuming that 6,000 cfs is coming off as an initial discharge. That would require that there is 6,000 cfs of available pumping capacity. And I'm showing the Middle River. I am showing Figure B1. I am again showing Middle River, but I have moved upstream so that I am between the discharge pumps and exports. And the flows were approximately 2,000 moving towards the pumps at this location for this assumed export; and that increased by about 2,000 cfs of discharge off of Bacon Island, perhaps some coming from Webb, finding its way into Middle River at this location. And the change in velocity that we've simulated for this worst case possible hydrodynamic effect

0098

is larger change, but it does not go beyond what this channel already experiences during other times of high Delta export.

I am ready for my hydrodynamic conclusions. The Delta Wetlands Project does not change the basic tidal hydrodynamic that make up the Delta channels; that is, that are observed in the Delta channels. The project cannot affect the channel geometry nor the tides in the Bay that cause these large tidal flows. The Delta Wetlands Project does not change the flow splits that the hydrodynamic model simulates at any of the channel junctures. The Delta Wetlands Project, under these maximum possible hydrodynamic simulations, does not change the tidal flows in the channels between the export and the pumps or between Central Delta and the siphons beyond what those channels already experience at a higher tide condition or at already maximum pumping, so that the Delta Wetlands is found to not effect or change conditions beyond historic observed conditions. And this leads to the finding of no significant hydrodynamic effects from the Delta Wetlands Project operations.

Thank you.

MS. SCHNEIDER: Thank you, Dr. Brown.

Mr. Stubchaer, our next witness is Mr. Forkel, and his testimony requires between 22 and 25 minutes.

HEARING OFFICER STUBCHAER: I was thinking it is a good

time to break for lunch before. But before we do that, I want to respond to one comment Dr. Brown said.

You said you were running out of time. We're timing you individually. It is up to your team to divide the four hours. We are timing the four hours.

MS. SCHNEIDER: He's out of time.

HEARING OFFICER STUBCHAER: Anyway, we have one question for clarification. Ordinarily, we save all the questions till the end, but it is timely for Mr. Sutton to ask you a question.

MR. SUTTON: Dr. Brown, when you were discussing the changes in flow in Delta channels in the hydrodynamic section, you made a statement that Delta Wetlands was not allowed to divert unless the export pumps were operating at their full rate of capacity. Is it correct to state that this assumption or restriction applies for in terms of the model application only?

DR. BROWN: Yes, that is correct. I meant to say that in the modeling of the Delta Wetlands, we make the assumption that all available exports are being made; and for diversion conditions in the modeling, the pumps are at their full permitted capacity.

MR. SUTTON: In fact, however, it is impossible for Delta Wetlands to be operating at times other than when the export pumps are, in fact, taking at their full capacity?

DR. BROWN: That's right.

MR. SUTTON: Thank you.

HEARING OFFICER STUBCHAER: Thank you.

Any comments, Ms. Leidigh, before we break? You look like you're going to say something.

MS. LEIDIGH: No.

HEARING OFFICER STUBCHAER: We will take a lunch break now. We will reconvene at 12:50.

(Luncheon break taken.)

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AFTERNOON SESSION

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HEARING OFFICER STUBCHAER: Good afternoon. We are going to reconvene the hearing.

Ms. Schneider, ready?
MS. SCHNEIDER: Yes, Mr. Stubchaer. We have three witnesses that will be sitting here and going in the following order: Mr. Forkel, then Mr. Easton, and Mr. Paff.
I just want to briefly introduce Caren Lindson who is a paralegal in my firm. She will be operating the audio visual equipment.
First, starting with Mr. Forkel.
Would you please state your name and briefly summarize your professional experience?
MR. FORKEL: My name is David Forkel. I am Vice President of Delta Wetlands Properties. Delta Wetlands is a project proponent for the in-Delta storage project here before you today. I have been with Delta Wetlands since 1988, and my duties include project management of the water storage project, as well as management of the agricultural operations on our 20,000 acres located in the Delta. I am also a director on four reclamation districts in the Delta and the Director of the Delta Ferry Authority.
MS. SCHNEIDER: Thank you.

Did you prepare Exhibit DW-7, which addresses project operations, description, and water ability issues for the project?
MR. FORKEL: Yes, I did.
MS. SCHNEIDER: Would you please summarize your written testimony?
MR. FORKEL: Mr. Stubchaer, because of lack of time, I am going to limit my testimony today to a brief description of the project history, as well as walk you through the steps of a typical water storage operation.
Delta Wetlands was first conceived in 1985 when Delta Wetlands desired to develop a new land use for agricultural property in the Delta. Water storage was an obvious choice because of the close proximity of the islands to the state and federal water supply systems, as well as the obvious demand for new water in the state.
In 1987, we applied for our initial water rights, and they included a project description for a dual purpose project. Each of the islands was operated as both a seasonal reservoir and seasonal habitat.
In 1990, our Environmental Impact Report was circulated, and it identified several concerns, especially concerns with the lack of flexibility of the water project as well as the lack of certainty with the seasonal habitat islands.

In 1993, Delta Wetlands reconfigured the project to its current two-island, year-round reservoir project and two-island, year-round habitat component. Webb Tract and Bacon Island, totaling 11,000 acres make up the 238,000 acre-feet of storage. Holland Tract and Bouldin Island, totaling 9,000 acres, make up the wetland and habitat component.
My second point was to talk about project operations. The Delta Wetlands water storage concept is really very

simple, and the basic concept has remained unchanged since it was first conceived.

The reservoir islands are opportunistic by nature. They have been designed to quickly fill and store surplus water when it arrives in the Delta, hold that water until later in the year when a demand exists, and discharge it back into the channels at that time for export.

Our water storage operations are tightly controlled by the current Water Quality Control Plan, as well as the federal OCAP biological opinions. This protects senior right holders. In addition, the project is now constrained by some final operations criteria, which are a set of extensive rules and relationships that were developed during the ESA and CESA consultation. Also, the Delta Wetlands Project is controlled or coordinated by our Operations Criteria and Plan, or Delta Wetlands OCAP, that has been

0104

included in Mr. Don Paff's testimony. This provides the important coordination between the Delta Wetlands Project and state and federal agencies.

But the real key to the Delta Wetlands Project is in its final operation criteria. This provides important fishery protection for nonlisted species, as well as ancillary fishery protection for nonlisted species and provides significant water quality buffers.

Our 1995 Draft EIR/EIS and biological assessment analyze what we now consider a worse scenario. This provided valuable information for developing and shaping our final operations criteria that was used to avoid or minimize fishery impacts. These final operations criteria took over two years to develop and included input from the federal and state fishery agencies, as well as the Army Corps of Engineers and the State Water Resources Control Board. These operations criteria are included in our current, non jeopardy biological opinions.

The final operations criteria have been included in a simple graphical format in my testimony, which is referenced as Table 1 of the Exhibit DW-7. As you can see in this table, the criteria are broken down into two areas: diversions to storage, and discharges for export. They've also been broken down by criteria and along the top by months. So this allows the reader to get a very quick view

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of the criteria that are in place for any month of the year.

Now, instead of going through each criteria and each month, I found it easier to walk through the steps of a typical water storage operation. This will show you the rigorous, multi-layered protection afforded by the final operations criteria.

For my example, I have selected water year 1969 for a couple of reasons. First of all, it wasn't too wet or too dry during our operations, and it also provided a good example of cusp period operations. It's fairly easy to determine when Delta Wetlands can operate after a big storm event or to determine that it can't operate during a very critical drought period. The real challenge is to determine

exactly when the project can start or have to stop during the middle ground or cusp period.

In this particular example, the project will have about half filled in December, completed filling in January. The water will be stored over the winter and spring and discharged back into channels for export into July.

If you can put out the first handout, this is a three-page handout that has been introduced as Exhibit DW-7B.

So, the first step is there must be surplus water available for diversion. In water year 1969, the Delta went

0106

to excess conditions in December. This means and by definition X conditions, there was some surplus water available. Step two requires that X2 must have been located at or downstream of Chipps Island for a period of ten consecutive days prior to initial diversion for storage.

The final operations criteria requires that X2 reach Chipps Island. And if we assume that it happened the 1st of December, ten days later Delta Wetlands could start diversions. Our maximum diversion capacity onto our reservoir island is 9,000 cfs. This is the capacity for an empty reservoir, operating with the siphons completely full. As the reservoir filled, the head differential driving the siphons is decreasing, so this 9,000 cfs rapidly diminishes.

Step three requires that initial diversions are limited to 5,500 cfs for five days once the Chipps Island waiting criteria is completed. So, after the 10th of December, this ramping criteria would apply, and the maximum diversion rate onto the Delta islands would be 5,500 cfs.

Step four requires that the Water Quality Plan limit total Delta exports to 65 percent in December.

Because Delta Wetlands' diversions are considered the equivalent of exports, we have to follow the export-inflow ratio. A check of hydrology indicated in December that inflow was around 26,000 cfs. Therefore, total exports

0107

would be limited to 16,900. A check of Banks and Tracy shows that they were operating at about their capacity of 11,200 cfs. Therefore, the available surplus pursuant to the Water Quality Control Plan would be the difference or 5,700 cfs.

Step five requires that the Delta Wetlands' diversions be limited to 90 percent of available surplus in December. The final operations criteria includes this requirement in December, so that 5,700 of available surplus would be limited to 5,130.

We have a few more steps to go through before we can start diversion. Step six requires that we have to check outflow. The final operations criteria limits us to 25 percent of outflow in December. A check of hydrology shows that December outflow was 14,000 cfs; and Delta Wetlands' diversions would, therefore, be limited to 3500 cfs.

Step seven requires that Delta Wetlands Project to have diversions limited if the Delta Cross Channel is closed for fishery protection. In accordance with our final operations

criteria, if the Cross Channel is closed for fishery protection, Delta Wetlands is limited by a function of Delta inflow. If inflow was between 30 to 50,000 cfs, we are limited to 4,000 cfs. If it is below 30,000, we are limited to 3,000.

So, a check of hydrology showed that inflow at this

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time was 26,000. So, therefore, Delta Wetlands would be limited to 3,000 cfs.

One more step. The Delta Wetlands' diversions may be limited by the San Joaquin River inflows. The final operation criteria allows the fishery agencies to invoke a San Joaquin River limit of 15 days, and, if the Delta smelt fall midwater trawl index is below 239, this limitation can be expand to 30 days. A check of hydrology showed that Vernalis flows were 1,823 during this time. So, if fishery agencies apply their restriction, which in the final operations criteria was 125 percent, our diversions would be limited to 2,279 cfs.

This is a diversion rate Delta Wetlands would be able to start, in my example.

We have a few more housekeeping items to go through.

Step nine requires that fishery monitoring would begin. The final operations criteria requires that Delta Wetlands monitor for presence of Delta smelt in the channels adjacent to our diversion point. If presence is detected, the diversion rate would be cut in half.

Step ten requires that seepage monitoring would begin. Ongoing seepage data that is being collected would be reviewed as Delta Wetlands diverts and, if seepage impacts our neighboring islands occurs, the diversions would cease, and the seepage impact would be addressed.

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Step eleven requires that the location of X2 remain west of Collinsville. The final operations criteria that the Delta Wetlands must cease diversions if X2 reaches Collinsville. In my example for December of water year 1969, outflow after our diversions was in the range of 12,000 cfs. This would have put X2 just west of Chipps Island, but well west of our Collinsville criteria.

Step twelve requires an upstream shift in X2 caused by Delta Wetlands' diversions cannot exceed 2.5 kilometers. So when Delta Wetlands begins diversion, we would maintain a calculation of X2, using, for example, the Monismith equation, which relates X2 location to flows and antecedant conditions. So, we would have a with and without Delta Wetlands Project location of X2 calculated, and if that shift approached 2.5 kilometers, Delta Wetlands' diversions would have to be cut back or cease.

In this example, using a flow rate or diversion rate of 2,279 cfs for a month, X2 would have been shown to have shifted approximately 1.7 kilometers, well within our 2.5 criteria.

And the last step is that our daily operations would be reported. Delta Wetlands would tally up the information and post this information to make it available for the public for coordination with other water projects or interested

parties.

That completes the diversion example. What happened in this was that the project would have half filled in December, completed filling in January, and stored the water until July. An important note here is that these criteria for December are not the most restrictive. The criteria progressively becomes more restrictive as we move through the year from January through March, and in April and May diversions are completely prohibited.

Now let's go through the discharge example.

Step one, the Water Quality Control Plan limits the total Delta exports to 65 percent of inflow in July. A check of hydrology shows that July inflows were 19,000 cfs. Therefore, total Delta exports would be limited to 65 percent or 12,350. The state and federal exports during this time were 6,655. So there was some export capacity available for Delta Wetlands. The difference is 5,695.

Step two requires that there must be unused export capacity available at Banks or Tracy. So, we not only follow the E/I ratio, but we are limited by the maximum permitted capacity at Tracy and Banks. That capacity in July is 11,280. So the difference between that and the actual diversions was 4,625.

One more step and then we can begin discharging for export.

Step three, Delta Wetlands exports are limited by the final operations criteria to 75 percent of unused available export capacity in July. So our discharges at this time would be limited to 3,469 cfs.

A couple more housekeeping items, then I will be done.

The step four requires that fishery monitoring would begin. The final operations criteria requires us to again monitor for the presence of Delta smelt in the channels adjacent to our discharges. If Delta smelt presence is detected, our discharge rate would be reduced by 50 percent.

Step five, water quality monitoring would begin. The Delta Wetlands Project is required to monitor water quality parameters of concern for fishery and M&I users during its discharges for export. This monitoring will be discussed in much greater detail later in our testimony by several of our consultants.

Our last step is step six. Daily operations will be recorded, and Delta Wetlands will, once again, tally up all of our information for the day, post it in a public format, and make it available for coordination.

That concludes my discharge example, and I have one last statement. I hope that this example shows you just how constrained the Delta Wetlands Project is. With these constraints in place, it will not impact senior water rights or the environment. It is a simple concept that provides a valuable new source of water for the Delta. It is an opportunity that should not be missed.

Thank you. That concludes my testimony.

MS. SCHNEIDER: Thank you, Mr. Forkel.
Our next witness is Mr. Easton.
Would you please state your name and briefly summarize your professional experience.
MR. EASTON: I am Jim Easton. I have had a 35-year career as a professional engineer. Twenty-six of that has been government. While in government, I served as the Chief Engineer for the Los Angeles County Flood Control District, the Assistant Director of Public Works of Los Angeles County and also as the Executive Director of State Water Resources Control Board. For the last nine years, I have been a private consultant.
MS. SCHNEIDER: Thank you.
Did you prepare Exhibit DW-8, which describes the water rights necessary for operation of the project?
MR. EASTON: Yes, I have.
MS. SCHNEIDER: Will you please summarize that written testimony?
MR. EASTON: Yes, I will. You have just heard Mr. Forkel describe the Delta Wetlands Project. Mr. Don Paff will follow me, and he will describe the operation of the project and how that will be coordinated with the other

0113

exporters within the Delta.
It is my task to discuss with you the water rights that have been applied for, how those water rights that have been applied for differ from the ones that are needed now to implement the project, and also to discuss with you how the Delta Wetlands Project fits into the current management of the Delta and how it may fit into the future management of the Delta.
With regard to the rights that have been applied for, I am referring to Table 14, and this is at the back of my written testimony DW-8. I would like to start by first referring you to the amount of storage in 1987 when we first applied. We applied for 106,900-foot storage capacity in Webb Tract and 110,570 acre-feet in Bacon Island. This totaled a little over 217,000 acre-feet.
In the interim, between 1987 and 1993, when we modified our previous applications and also made additional applications, we did an engineering analysis that showed that, rather than storing to elevation plus four, which was what the original amounts were based on, we thought we could safely store water on the reservoir islands to elevation plus six. This resulted in an increase in the combined storage capacity for the two reservoir islands, 238,000 acre-feet.
Now, what we are applying for finally is a total of

0114

260,000 acre-feet. And how we get from 238,000 acre-feet, which is the current capacity of the two reservoirs, to the 260,000 is that we are assuming that there will be a half an inch of subsidence per year for the next 50 years. That is why we are applying for an ultimate capacity of 260,000 acre-feet.
We have applied for storage rights in these amounts in 1987 and 1993. What we are currently asking the Board to

consider is 245,000 acre-feet of storage in each of the two reservoir islands for a total of 490,000 acre-feet.

HEARING OFFICER STUBCHAER: Mr. Easton, when you say "these amounts," it doesn't show up on the transcript in the proper location.

MR. EASTON: Okay. I think it is in the written testimony, so I won't go back over that.

We are asking for a total of 490,000 acre-feet combined for the two islands. In addition to that, we are also asking for direct diversion rights in the amount of 60,000 acre-feet for each of the reservoir islands. I believe there are instances where we will be able to, within a 30-day period, convert water on to the reservoir islands, and within that same 30-day period, there will be an opportunity to export water from those islands. That is the reason we are asking for 60,000 acre-foot per island, or a combined total of 120,000 acre-feet of direct diversion.

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Now, I would like to discuss with you how the Delta Wetlands Project fits into the current management of the Delta and, also, the future management of the Delta.

First I would like to address the protection of senior water rights. These rights that we have applied for are going to be junior to the appropriative rights held by the exporters and also the riparian rights that are held within the Delta. These rights can only be exercised when we have demonstrated that there will be no interference with existing water right holders within the Delta. Don Paff is going to follow me, and he is going to describe in detail the operational process and the coordination processes and procedures that are going to assure that there will be no interference with senior water right holders. It's going to be necessary for operators of the Delta Wetlands Project to be constantly aware of the operational plans of the other Delta exporters, and to also be constantly aware of what the hydrologic conditions are and what the applicable regulations are. So that we can been assured that our project is going to be operated in full coordination with the other exporters and without interference to the senior water rights and in full compliance with the regulations that apply.

So, we can conclude that the Delta Wetlands Project will have no effects on how other water projects and other

0116

water diverters conduct their operations within the Delta.

Now I would like to talk about how the Delta Wetlands Project will fit into future and ultimate Delta management. If we are going to talk about that, we need to talk about CAL/FED.

All of us are very concerned with what CAL/FED is doing. Many of us are involved in that process. It is a very important process. The Delta Wetlands Project has held several meetings with the CAL/FED staff. And there have been two purposes for that meeting or those meetings. One is to make sure that the CAL/FED staff is aware of the status of the Delta Wetlands Project as it has evolved.

Second is, as part of our efforts to stay very closely

involved in the CAL/FED process. We have attended numerous meetings. We have submitted written comments on various CAL/FED documents. We have been, and we intend to be, closely involved in that process as it continues to evolve.

The Delta Wetlands Project closely adheres to all four CAL/FED objectives. The first objective is ecosystem restoration. The Delta Wetlands Project is going to provide 9,000 acres of new habitat. Our efforts with the fisheries agency have resulted in no-jeopardy opinions from the federal fish and wildlife agencies.

The second objective of CAL/FED is water supply dependability. We help meet that objective because Delta

0117

Wetlands provides a much needed and very important source of new surface water within the Delta.

Third objective of CAL/FED is Delta levee stability. All four of the Delta islands' levees will be upgraded to comply fully with the criteria and standard specified in DWR Bulletin 192-82.

And, lastly, the preservation and enhancement of Delta water quality is designed and mitigation measures of the Delta Wetlands Project will assure that there will be no significant adverse impact to Delta water quality. And, in fact, the Delta Wetlands Project will provide opportunities for Delta water quality improvement.

This project is consistent with all six of the CAL/FED solution principles. And even though Delta Wetlands is not part of the CAL/FED process, we do adhere to the criteria that have been established for early implementation projects.

I think one of most important ways that Delta Wetlands is going to benefit the CAL/FED process is in the matter of balance. CAL/FED representatives have consistently stated the importance, as the CAL/FED process is implemented and CAL/FED program is implemented, of maintaining a balance, particularly between ecosystem restoration and water supply benefits.

The Delta Wetlands Project, even though it is not part

0118

of CAL/FED, is one of the few opportunities to provide new water supply benefits within the Delta. So that will provide an important balance between water supply benefits and the very large expenditure and great deal of activity that is going to take place on early implementation ecosystem restoration projects of CAL/FED.

The project is consist with the alternatives that are currently under consideration by CAL/FED. Indeed, we can say, because of the multiple benefits of this project, because of its flexibility and its versatility, that regardless of the CAL/FED alternative that is finally selected as the preferred alternative, the Delta Wetlands Project will not only fit in with, it is going to be a very important compliment and enhancement to whatever CAL/FED decides to do.

The Delta Wetlands Project is ready for permitting now. We have fulfilled the requirement for permitting, and I am not going to go through all of those that are listed in

the Water Code, but I would like to discuss very briefly two of them.

One is water available for this project. You've heard Dr. Brown testify. You've heard Mr. Forkel testify. And I think Mr. Forkel's testimony was particularly interesting. Because, despite what are very daunting and very severe constraints on this project, there are significant

0119

quantities of water that are available for diversion and use by this project.

With regard to beneficial use, there are a number of beneficial uses listed in our water right applications. But, certainly, the principal and most important one is as a new source of surface water. Bulletin 160-93 states that by the year 2222 California may be facing a total water supply deficit in the range of 4 to 5,000,000 acre-feet. There are many in the water community that are very concerned that not enough is being done to address that deficiency. Certainly, having 154,000 acre-feet of water on an average annual basis available in the Delta, that would otherwise be lost to beneficial use within the system, that will be put to beneficial use, probably as urban water supply, is a very important consideration.

Mr. Stubchaer and other Members of the Board, I would submit to you that we have, indeed, demonstrated, and that we will again demonstrate during these proceedings, that we have made the requisite showings and substantiations, not only for a water rights permit, but to demonstrate that this project is a critically needed element of ultimate efficient Delta management. As I mentioned before, this project is one of the few that appears to have the opportunity to be implemented within the next decade, as far as new sources of surface water are concerned.

0120

The issuance of the water rights permits by this Board will demonstrate to the water community that this is an important and viable project and will remove the last major impediment to our successful marketing of this project.

In summary, the Delta Wetlands Project has been carefully crafted to provide an immediate and important water supply benefit without detriment to current and senior water right holders or to the environment. This project has been honed, modified, and adjusted through ten years of intensive interaction between the project proponents and the water community, the environmental community, and the regulatory agencies. We have no-jeopardy opinions from the federal fishery agencies. This project is flexible and versatile, and it will be an extremely valuable tool in the efficient management of the Delta.

It is needed now. It doesn't take a rocket scientist or specialist in Delta water project operations to realize what a great benefit it would have been to have had a fully operational and permitted Delta project beginning in December of last year. Wouldn't it have been great if we could have stored 238,000 acre-feet of that huge outflow that went out the Delta in December, January, and February, and not have been constrained as the upstream reservoirs

were by flood control requirements?
It is my strong testimony and belief that this project

0121

richly deserves your favorable consideration for granting the water rights permits that have been applied for.
And that is my testimony.
MS. SCHNEIDER: Thank you, Mr. Easton.
Our next witness is Mr. Paff.
Would you please state your name and briefly summarize your professional expertise?
MR. PAFF: My name is Don Paff. I have had 45 years in the water resource field. I guess that makes me one of the oldest folks in this room today. Since my retirement as Chief of Operations of the Central Valley Project, I have worked as a water resource management consultant, and I have been a consultant to Delta Wetlands since 1994.
MS. SCHNEIDER. Did you prepare Exhibit DW-9 that describes Delta Wetlands operations under the DW Operating Criteria and Plan?
MR. PAFF: Yes, I did.
MS. SCHNEIDER. Would you please summarize your written testimony?
MR. PAFF: Thank you. I will.
Mr. Stubchaer and Members of the Board, in most of my previous experiences in appearances before the Board I had the responsibility to report painful and difficult aspects of water deficiencies and address with the Board the impacts of multi year drought conditions. Today is different.

0122

Today I have the pleasure and opportunity before you to discuss a new, an additional supply of water to California and the potential opportunities for additional capabilities for effective and efficient water management as a result of the opportunistic Delta Wetlands Project.
In summary of my written testimony, I would like to highlight some of its elements. The substance of these highlights resolves around Delta Wetlands Operating Criteria and Plan, Delta Wetlands OCAP, which is attached to my written testimony.
The purpose of Delta Wetlands OCAP is to document information on the fundamental elements and criteria governing Delta Wetlands' operations, formulated specifically to be consistent with the State Water Project and Central Valley Project operations. It will serve as a base operations reference. It defines the relationships with the Central Valley Project, the State Water Project, CAL/FED, and the fishery agencies. During the development of Delta Wetlands OCAP, drafts were provided and discussed with the Bureau of Reclamation and the Department of Water Resources. Both agencies provided valuable additions and comments which were incorporated into the document.
Delta Wetlands OCAP contains operational criteria which have been described in detail by Mr. Forkel. Basically, information and criteria affecting Delta Wetlands'

0123

diversions and discharges, in addition to the requirements of the 1995 Water Quality Control Plan and the protection of

senior water rights. Delta Wetlands OCAP contains operational coordination, which describes the needed communication and coordination with the Bureau of Reclamation, Department of Water Resources, CAL/FED, National Marine Fisheries, Fish and Wildlife Service, and Department of Fish and Game. It also describes the coordination required to collect and share Delta Wetlands monitoring data and information.

Delta Wetlands OCAP contains an operating plan which describes a four-element approach. The development, first, of a 12-month forecast of operations, an operations plan reflecting any and all CVP and SWP forecasted operations that would influence Delta Wetlands operations.

Second, the monthly updates of the 12-month plan in coordination with CVP and the State Water Project.

Thirdly, updates or revisions to operations resulting from the coordinations with CAL/FED's OPS Groups. Those could take place. And finally, the weekly and daily adjustments to diversions and discharges to conform to actual, real time Delta conditions.

Delta Wetlands is a highly flexible and responsive project. Delta Wetlands OCAP was developed to be a dynamic document. Subject to revisions and additions to incorporate

0124

such features as details on fish monitoring, details on water quality monitoring, and certainly the diversion and discharge criteria and coordination procedures as identified in the recent Delta Wetlands/Bureau Reclamation agreement submitted to the Board on July 2nd.

Mr. Stubchaer and Members of the Board, my water experience, especially with the Central Valley Project and 18 years with the overallocated Colorado River, indicates that California must seek and develop new water supplies which are environmentally sensitive and respect senior water rights. I believe Delta Wetlands fulfills those criteria.

The Delta Wetlands Project would have been a valuable asset to both the operational efficiency and water supply during those terrible years of 1987 and 1992. I wish I had the project as an asset when I was CVP Operation's Chief to help alleviate the drought conditions and aid in the water management processes that took place during those tough years.

Most recently, the wet-dry 1997 year is one which Delta Wetlands could have played an important role in the retention of flood waters to offset later reductions in runoff and storage. I believe that the flexible Delta Wetlands Project could benefit California's water management, even during drought periods where little or no diversions are made. It is an important element in the

0125

Delta to be used.

The Delta Wetlands Project is important to water supplies in California. It should be permitted. It should be constructed, and it certainly should be put into operation. Thank you.

MS. SCHNEIDER: Thank you, Mr. Paff.

Mr. Stubchaer, our next two witnesses need to come up,

and they will be Mr. Hultgren and Mr. Egan.
HEARING OFFICER STUBCHAER: Whenever you are ready.
MR. SCHNEIDER: Would you please state your name and briefly summarize your professional expertise?
MR. HULTGREN: My name is Ed Hultgren. I am a geotechnical engineer. I have been practicing for 25 years.
MS. SCHNEIDER: Did you prepare Exhibit DW-17, which describes the development of Delta Wetlands Seepage Program and Levee Stability Program conducted by your firm on behalf of Delta Wetlands?
MR. HULTGREN: Yes, I did.
MS. SCHNEIDER: Would you please summarize that written testimony?
MR. HULTGREN: Sure. It is a pleasure to be here, Board Members, and talk to you today. I have been working on this project for nine years. It has been a fun project for me. One of the things that made it fun was the

0126

proactive nature in which much of the work occurred. Technical Review Committee was set up by the Central Delta Water Agency; and the members of that committee consisted of all the reclamation district engineers representing the neighbor islands, as well as two consulting geotechnical engineers. All of our work was bounced off them; we were able to interact with them and incorporate their ideas into our work, and it made for a very enlightening experience.
The project -- one of the key things of this project is the levees will be stabilized and buttressed. You have heard that before. I am sort of reiterating it, that we are going to be putting additional fill and buttressing the levees, making them stronger and raising them so they have less over-topping; and the goal is, as a minimum, the criteria of 192-82 guidelines of DWR.
The rest of my testimony is going to relate to seepage. And as one guiding principle, I think, of seepage that is important, we recognize, Delta Wetlands cannot operate -- Delta Wetlands must operate without causing a seepage impact or the corollary of that, Delta Wetlands will be not allowed to operate if it does cause any seepage.
Let's go to the first figure. All these figures come out of my testimony. They are Figures 1 through 6. This is Figure Number 1, and it just shows what a typical condition is today in the Delta. It shows a slough or river or a cut,

0127

and the seepage coming out of that river or a cut and it is infiltrating beneath the islands, and it is causing seepage out of the islands. This is the current source of water.
In Figure 2, it shows what is happening opposite a currently flooded island, be it Little Mandeville, Mildred, Franks Tract, or one of those other islands. We have an island that is now inundated with water and the seepage is not just occurring from beneath the slough, but it is also occurring from beneath the entire width of that island, and that seepage is tending to go toward a neighbor's island.
I have shown on here, the dashed black line, that shows the hydrostatic head in the sand aquifer under the island.

It is considerably higher under this kind of condition than it was in the previous figure because there is a lot more seepage occurring. What is Delta Wetlands going to do? Let's look at Figure 3. Delta Wetlands is gong to be similar to the flooded island concept. There will be seepage occurring from the Island into the underlying aquifer, but we are not going to allow it to go past the island perimeter. That is going to be handled by a series of pumped wells that are placed all around the important issue of the island. We are not going to put it across from Franks Tract where there is already a flooded island. Across the neighbor's island we are going to have a line of wells that are going to be pumped to keep the groundwater

0128

within historic ranges, and capturing essentially all the seepage that will be occurring from the island.

Let's go to Figure 4. This is a proven technology standard used in the construction industry. It's basically how do you dewater the ground. Any time you want to build a deep abasement in Stockton or Sacramento or a BART station in San Francisco, you are going to be digging below the groundwater table. A classic solution is you put a series of wells, and you pump from those wells to lower the groundwater below the excavation, as illustrated by Figure 4.

Well, Delta Wetlands is similar to that, but we are going to do something that is different to this excavation. In Figure 5, let's imagine we filled it with water. This is, essentially, a Delta Wetlands Project. We would use those very same wells to control that groundwater by pumping the groundwater down those wells that would be seeping, in this case, from the excavation, we would able to keep from affecting the neighbor's property. That is the Delta Wetlands Project.

How are we going to know we are not affecting our neighbor's island? Figure 6 shows a map of the Delta. It shows a bunch of solid dots opposite the two reservoir islands. Those are monitoring wells or piezometers, in which we are going to keep track of the groundwater levels

0129

on those islands. We are going to start doing that at least one year prior to start of filling the reservoir. So, we will have some background data on what goes on in those islands. We have been, by the way, doing this for the last eight years. On 17 islands we have 34 wells out there. We have been tracking the groundwater, so we have some history of the background wells out there.

Delta Wetlands must keep those within historic ranges. Let's go back to Figure 3. Figure 3 shows a monitoring well on the adjacent island. That is how we are going to see it. We are going to keep the groundwater of that island within its historic range, not allowing seepage to occur.

Probably if any seepage tends to occur, it will be most noticeable during the very first filling. So, Delta Wetlands, rather than just fill these things as fast as you can, the very first time it is going to be a staged filling process. That means we are going to fill it by a few feet

and stop filling, and take time to make sure we have all the data we can fully assimilated to know that we are not affecting neighbor's island. If we start to see trends building up that are still within the historic range, we start seeing a trend, we are going to adjust our pumping rates, even add additional pumps.

I am sure our neighbors, at that point, will be looking real close at their fields, too, because they know we are

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filling for the first time. If we see we have no issues, we will fill to the next stage. Let's say we find something is happening and we need to -- start causing an impact to our neighbors; if we can't control it with adequate pumping right then and there, we will have to lower the water level in our reservoir. Why? Because we are not going to be allowed to cause seepage on our neighbors' islands.

Again, this would be repeated, cyclically until we finally get to full reservoir storage and have enough wells and enough pumping capacity and controls so we can control it at whatever stage we are going to operate.

Let me summarize by just reiterating that the key rule for seepage is that the permit conditions will not allow seepage impacts. I consider the big hammer for this project is to protect the neighbors, is that no impacts means no water stored. So Delta Wetlands is going to have to control the groundwater if they intend to store water.

Thank you.

HEARING OFFICER STUBCHAER: Mr. Hultgren, do all islands have sand under them?

MR. HULTGREN: Most do, but not all. The two reservoir islands do. And most all of the islands we have found in the central part of Delta have a single aquifer under it, mainly a dune sand that goes between them. We've got north of the San Joaquin River on Bouldin Island, there was not

0131

nearly as much.

HEARING OFFICER STUBCHAER: Thank you.

MS. SCHNEIDER: Thank you, Mr. Hultgren.

Next witness is Mr. Egan.

Would you please state your name and briefly summarize your professional expertise?

MR. EGAN: My name is Geoffrey Ronald Egan. I have degrees in mechanical engineering, materials engineering, and applied mechanics. And after all schooling, I have spent probably 25 years involved in most aspects of oil and gas pipelines, both in the U.S. and overseas. I have worked on gas pipelines in Alaska, gas gathering lines. I have worked on lines into the strategic petroleum reserve. I have worked on lines in Indonesia, the South China Sea, and most recently on what is called the Oman to India Gas Pipeline Project, which is a novel project to deliver to a billion standard cubic feet a day of gas to India from the Sultan of Oman.

MS. SCHNEIDER: Did you prepare Exhibit DW-18, which describes the potential effects of the Delta Wetlands Project operations on the Pacific Gas & Electric Company's natural gas lines 57A and 57B underlying Bacon Island?

MR. EGAN: Yes, I did.
MS. SCHNEIDER: Would you please summarize your written testimony?

MR. EGAN: Yes. My testimony addresses the issues that are related to PG&E gas lines that cross Bacon Island. The diagram that we have from my testimony, and I believe this is Figure 3E-2 of my testimony, shows that the two lines that we are concerned with. That is lines 57A and 57B that cross Bacon Island and also cross Mildred Island. 57A was laid in about 1949, and put into service at that time. Line 57B dates from the mid seventies.
Currently, the 57A line is not being used. We don't know the exact status of that line. We know that it is not in use at the present time. We also found out from some documents that we received yesterday that the line is actually cut and capped inside the levee on Bacon Island.
Line 57B is used to fill and draw down gas from the McDonald Island gas storage facility. And that is the connection here, 57B. It is important, I think, to note that both lines cross Mildred Island, which has been flooded since 1983. And this fact is important because those lines are now operating in conditions that would be similar to the conditions that will apply when Bacon Island is used as a reservoir. This means that the experience of PG&E and its activities for operations and maintenance from Mildred Island are directly applicable to what happens in the future to Bacon Island.
So, the purpose of my testimony, Mr. Chairman, is to

provide information on the hazards associated with the intentional flooding of Bacon Island and its use as a reservoir. There are really three main issues. First, what effect will inundation of the operation and maintenance practices employed by PG&E for their lines? Secondly, what effect will inundation have on the corrosion of the pipeline? Because this is the main thing we guard against when we lay lines in swamps or even wet/dry, wet/dry environments. And thirdly, what is the influence of levee buttressing on loads that may be generated on the line by differential settlement?
Let me jump to the bottom line before I describe each of these issues in detail. We believe, basically, that there will be no impact on current ongoing procedures when the island is inundated. The cathodic protection system will remain functional and the line loads due to differential settlement will stabilize, and there are procedures to manage that effect.
Let me deal with each of these separately. First, with regard to O&M practices. I believe that these will be identical to those that are now employed by PG&E at Mildred Island, and other shallow water crossings. This is not a unique situation, a gas line under water. In fact, it is under shallow water. This means that PG&E's current practices for operations and maintenance at Mildred Island

can be employed when Bacon Island is flooded. In the past,

the line under Bacon Island would have operated in water most of the year, with the water table above the line. In other words, under the current agricultural use, there are alternating periods of water and damp soil surrounding the pipe. And this, of course, affects the corrosion rate.

It is unlikely that the pipe has ever experienced dry soil conditions, except in the drought years that we heard about earlier. This is common for gas pipelines in swamp areas, and provision for local repairs that may be needed during water periods that may be shoring and pumping out excess during the repair activities.

It is important to note, I think, Mr. Chairman, that these conditions, the dry maintenance window and then water below, the water table below the bottom line, have not existed for over 14 years at Mildred Island. So, this has system is, in fact, manageable once the island is inundated.

To protect the line against corrosion, a cathodic protection system is used by PG&E. This is what we call an active and pressed current cathodic protection system, and that will not be affected by the inundation. In fact, Delta Wetlands has agreed to relocate and modify, if necessary, the aboveground facility. This aboveground facility is a relatively, modestly-sized rectifier and test equipment, so

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that you can measure to make sure the cathodic protection system is operating. The change from agricultural use to water use will have basically no effects upon the soil corrosivity, which can be handled by the cathodic protection system. The pipe itself is already coated by a corrosion protection coating and also by cement. This means that it is extremely robust from the corrosion point of view.

Based on a review of the records that we have seen recently, we believe that it will not be necessary to excavate this line as part of a normal maintenance and inspection follow-up procedure. Excavations were done in 1992, and the data indicate that there was no external corrosion damage, and the line was in, quote, excellent condition. That is from the inspection report from PG&E.

The absence of external corrosion is consistent with the cathodic protection system monitoring which is sensitive to significant changes in corrosion.

To assist the potentially effect of differential sediment at levee crossings, it will be necessary to implement a version of the PG&E monitoring procedure that has been in place on the levees on McDonald Island. The levees will be brought up to state standards in common with other levees in this region. In the long run the settlement will stabilize and, we believe, this will not impact the pipe integrity with respect to axial loads.

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Levee settlement leads to axial loads in the pipeline.

By design, the controlling stress and loads in the pipe out of the circumferential stresses, what we call the hoop stresses, and these are imposed by internal pressure. They normally limit the operability of the line. We believe this is and will remain the limiting condition.

I did notice from documents recently received, in fact yesterday, that PG&E is already monitoring levee displacement on both sides of Bacon Island. So, here is a tool we can use to manage the settlement that occurs.

Finally, and this was written up in my written testimony, the likelihood of line rupture, the event postulated by PG&E, which would require repairs, is significantly reduced because of major hazards to the line, that is what we call third party damage, is almost totally prevented because of the inundation itself. This is particularly significant because the soil level will continue to drop as agriculture activities continue. This means the pipe becomes more at risk than the absence of inundation from third party damage, which is somebody hitting the line and causing a rupture.

Recent statistics for pipeline accidents indicate, and these are from the Office of Pipeline Safety of the Department of Transportation, indicate that over 50 percent of all accidents in gas pipelines are from this third party

0137

damage event. So it is very important to recognize that that will be prevented once the island is inundated.

Let me conclude with just a few general remarks about the gas lines. We really are not dealing with the unique situation here, once this island is flooded. We have numerous sections of lines, even in the Delta, already that are under river crossings and so on. Lines in swamp areas of Louisiana and Texas are commonly managed, and we are simply applying standard industry practices to manage a gas pipeline in what we now believe, once it is flooded, to be an overall more benign environment.

That concludes my testimony. Thank you.

MS. SCHNEIDER: Thank you, Mr. Egan.

Mr. Stubchaer, the next three witnesses will be addressing water quality issues. They are Dr. Brown, again, but on water quality; Dr. Kavanaugh and Dr. List.

DR. BROWN: I hope everyone remembers all that I told you before lunch.

MS. SCHNEIDER: Thank you, Dr. Brown.

MEMBER DEL PIERO: Time is up.

MS. SCHNEIDER: Dr. Brown, did you prepare Exhibit DW-10, which describes the environmental review of potential water quality effects of the Delta Wetlands Project that was conducted by Jones & Stokes Associates on behalf of the Board and the Army Corps of Engineers?

0138

DR. BROWN: Yes, I did.

MS. SCHNEIDER: Will you please summarize your written testimony on those issues?

DR. BROWN: The Delta Wetlands Project will have three potential effects on water quality. The first potential effect is that because the majority of agricultural land practices will be converted to new land uses, there will be a substantial reduction in the agricultural drainage that carries, in general, poor water quality from the islands into the Delta channels.

The second major effect will occur during periods of

diversion. When Delta outflow is reduced, there will be an increase in salinity throughout the Delta channels because the reduced Delta outflow will allow an increased amount of salinity intrusion everywhere in the Delta.

The third potential effect on water quality will occur during discharge for export. Because, if the reservoir water quality, or concentration of variable is higher than is occurring at the export, that discharge of that higher concentration will raise the export concentration. And this third effect will be proportional to the contribution that the Delta Wetlands' discharges are making to the export, the total export pumping.

Although there are many water quality variables of potential interest, my brief review of the water quality

0139

assessment will focus on just two key assessment variables, salinity and dissolved organic carbon. Salinity we'll use to track the possible effects of Delta Wetlands during diversions, when there will be increase salinity.

The dissolved organic carbon is a major importance because of the peat island land acreage and the vegetation within the Delta. We know this contributes to the dissolved organic carbon concentration at the exports. And dissolved organic carbon along with bromide, which is one component of salinity, are the two precursors, we call it, for creating disinfection by-products out of the treatment plant. So by tracking salinity, using the variable bromides and dissolved organic carbon at the export pumps, we will have fully analyzed the possible effects of Delta Wetlands' discharges on export water quality and treated drinking water, disinfection by-products.

I think I am ready for my first figure. This is a schematic of a reservoir island under agricultural land use, of a Delta island under agricultural land use. The water quality assessment methodology is very similar to the monthly water budget assessment that we used for water supply. I am just illustrating that the three important variables, which is the water budget, the soil-salt budget, tracking salinity on the island and in the channels, and the dissolved organic carbon are the three variables that need

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to be tracked together. And so we rely in our water quality assessment on the water budget that was used for the water supply.

We are just needing to focus on the water budget on an island, which will be some applied water that is siphoned diversion water. The drainage water that comes off the island from seepage and from the irrigation, keeping the groundwater low enough to grow crops; the rainfall that comes on to the island on occasion; the evapotranspiration which is consuming water off the island, seepage and leaching. Leaching is applied water that is then -- well, in this case we are using leaching to be seepage off of the island towards the channels, and seepage is the flow coming on.

What we are attempting to do is to create the similar monthly water quality budgets to go along with the monthly

water budgets that we already have. The salt budget is that there is an applied salt concentration coming from the channels that is being loaded or added to the islands when either applied water or seepage water comes onto the islands. Then there is a drainage salinity, a salt concentration, that is leaving the islands during the drainage activities. And so --

MS. LEIDIGH: Dr. Brown, could you identify the figure for the record?

DR. BROWN: I am working off of Figure C2-1 from the EIR/EIS document.

So we construct the soil/salt and the salinity budget by piggybacking onto the water budget, the concentration terms going onto the island and drainage concentrations coming off.

The dissolved organic carbon analysis is nearly identical to the salinity analysis with the addition of the important source of dissolved organic carbon that may occur on the island acreage. There is no internal source of salt. The salt budget is simply seasonally lagged between the irrigation application and the leaching. There is no new salt being created on the island.

In contrast there is considerable source loading of dissolved organic carbon under both present agricultural, and there may be substantial sources under the proposed project, either reservoir or habitat island uses.

Next figure, please.

I mentioned that there are, at this point, 25 years of continuous salinity measurements using electrical conductivity as a variable. I am just wanting to say that for doing salinity, there is adequate direct measurements of the effects of outflow on salinity so that the assessment of salinity effects for the Delta Wetlands Project can be completely described from the historic data. Although we did use for the EIR document a combination of field measurements and model results, I am just summarizing the possible effects on salinity with this Figure B2-18 that indicates with this combination of measured monthly salinity at Chipps Island, Antioch, and Jersey Point in comparison to an estimate, which looks like an exponential curve going backward, what the effect of a change in outflow would be. So, for example, if we had outflow of 8,000 cfs at Chipps Island, we are estimating off of this approximate curve, four millisiemens per centimeter of electrical conductivity, a salinity measure. And if the outflow were to be reduced to 4,000, corresponding to 4,000 cfs of diversion, the salinity at Chipps Island, with this relationship, would have been increased to 12. That may very possibly be a significant change in salinity.

This same type of relationship between outflow and salinity can be constructed at any Delta or for any Delta location; and, in particular, the effects of reduced outflow on the export salinity, which we now often measure as chloride, a third variable for salinity, is one that we track and are looking for with our impact assessment.

Now, moving on to dissolved organic carbon, the condition or the availability of direct measurement of what the effects of dissolved organic carbon loading and the effects of river inflows and outflows are, we have much less

0143

data to go on. Beginning in 1989, under staff Board direction, several interested agencies, Department of Water Resources, which was running what is now called the Municipal Water Quality Investigation Program, directly measuring the agricultural drainage and Delta channel concentrations of dissolved organic carbon and other associated water quality parameters, Metropolitan Water District, Contra Costa Water District, basically all of the interested agencies in drinking water quality at that time began participating in what I now call the Water Quality Advisory -- forget what I called it.

It is an agency review team that meets under Board staff direction numerous occasions and participated with Delta Wetlands in attempting to do the very best analysis of dissolved organic carbon.

The dissolved organic carbon load in units that I will use as grams per meter squared, that is how much organic carbon comes off a certain area and would, therefore, be dissolved in the water above that area, is related to concentration in the water times the mean depth of the water that is over that.

Now, for agricultural drainage, there is approximately a meter, we will say, for example, of water that is drained off the Delta islands each year. So the concentration showing up in that drainage water will be directly related

0144

to the load in grams per meter squared, because of the depth of meter. So the load and concentration will have the same number.

But for reservoir island there will be much more water placed over the peat soils. So whatever load they were producing will be diluted and the concentration will be related to the load times the mean depth. As the mean depth goes up, the concentration will go down if the loading, under the two conditions, were the same.

MS. SCHNEIDER: Excuse me, you are referring to Figure C3-11?

DR. BROWN: Yes, thank you.

In consultation or under cooperation with these participating agencies, there were some specific water quality experiments done by the Delta Wetlands Project to assist in this water quality assessment. There were four experiments; all of them associated with trying to determine what the loading of dissolved organic carbon would be.

Next figure is Figure C3-2 from the documents. This just shows the map of the Holland Tract demonstrates a wetland. It is a little over 60 acres, and all of the experiments were associated with demonstration wetlands. The first experiment is that this portion of the wetland was flooded in the late fall of 1989, and the total load emerging from the combination of decaying vegetation and the

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peat soils was measured as a concentration with a mean depth of about half a meter.

In the spring of 1990, the entire wetland was flooded up to a deeper elevation. All of this loading remained in the wetland. And again, the concentration in this flooded wetland was measured to determine if additional source of organic carbon would come out of the peat soil during approximately a three-month storage.

The third experiment is that wetland vegetation harvested from this wetland was placed in a tank, and the concentration of dissolved organic carbon coming out of this known actual density of wetland vegetation was measured, to determine how much of the total organic carbon came from vegetation as compared to peat soil source.

And the fourth experiment was a comparison of the organic carbon in soil samples collected from this demonstration wetlands and an adjacent agricultural field.

Quickly, the results of these four experiments, which are being used in consultation with the agencies and in analysis of their municipal water quality investigations data from ag drainage and channel sites, together, was being brought together in the water quality assessment model.

The first experiment, dissolved organic carbon of approximately four in the channels. When it was applied to the wetland, increased, and over the three-month period

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reached a concentration of nearly 40 milligrams per liter.

The mean depth of this initial experiment was a half a meter, which means that the loading was approximately half of this concentration. We'll call it 20 grams per meter squared.

MS. SCHNEIDER: You are referring to Figure C3-5?

DR. BROWN: Yes, I am. Thank you.

And right below it is Figure C3-9. In this experiment, the seasonal experiment was connected where the initial concentration, as the entire wetland was filled, was approximately 30 milligrams per liter. And over a three-month period, from April through July, the concentration of dissolved organic carbon, while it fluctuated some, this is a natural experiment, did not increase substantially. This had a deeper water mean depth of about .8. The 30 milligrams, times the .8 gives an estimate loading, total loading off of the combination of wetland vegetation and peat soils, again, of about 20 grams per meter squared.

The vegetation experiment indicated that approximately half of that total loading of 20 grams per meter squared came from the wetland vegetation; and the other half must have come from the peat soils themselves.

The fourth experiment was a comparative analysis of soil samples collected from the demonstration wetland at the

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surface and down a couple of feet and then soil samples from an adjacent agricultural field.

These experiments demonstrated, I am now referring to Figure C3-23, Figure C3-26. The dissolved organic carbon observed in the saturated or pore water of soil sample was

brought to full saturation, fully wetted, and then that water was squeezed out of the sample, and when the dissolved organic carbon is measured, the wetland soils, either surface or bottom, are less than a hundred milligrams per liter dissolved organic carbon.

The two surface soils in the three different measurements are indicating three different holding times before the chemistry is measured, exhibited dissolved organic carbon of greater than a hundred milligrams per liter. This dissolved organic carbon can actually be compared to the organic carbon in the soil sample. And it turned out for the wetland soils, it is less than one part per thousand. One milligram per gram of total carbon is in the dissolved organic carbon form in the water after saturated the soil. Whereas for the surface soils from the agriculture, greater than one part per thousand, approaching two parts per thousand. And we learned from this experiment that it is likely that the loading of dissolved organic carbon under wetland conditions will be less than under agriculture. However, there is not sufficient information.

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We don't have the amount of water coming off of these land uses to completely describe the loading conditions.

Finally, we are ready to put this information into the monthly water quality assessment model. Under the direction of your staff, we created another model called DWQ, Drainage Water Quality, which accounts on a month-by-month basis the change from the no-project conditions, where we removed the agricultural drainage estimated to be coming off of the Delta wetland island, and in the estimated loading that would come off the islands under the reservoir and habitat conditions and looked to see what effects of the exports are.

This cooperative agency group asked at this point in the analysis that an additional model be used to fully disclose possible environmental effects on drinking water quality, in particular an EPA model called the Water Treatment Plant Model was asked to be used to show what the effects of these changes, possible changes, in dissolved organic carbon and bromide at the export pumps might do to concentrations of trihalomethane. We used the Penitencia Treatment Plant as a representative water treatment plant, using basic chlorination as their disinfectant process and tracked the effects on their trihalomethane concentrations.

I guess I am showing this briefly. We are looking at Figure 3C-19, which, for the same 25-year period that we

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have been using, the historic, or this period of historic conditions, here simulating the no-project compared to Alternative 1, we can estimate that dissolved organic carbon at the export pump each month, using the Delta DWQ model, and using the EPA water treatment plant model, we can estimate the trihalomethane concentration expected at a plant similar to the Penitencia, and it fluctuates through time. And we are ready to finish our impact assessment by applying significance criteria, which of these simulated changes in water quality, either in bromide or other

salinity measures, or in dissolved organic carbon at the exports or four trihalomethanes at a representative treatment plant, which of these would be considered significant water quality impacts? We used two significance criteria. If there is an established objective, such as a chloride, 150 milligrams per liter standard, then we apply a safety factor, a buffer, and choose that any change greater or approaching 90 percent of the established objective would be considered significant impact.

But there are many water quality variables such as dissolved organic carbon that do not have an established threshold or standard. For these, we used our second significance criteria, which is a 20 percent change. For a variable such as chloride with a standard of 150 milligrams per liter, which applies during part of the year at Contra

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Costa's intact, 20 percent of that or 30 milligrams per liter was used as our second significance criteria. Any change greater than 20 percent of the standard was considered a significant impact. This is on a month-by-month basis. So, a one-month change would be considered significant.

For dissolved organic carbon there is no established standard. So we are using 20 percent of the mean value. For example, the mean value for dissolved organic carbon at the export pump over the last number of years has been approximately 4 milligrams. Using the 20 percent significance criteria, a monthly change of more than 0.8 milligrams per liter of dissolved organic carbon was considered a significant water quality impact in the document.

Because the modeling indicates that it might be possible or it is possible that the Delta Wetlands' discharges could have more than that significant change in dissolved organic carbon, for example, there is a mitigation measure recommended in the draft document which would require monitoring of these variables of concern and limiting the Delta Wetlands' discharges to assure that change in export concentration of the dissolved organic carbon, for example, would not exceed the, in this case, significance criteria. In the case of actual terms and

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permits, it would be your specified mitigation standard. That might be the same as what we use for significance criteria, but would not necessarily be the same.

I have one last point. The final operations criteria, which limits the period of Delta Wetlands' diversions and also limited amount of discharge, is likely to have reduced the possible occurrences of significant water quality impacts to less than what was shown in the draft document under Alternative 1 and 2. With the mitigation monitoring applied, we can be assured that Delta Wetlands Project will not have a significant effect on either salinity or dissolved organic carbon.

Remembering that the Delta Wetlands Project eliminates ag drainage from much of the projection land, that currently leads to some of the high export and/or dissolved organic

carbon values. There is the possibility that the project will actually have beneficial effects, small, but measurable in many months, and then, during diversion months and discharge months, will have impacts. But with mitigation, they will be less than significant.

Thank you.

MS. SCHNEIDER: Thank you, Dr. Brown.

HEARING OFFICER STUBCHAER: Ms. Schneider, interruption for a question from Ms. Forster.

MEMBER FORSTER: Dr. Brown, I don't understand, I

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couldn't follow the mitigation monitoring. Why that solves the problem if you created a significant impact? I don't -- what is it?

DR. BROWN: The significant impacts are identified in this simulation of the 25 years of potential operations where at times it looks from the modeling to be possible for the Delta Wetlands Project to have greater than the selected change in either the chloride or the dissolved organic carbon. The impact assessment is really looking for the possibility of an impact that might be greater than our significant criteria. So, the modeling shows the possibility of those impacts occurring.

The mitigation in monitoring requirement is suggested as the way to reduce those potential impacts to stay within the bounds or the limits that you will place on the project as a possible term or permit condition. And by monitoring. We can reduce the monitoring of the reservoir concentrations compared to the export concentration before Delta Wetlands discharges. We can limit the discharge to be sure that the effect on the exports is less than whatever level is specified as allowable.

HEARING OFFICER STUBCHAER: Anything else?

MS. SCHNEIDER: I want to correct a question I asked Dr. Brown. I asked if you prepared Exhibit DW-10; and that was in error. It was DW-12 as your water quality testimony.

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Did you prepare Exhibit DW-12?

DR. BROWN: Yes, the water quality testimony.

MS. SCHNEIDER: Our next witnesses are Dr. List and Dr. Kavanaugh. Dr. List will be first.

HEARING OFFICER STUBCHAER: Time out for just a second.

(Discussion held off the record.)

HEARING OFFICER STUBCHAER: We are ready.

MS. SCHNEIDER: We will proceed. Would you please state your name and briefly summarize your professional expertise?

DR. LIST: My name is Ericson John List. I am an Emeritus Professor of Environmental Engineering at California Institute of Technology. I am also principal consultant of Flow Science, Incorporated, which is a consulting engineering company located in Pasadena, California.

My experience extends over 35 years in hydraulic engineering. Twenty-five years of that has been in the Delta. I principally have been working for the State Board, Department of Water Resources, Wetlands Contra Costa Water

District. Pretty much anybody who had an oar in the Delta at one time or another.

MS. SCHNEIDER: Did you prepare Exhibit DW-14, which describes the potential salinity affects of the project on Contra Costa Water District's Los Vaqueros Project?

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DR. LIST: It was prepared under my direction.

MS. SCHNEIDER: Would you please summarize your written testimony?

DR. LIST: First of all, at the outset, what I would like to draw attention to is, there is an error in my written testimony, and I apologize for that. It was associated with use of incorrect data file in the modeling. The error is small and numerical. They don't change the basic conclusions that I'm going to present here in any way, but it's important that you understand that there is a correction to the testimony. Copies of the corrected testimony have been delivered to all the parties concerned here. So, with that mia culpa, what I would like to do is talk about my basis for work, which was performed to analyze the effect of the Delta Wetlands Project on the Contra Costa Water District's delivered water supply. This work was done at the request of Delta Wetlands; and Contra Costa Water District, with whom we have worked closely on many projects, had requested that Delta Wetlands use us to do this assessment.

To this end, extensive discussions were held at Contra Costa Water District as to how to encompass the operations of their two pumping plants; one at Old River and one at Rock Slough, and the future operations of the Los Vaqueros Reservoir on the modeling and how this would interact with

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Delta Wetlands. Contra Costa Water District provided us with what is termed a Los Vaqueros module, which is a computer program which is developed by Contra Costa Water District for the purpose of defining operations of Los Vaqueros Reservoir and their new pumping plant. This Los Vaqueros module was incorporated by us into the Fish and Delta model. The Fish and Delta model is a numerical simulation model for representing flows and salinity within the Delta, and it's been widely used by many people in the Delta, including State Board for the water quality hearings in the 1980s and also forms the basis of DWR's DWRSIM. It's been a widely used model in the Delta. We have worked with Contra Costa Water District recently in recalibrating the Fish and Delta model.

The modeling area that we have covered includes the entire Delta, tidal Delta, from Vernalis in the south to Freeport in the northeast to Carquinez Strait in the west, and in particular the area around the Bacon Island and Holland Tract in the east end.

At this point I would like to put up a slide to show you. This is from Figure 2 of Delta Wetlands Exhibit 14, and it just shows you how the Fish and Delta model incorporates the operation of the islands. I just draw your attention to the position of Contra Costa's Water District's pump stations here. And the red dots are diversion siphons

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on the island. The purple dots are the discharge points on the Delta. And each one of those lines represents a channel in the Delta and the nodes represent interconnections between the channels. There is something like 156 channels in the Delta that are represented. It is driven by the tides. Driven by the hydrology of the Delta. You have the evapotranspiration for each part of the island, each part of the Delta, the rainfall, the inflows that are provided to this model comes from DWRSIM Run 409, and they provide the inflows to the rivers, each side rivers and the San Joaquin-Sacramento River.

The way we use this model is to represent a base case, which would be the operation of the Delta without the Delta Wetlands Project for the period 1922 to 1991. Establish the flows and salinity at each and every one of these node points in the channels, assuming that Delta operations would proceed for that 70-year period in the absence of the Delta Wetlands Project. Then we would rerun the model, putting the Delta Wetlands Project in and incorporate all the salinity transfers and the diversions and returns back to the island, and then make a comparison of the salinities and the flows at each and every point in the Delta.

The modeling is very complex. As I mentioned, it includes all these Delta channels, and includes all the data. The data file is extremely large to run this model.

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It takes four hours to do a 70-year simulation on the fastest PC you can afford to buy.

Fundamental changes between the two -- fundamental changes between the base case and the Delta -- first of all, in the summertime, the agricultural divisions in July and August were gone and replaced by Delta Wetlands return flows. That is a very fundamental change. What it means is that increase in the net Delta outflow in that period, July through August, at a time when the salinity tends to be starting to invade the Delta. It is a very fundamental change, but isn't appreciated, the fact that these agricultural diversions are foregone. Normally they would be diverting out of the time that the salinity is intruding in the Delta.

Second fundamental change is that the return flows occur at the time -- sorry, I'm getting confused here.

The return flows are at the time when there would normally be agricultural diversions. The diversions from water onto the island at the time when there would normally be agricultural returns off the islands. So, you have this complete switch from summer to winter. It is very important to understand that.

The results of these comparative analyses are shown on some slides here which I am going to put up, which is Figure 3. The first one is Figure 3. There is a lot of

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information on this slide. I want to go through it slowly to understand exactly what is going on here.

Each dot represents two pieces of information. One is the salinity at the Contra Costa water delivered in a month

with no Delta Wetlands Project and salinity when there is a Delta Wetlands Projects. There are 840 dots on here representing 840 months of the period of 1922 to 1991. Each one of the dots is representing, take this dot up here, represents approximately 480 parts per million total dissolved solids with no Delta Wetlands, and it represents something like 460 parts per million total dissolved solids when there is a Delta Wetlands Project.

For reference we have put on here, on this diagram, the 65 milligram per liter water quality control goal that Contra Costa Water District has set for themselves as part of their operations program for the Los Vaqueros project. We have also marked on here the 150 milligram per liter chloride. The 65 milligrams per liter chloride at Contra Costa corresponds to about 224 parts per million of total dissolved solids.

The data that is on this graph are very, very interesting. Because they show that in the period when the water quality is exceeding Contra Costa's goal, the Delta Wetlands Project actually improves the water quality. In the period when the water quality is slightly below Contra

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Costa's goal, sometimes there is degradation of the water and sometimes there is improvement, and this is no accident. Because Contra Costa has gone to great pains in the design of their operations module to make certain that they get water which is of good quality, the best quality.

But effect here of the Delta Wetlands Project is actually to improve the quality of the water in the time when the salinity is greater than 224 parts per million, sometimes degraded, but only if -- can I have the next slide.

What I have done is blown up this section on the bottom here and show you a little more clearly what is occurring. You see here, there is really on six occasions when the water quality was degraded to be worse than Contra Costa's 65 milligrams per liter goal.

The rest of the time, the only time degradation occurred was never to take it above 65 milligrams per liter goal. Remember, this is a mixture of water. It is a mixture of Rock Slough water. It is a mixture of Old River water, and it is a mixture taken out of Los Vaqueros Reservoir. And it is a mixture that is defined by Contra Costa Water District as part of their operations. This represents the delivered water.

Overall there is an average change of minus three parts per million total dissolved solids. In other words, the

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average salinity of Contra Costa water delivered would actually be improved by the operations of the Delta Wetlands Project. You see here the predominance of points even when the water quality is below 65 milligrams per liter, actually still a significant number of improvements occur at that time.

MS. SCHNEIDER: Before you go on, would you identify the graphic that you are referring to?

DR. LIST: This graphic here is Figure 3. It is an

expanded version of Figure 3 from Delta Wetlands Exhibit 14. It corresponds very closely to an exhibit that will be presented by Contra Costa Water District. We replotted this data in the form of milligrams per liter chloride instead of total dissolved solids.

Now, there is one other way in which we could look at the data, which is also very informative, and that is shown on the next slide. This will take a little time to go through this because it is important that you understand exactly what the details on this graphic are. What the graphic does is compute the number of times that a given water quality is met. Like, for example, a fraction of times. So, if I take 200 parts per million total dissolved solids, it says that in the 70-year period 68 percent of the time water quality was better than 200 parts per million. You see if I take the brown line, which is no Delta Wetlands

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Project, the actual percentage of time is slightly less. And you notice here that the brown line lies uniformally below the dark blue line. That means, or the implication of these results, is that no matter what total dissolved solids/salinity that you select, the probability that you are going to have water better than that is going to be improved by the operation of the Delta Wetlands Project.

This is Contra Costa's delivered water. I repeat, this is the delivered water which is based on -- you notice here the sudden break in the curve slightly above 65 milligrams per liter; that is because of the manner in which Contra Costa Water District decided they are going to operate. They wanted the high probability of having water which is better than 65 milligrams per liter. In other words, they want 94 percent probability that the water is going to be better than 65 milligrams per liter. That is the operating goal they set for themselves.

Now, in the last two slides --

MS. SCHNEIDER: Before you go on, you have been referring to a graphic from DW-14 entitled CCWD Delivered Water Basin Delta Wetlands Study 1922 through 1991.

DR. LIST: That is Figure 12 of Delta Wetlands Exhibit 14.

I can do the same exercise for Clifton Court Forebay. This is the water which would be delivered from Clifton

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Court Forebay and reclined with improvement. Clifton Court Forebay is almost the same. The average improvement over that 70-year period is minus 3.2 total dissolved solids. Again, the shift is, if you take water better than 250 milligrams per liter, or possible millions of total dissolved solids, you see uniformly, pretty much uniformly, improved quality of the water.

One thing that I have to state here is that in forming average change here of minus 3.2, that doesn't necessarily say there is going to be less salt pumped out of the Delta. Because if I have higher flows at these particular salinities here, I may end up pumping more salt. Salinity is a good measure. On the average, salinity is a good measure of the effect of a project. That is Figure 16 of

DW-14.

If I could have the last figure, Figure 17. This is the corrected version of, again, what we have done here is plotted the exceedance curve of probability of attaining given water quality. For example, take 300 parts per million. If I take 300 parts per million, there is a probability of 92 percent or better that that water that is delivered to Clifton Court Forebay is going to get better water quality than 300 parts per million.

In summary, what I would just like to emphasize, that it is very important in the assessment of the Delta Wetlands

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Project to focus on the overall effects, not on the local effects where the water is returned to the channel. In fact, it is a very complicated system, and it is a very difficult-to-understand system. And it is only with the help of these very sophisticated models, the Fish and Game model and the DWRSIM, that it becomes possible to determine what the overall impact of the project such as this is.

For this reason, I have concluded from an analysis of this that, in general, the overall impact of the Delta Wetlands Project is going to have a positive impact on the water that is delivered by Contra Costa Water District and have a positive impact on the water that is delivered out of Clifton Court Forebay.

And that concludes my testimony.

MS. SCHNEIDER: Thank you, Dr. List.

HEARING OFFICER STUBCHAER: Ms. Schneider, for your information, you have exactly an hour left, and the light is now working. It will go yellow when you have five minutes.

(Discussion held off the record.)

MS. SCHNEIDER: Would you please state your name and briefly summarize your professional expertise?

DR. KAVANAUGH: My name is Michael Kavanaugh. I am a vice president with the firm of Malcolm Pirnie, Inc. I am a chemical and environmental engineer with a Ph.D. in environmental engineering from the University of California

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at Berkeley, and I have been involved with various aspects of environmental engineering projects for the past 25 years, and I have special expertise in the area of water quality and treatment and water resource management.

MS. SCHNEIDER: Did you prepare Exhibit DW-13 which describes your analysis of the potential water quality effects of the Delta Wetlands Project?

DR. KAVANAUGH: Yes, I did.

MS. SCHNEIDER: Would you summarize that testimony?

DR. KAVANAUGH: Members of the Board, I was retained last year by Delta Wetlands to assist them in preparing responses to various concerns raised by Delta urban water users on potential water quality effects of the Delta Wetlands Project. I had particular focus on the potential effects of the Delta Wetlands Project on the operations of and future modifications to water treatment plants which rely on Delta water. In particular, those that are necessitated by the anticipated changes in drinking water regulations, namely the proposed enhanced surface water

treatment rule and the proposed stage one/stage two disinfection disinfection by-product rule.

I was asked to undertake an independent, but complimentary, evaluation of water quality issues in comparison to what Dr. Brown has presented and what was presented in the Draft EIR. I prepared this testimony with

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the assistance of Ms. Carol James who is a registered civil engineer in California and an expert in water quality and watershed management. She is the principal of C. R. James & Associates. I was also assisted by the staff of my previous employer, Environ Corporation.

I would like to start off by summarizing the two main conclusions that I would like to present to the Board today on the issue of water quality effects. If we can put up the first slide.

I have provided the bases for the opinions presented in this matrix in my written testimony, and I would refer you to that. The first general conclusion is that the Delta Wetlands Project is very unlikely to have significant effects on the no-project annual averages in the peak values in the export waters of the nine parameters that are listed on this table: DOC, bromide, salinity, TDS, algae, nutrients cryptosporidium, and giardia to protozoa, a major concern to water utilities, pesticides, and turbidity.

I base this opinion using the definition of significance as was defined in the Draft EIR/EIS. You will notice there are three columns here. The first is a qualitative assessment of the impacts of the Delta Wetlands Project on these parameters. You can see that I opined that there are no significant effects on the annual averages of these parameters with the implementation of the Delta

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Wetlands Project.

Just one example of this would be dissolved organic carbon where I have said no dissolved organic carbon releases from soils under agricultural conditions is expected to be far significantly higher than the DOC released under a reservoir storage option.

The second column is a quantitative assessment, where I have also opined that there are no significant effects with the exception of three parameters where the data is not sufficient to provide a quantitative assessment. I have used in making these quantitative assessments information provided in the Draft EIR/EIS, recent modeling work, and my own independent assessment.

Again, looking at dissolved organic carbon, the no-project or current estimated release of DOC to the Delta from the agricultural activity is approximately one million kilograms. My assessment of the Delta Wetlands Project is that it could be as much as 60 percent less than the current discharge or it could be, perhaps, 30 percent more in the no-project alternative. And I will get back to that in detail subsequently.

This conclusion is based on several key aspects of the project that have been briefly touched upon by other commenters, other witnesses. First and foremost is the

converse of approximately 20,000 acres of agricultural land
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to habitat and reservoir land use. There is an attendant reduction of between five to eight percent of agricultural drainage that is currently being discharged to the Delta from those islands. I might add that this five to eight percent, the agricultural drainage, contains dissolved organic carbon that has been identified as being very reactive with respect to formation of trihalomethanes and other disinfection by-products by a number of scientists: Dr. Gary Amy at the University of Colorado, Mr. Stewart Krasner at MWD, and other well-known water chemists.

The second key point, there will be significant reductions in fertilizer and pesticide use due to the change in land use. This is consistent with good watershed management practices. This decreases the loading of these two parameters to the Delta. Consequently, based on the diverse and discharge program as postulated, as presented in the Delta Wetlands Project, there will be unlikely net benefit to export water quality during most of the water year, due to the removal of this agricultural diversion and drainage.

Finally, during periods of time when significant effects could occur, the proposed mitigation measures, in my opinion, will assure that the significance criteria in the export water are maintained.

The second key conclusion that I would like to refer
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you to is with respect to the impact of the Delta Wetlands Project on water utilities. It is unlikely, in my opinion, to have any effect on the operations of water treatment plants relying on Delta export waters. It is unlikely to have any effect on the type of modifications that will be necessitated by the future changes in drinking water regulations that I mentioned.

There are three main reasons why I come to this conclusion. The first is a corollary to the first general conclusion. There are no significant impacts on the nine water quality parameters, and particularly with respect to dissolved organic carbon and bromide, which are two most important parameters, in many ways, to Delta urban water users. The DOC annual average is going to remain unchanged, possibly reduced, and peak values will also remain unchanged.

The bromide annual average will be slightly reduced, based on the recent modeling work, and consequently, the Delta Wetlands Project is unlikely to cause significant effects during discharge and diversion in combination with the mitigation measures that have been briefly discussed. The point of the mitigation measures, again to reemphasize, I know a question was raised on this, a program would be developed to measure the key water quality parameters in the stored water compared to the values in the export water and
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determine whether or not restrictions on the rate of discharge from the islands would be required.

And as you can appreciate, there is a period of time

over which the water can be discharged, ranging from, perhaps, one month up to three months.

HEARING OFFICER STUBCHAER: I am not sure we identified.

MS. SCHNEIDER: Before you go on, you have been referring so far to Table IV-2 on Exhibit 14.

DR. KAVANAUGH: Table IV-2. I promised myself I would refer to all of these charts, and I've already blown it. Let me try to do better.

I am referring now to Table V-1 in my testimony. The point I wanted to make here is that potential increases in the dissolved organic carbon during a water year under the Delta Wetlands Project, which is likely to be lower than the significance level of, .8 is well within the natural variability of DOC that is already being effectively treated by water treatment plants in the Delta.

The annual average DOC over here in Banks, based on over 200 data points from the Delta from the DWR database, indicates a 3.9 per milligram per liter DOC. At this level, based on the new coming regulations, enhanced coagulation will be required today at water treatment plants to meet these standards. Although it is in the chart, the standard

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deviation based on this is 1.4 milligrams, a coefficient of variation of over 36 percent. You are already looking at a significant degree of variability of dissolved organic carbon in the export waters.

Finally, the 90th percentile, about 5.5 milligrams per liter. Water treatment plants are currently dealing with water with these kinds of DOC levels, and they are certainly meeting the current drinking water standards. And based on the CUWA Report, which was attached to my testimony, many utilities are able to meet the Stage I standards despite this significant degree of variability dissolved organic carbon.

The third key point is modifications to water treatment plants. I already mentioned that enhanced coagulation will already be required. This is already underway at many water plants, and the Delta Wetlands Project will have no effect on that aspect of water treatment plant management. I want to point out that all of the nine parameters that I listed in Table IV-2 are of certainly of concern to the Delta water users.

However, the two primary ones are dissolved organic carbon and bromide for the reasons I already explained; and that is, they are the ones that impact the formation of disinfection by-products, which are of health concerns.

I would like to point out, then, some highlights on my

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testimony with respect to those two parameters, namely DOC and bromide.

The next overhead shows a summary of all of the natural organic matter or dissolved organic carbon sources in the Delta. In order to evaluate the impact of the Delta Wetlands Project on dissolved organic carbon and the export waters, one needs to try to quantify all of these various sources. We have the inputs from the rivers, the input

potentially from precipitation. We have the internal losses due to absorption on soils. There is the potential for ultraviolet oxidation of DOC. And finally, and most importantly, with respect to the Delta Wetlands Project, we have internal sources; namely, peat soils and algae and vegetation. This leads to a DOC level in the export water.

Now, the Delta Wetlands islands, the four islands, must be put in the context of the overall formation and discharge of DOC today.

Next overhead.

MS. SCHNEIDER: Before you go on, that was Exhibit 5-1 you were referring to?

DR. KAVANAUGH: Right.

I am now referring to Figure 5-2, which is from my testimony. The important point to get, to obtain from this overhead, is that dependent upon the estimated amount of total agricultural drainage from the lowland islands, the

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current discharge from the four islands represents between five and eight percent of the total amount of agricultural discharge to the Delta.

This represents -- if you will put on the next slide, please. This represents a very small amount of dissolved organic carbon in the export waters. The current average, as I mentioned, is 3.9 milligram per liter. I am referring now to Figure 5-3 of my testimony. And of this 3.9 approximately up to a maximum of 1.1 milligram per liter is due to agricultural drainage.

This data has been confirmed or this estimate has been confirmed by Dr. Amy, also by the Department of Water Resources. Of that 1.1 milligram, the current four islands contribute approximately 0.08 maximum of milligrams per liter or less than two percent of the total DOC in the export waters. This means, of course, that if you could remove all the drainage from the Delta islands today, you would have a very modest and very minimal impact on the DOC in the export waters.

I mentioned to you that I have undertaken a qualitative and quantitative assessment of the nine parameters. I would like to go over in detail the qualitative and quantitative analysis of DOC.

If you would show the next overhead, please. As I mentioned, the agricultural land use produces the maximum

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rate of DOC release to the water in comparison to reservoir and habitat land uses. This chart, Table V-4 from my testimony, looks at two key components of DOC formation. First, it has to be formed in the soil. Secondly, it has to be released from the soil into the water. Various factors are listed here that influence the rate of this information, and under agricultural use, these conditions are at the point where the highest amount, the maximum amount, of DOC is released from the soils. In contrast to habitat and reservoir islands, the land use is where it is a low to a medium. In terms of releasing it out of the soils, again, agricultural use produces the greatest amount of DOC.

I would like just to point out one, which is the annual

frequency of soil/water content. What you have under agricultural conditions is the regular pumping of drainage water up and down in the soil to remove salt and DOC from the soils. This is why agricultural drainage has DOC levels up into the 20s, 30s, and 40s, and, of course, high TDS. In contrast, under habitat and reservoir land use, there will be minimum contact between the soil and soil pore water and the water both in the habitat and reservoir conditions.

Now the quantitative assessment of this problem presents a challenge. In the next overhead, I have undertaken an independent assessment of the amount of dissolved organic carbon that is contributed today from the

0174

four islands, and I have also estimated the amount of dissolved organic carbon released, or expected to be released, under the Delta Wetlands Project in the reservoir and habitat islands.

What you see here, again, this is Figure 5-5 from my testimony, the no-project estimate that I have completed is approximately 1.1 million kilograms of dissolved organic carbon. Dr. Brown, in the Draft EIR, estimated about a million. So my independent assessment confirms approximately his number.

With respect to the Delta Wetlands Project, I have estimated a low estimate of 400,000 and a high estimate of 1.3 million kilograms. What does 1,000,000 kilograms mean? 1,000,000 kilograms dissolved 238,000 acre-feet, which is the maximum capacity of the reservoirs, would be approximately 3.4 milligrams of dissolved organic carbon above background levels. And as I will point out in a minute, I do not expect that amount of organic carbon to be released only on the reservoir islands; rather it is all four islands, the habitat and the reservoir islands.

Next slide.

In order to address this question of quantitative estimates, I had to look at various mechanisms for release of DOC, and I will be fairly quick about this. I know this is a lot of data and a lot of information. Let me quickly

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summarize. There are three main sources of DOC: diffusional processes from the sediments to the water in the reservoir, vegetated biomass release, and algae that can grow in the reservoir, die and decay. I have represented a low and a high estimate for all four of the islands; two of them under reservoir, two of them as habitats. This provides the estimate.

The point I would like to make about this chart is that diffusional processes in the sediment water interface are under considerable debate as to how much impact they have. If I look at molecular diffusion only, which is a very slow process, my number that I would use would be only one milligram of dissolved organic carbon per square meter per day. To account for various processes that occur at the interface, I have chosen to look at 5 and 25 milligrams, numbers that are consistent with the literature on DOC release from sediments in estuarial conditions, oceans, and lakes; and I have accounted for various processes, such as

wind mixing, such as evective flows in the pores and such as so-called benthic organisms that cause release from the sediment interfaces, so-called bioturbation processes.

I consider these numbers to be quite conservative, and, as I said, they are consistent with literature values.

Next slide.

MS. SCHNEIDER: Dr. Kavanaugh, before we go on, could

0176

you identify that last slide for the record?

DR. KAVANAUGH: Yes. I am sorry, it is Table V-5 from my testimony.

MS. SCHNEIDER: Thank you.

DR. KAVANAUGH: I am now referring to Figure V-6 from my testimony, which is a summary comparison of the Delta Wetlands Project discharge, both mean and maximum, in comparison to the CVP and SWP exports, mean and maximum. What you see here is that for nine months of the year, approximately, the Delta Wetlands' export represents something on the order of 10 percent or so of the total exports. And that during the months of July, August, and September, on average, and this is based, of course, on the seven-year simulation, it can go up as high as 35 percent.

The key point here, of course, is that during these periods will the Delta Wetlands' export lead to a more than significant effect, impact, on the DOC in the export waters. That is why there are mitigation measures that have been proposed to assure that such an occurrence is eliminated or at least reduced in occurrence. In my analysis, however, I want to point out, however, it is unlikely that the significance levels will be exceeded in those months. But because of the uncertainties in predicting these phenomena, one has to impose mitigation measures and a measurement of the DOC to assure that the DOC in the export water stays

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below the significance level.

Second key point with respect to DOC that I would like to go over briefly is the impact on the water operations. I would like to go back to Table V-1, if I could. Table V-1 summarizes, again, the concentrations of DOC in the various Delta export locations. And I will find it here in a second. This is again Table V-1. I refer again to the dissolved organic carbon in the HO Banks Station, the mean value of 3.9. The DOC concentrations in the Delta export waters are already exceeding the levels at which enhanced coagulation will be required. And as I mentioned, the water treatment plants with this kind of variability are able to achieve at least the current drinking water standards, and in many cases the Stage I standards.

With the Delta Wetlands Project, there will be no effect or slight benefit on the monthly DOC during most of the years I mentioned. Perhaps a .1 milligram per liter reduction. This will have no impact on operations water plants as water plants are not operated, not fine-tuned to that extent. Coagulation doses, disinfection doses, and solids handling will not be impacted during most of the water years.

Now, during those three months when discharges occur,

there is the potential for increases in DOC. Even at the maximum significance level of .8, the average DOC

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concentrations during those three months most will be well below the maximum DOC levels that have been observed and are currently dealt with by water utilities. There is in this case then an adequate margin of safety to deal with DOC.

I would like to just quickly summarize then by looking at the final collection of parameters. I mentioned that bromide was the second most important parameter that is of importance to water utilities. Table III-5 from my testimony summarizes the water quality monitoring data from the DWR database. And the point I would want to make in this chart is that the bromide level, median level, at the Banks Station, .29 milligrams per liter, is already quite high. It exceeds the 90th percentile value in all the surface waters across the United States.

Bromide is clearly the significant problem that must be dealt with in terms of water quality and water treatment in the Delta water. You've already heard that, based on the modeling results, there is at least a no-degradation or possibly a modest benefit with respect to bromide. A slight reduction in TDS; that means a slight reduction in bromide because the bromide to chloride ratio is relatively constant.

Now, this is an important impact with respect to DOC and bromide because the two together are of great significance to water utilities. The issue here is the use

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of ozones to control cryptosporidium. As you may have heard, many utilities are going to the use of ozone. If DOC were to increase, you would have to increase your ozone dose; and this could produce significantly more bromate, which is a possible human carcinogen. With the no-effect on DOC, very slight but potential net benefit of bromide, you are looking potential slight net benefit with respect to the issue of ozination and control of bromate.

Lastly, I want to quickly go over algae and nutrients. This is, of curse, a key issue in the Delta. I think that you can see that nitrate/nitrogen 3.2 as an average. The key issue here with nutrients with respect to Delta Wetlands Project is the reduction of fertilizer. Approximately a million pounds per year of fertilizer is used on the four islands. This will be significantly reduced. This will reduce the net contribution of nutrients to the export water. Many of the algae problems being dealt with by utilities occurs in the terminal reservoirs.

With respect to algae itself, the project will see some increase in algal growth in the reservoirs. The phosphate levels are high enough to produce algal growth in the reservoirs. However, algae will be subject to consumption in the reservoirs and decay and, also, in the channel. It is not -- in my opinion, there is unlikely to be a significant effect of algal levels in the export waters.

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However, again, a mitigation measure is proposed because of the uncertainty regarding algae growth.

Last, but not least, reservoirs will remain unstratified because of the wind mixing conditions in the Delta. And as a consequence, the probability of producing algae that produce taste and odor compounds, namely the blue-green algae will be minimized.

I want to summarize, then, with four of the other parameters. Turbidity; turbidity, the Delta is a net sink for turbidity. No turbidity removal will occur within the Delta and on the islands. Consequently, there is no effect on turbidity in the export waters likely in the Delta Wetlands Project. Again, a mitigation measure is proposed.

With respect to cryptosporidium and giardia, there are no sources of these two protozoa on the islands. So there is no impact, no effect expected there.

With respect to pesticides, finally, pesticide use will be significantly reduced. Again, reducing the load on the Delta.

I put up Table IV-2, again, to summarize.

The main conclusions of my testimony are that under the no-project condition, the Delta Wetlands Project is a minor contributor of DOC to the export waters, shown in the chart over here on my right, less than two percent of the DOC. And the Delta Wetlands Project itself is unlikely to

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cause significant effects on the no-project annual averages and peak values as I summarized in Table IV-2. This is supported both by a qualitative and quantitative analyses as I presented.

Thirdly, the Delta Wetlands Project, again, is unlikely to effect operations of the water treatment plants, relying on Delta export waters. The modifications that will be required are currently under way and none of these will be affected by the Delta Wetlands Project.

Finally and critically, the mitigation measures that have been proposed are designed to assure that the Delta export water significance criteria on all these parameters is not exceeded.

That concludes my testimony. Thanks for your attention.

HEARING OFFICER STUBCHAER: The chart to your right was?

DR. KAVANAUGH: The chart to my right is Figure 5-3 blown up on the chart, which is in my testimony.

HEARING OFFICER STUBCHAER: Time for an afternoon break, Ms. Schneider.

MS. SCHNEIDER: It's a good time to break for us.

(Break taken.)

HEARING OFFICER STUBCHAER: Back on the record.

There has been an inquiry on what the order of cross-examination will be. Parties will be called in the

0182

order in which they were asked to identify themselves.

And, incidentally, is there anyone here representing Reclamation District 2059, Robert C. and Jean M. Benson, Brent L. and E.E. Gilbert, and Delta Water Users Association? Have they arrived yet?

UNIDENTIFIED VOICE: I think Mr. Hoslett will be here tomorrow.

HEARING OFFICER STUBCHAER: He will be first, to be followed by Central Delta Water Agency. That is you, Mr. Nomellini, of course. And Pacific Gas & Electric, California Urban Water Agencies, Contra Costa Water District, East Bay Municipal Utility District, Diablo Water District, City of Stockton, Bureau of Reclamation, Department of Water Resources, State Water Contractors, Department of Fish and Game, Bay Institute of San Francisco, California Sportfish and Protection Alliance, Peter Margiotta, Amador County, and Caltrans.

Are you ready to resume?

MS. SCHNEIDER: Yes, thank you, Mr. Stubchaer.

Would you please state your name and briefly summarize your professional experience?

MR. SHAUL: My name is Warren Shaul. I graduated with a Bachelor's degree from Humboldt State in biology, and I have a Master's degree in fisheries from Oregon State University, and I have been working in fisheries biology and

0183

fisheries management for a little over 20 years.

MS. SCHNEIDER: Did you prepare Exhibit DW-15, which describes the potential effects on fishery resources from the Delta Wetlands Project?

MR. SHAUL: Yes, I prepared Exhibit 15 in my employment with Jones & Stokes Associates.

MS. SCHNEIDER: Would you please summarize your written testimony?

MR. SHAUL: On behalf of the State Board and U.S. Army Corps of Engineers, I worked on the impact assessment for fisheries for the Delta Wetlands Project for the last, approximately, eight or nine years. It has been a long process. During that time, I was the lead investigator and the primary author of several documents. Those documents included the Draft Environmental Impact Statement, Impact Report and Impact Statement; the biological assessment, prepared for the U.S. Army Corps of Engineers as part of the endangered species consultation. And I have also been involved in endangered species consultation process, including an evaluation of the final operations criteria, which was a report that was produced in December, on December 20, 1996, and also an evaluation of the proposed Department of Fish and Game operations criteria.

This process, over the last eight or more years, has not been a closed process at all. During that time, I have

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worked presenting our methods and developed the methods through interaction with all of the resource agencies, including the Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fishery Service, and also the U.S. Environmental Protection Agency. Reviewing methods that they have developed, as far as looking at relationships between fisheries populations and various physical parameters in the Delta.

During development of those methods, we reviewed all the available information from those agencies, and in addition performed some analysis ourselves.

My discussion today is going to be restricted to a

small piece of the fisheries analysis. And it is -- you have to keep in mind that the fisheries analysis is based on everything else that we talked about, up until this time. So, the fisheries analysis has the complexity of all the preceding analysis, plus its own complexity of the biology and ecosystem itself.

The parts that I am going to talk about today have to do primarily with flow effect on fishery resources. The information in evaluating flow effects came primarily -- flow information came from the Delta SOS model, which Russ Brown discussed earlier. That information fed into some other models. One was called Delta Mood, which is a simulation in transport and training. Essentially, a

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simplified model for evaluating hydrodynamic effects on movement of particles in water in the Delta.

Information from that model fed into an index model for evaluating entrainment losses; and that model primarily deals with species with planktonic life stages, such as striped bass, Delta smelt, longfin smelt. That model also provided information that was used to evaluate entrainment or to produce an entrainment index or an index of -- not entrainment, a mortality issue of salmon. And I will talk about primarily winter-run chinook salmon today.

The other model is an estuarian habitat model. Essentially, it evaluates salinity distribution and the effects on potential habitat availability in the Delta.

MS. LEIDIGH: Mr. Shaul, could you identify the last overhead for the record?

MR. SHAUL: This is from Exhibit 15 from my testimony.

MS. SCHNEIDER: It is entitled Models Used in the Delta Wetlands Draft EIR/EIS Fishery Resources Impact Assessment.

MR. SHAUL: The next, this is a map of the Delta. It is also in Exhibit 15. The first model I am going to discuss is the entrainment model. What the entrainment model does it evaluates the movement, the potential movement, of fish and their entrainment in Delta diversions, including exports.

The input to that model includes distribution of the

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fish, both the geographic distribution and the seasonal distribution, when they occur in the Delta and which life stages also occur. It also takes into account the vulnerability of the life Stage II entrainment in diversions and also the potential effect of net flows or flow movement in the Delta.

The model essentially takes, looks at the movement of water from different parts of the Delta and what percentage of that water would end up in Delta diversions and exports. Essentially, the major assumption for that model is that water movement can have an affect on entrainment. We know that from the records from the CVP and SWP salvage and other studies in the Delta, that fish are entrained in diversions and it are appears that fish that may be distributed in this part of the Delta are also entrained in diversions in the South Delta; and those fish get to those diversions in some way. And the assumption is that flows will affect what

proportion and what the effect would be on fish from this part of the Delta that are moving down the Sacramento River or moving from the San Joaquin River. What affect do diversions have in flow patterns in the Central Delta on those fish and entraining those fish?

MS. LEIDIGH: Mr. Shaul, when you refer to "this part of the Delta," which part of the Delta are you referring to, in words?

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MR. SHAUL: So, basing the Central Delta, those fish can end up in diversions in the South Delta. Fish entering the Delta from the Sacramento River can end up in diversions in the South Delta. Fish entering from the San Joaquin River can also end up in diversions in the South Delta and in the Central Delta.

It is important to keep in mind that this model is not an estimate of entrainment. This is not what percentage of any population is entrained. This is purely -- it gives you an idea of the direction that entrainment can take. It is an evaluation of conditions that could lead to increased or decreased entrainment. The chinook salmon mortality model is, what I am going to discuss today, based on fish, chinook salmon juveniles, that entered the Delta from the Sacramento River and would prefer to move through the Delta and toward the ocean. Some of those fish enter the Delta Cross Channel and Georgiana Slough, and fish model studies have shown that those fish that enter Georgiana Slough and the Delta Cross Channel have lower survival than fish that continue down the Sacramento River.

The reasons for the lower survival have to do with temperature and possible degradation and also may have to do with degradation and also may have to do with diversion and the diversion effects on flow patterns on this part of the Delta. The higher the flow, basically, the higher the

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survival of fish moving through the Delta. That is tied with other factors, such as what portion of flow is diverted into the Delta Cross Channel and Georgiana Slough.

The third model is the habitat model. Primarily focuses on habitat in this part of the Delta, downstream or near Chipps Island. So it includes upstream of Chipps Island in the lower Sacramento and San Joaquin Rivers, and also habitat in the Suisun Bay. It is based on a salinity requirement or needs of, primarily, three species: striped bass, Delta smelt, and longfin smelt. And I am going to talk mostly about Delta smelt. Those fish, during their larva and juvenile stages, have certain salinity needs or preferences; and they are found in a certain salinity range. And what the model does is evaluates based on outflow where the salinity grading is located, where that range is located, and how the area of habitat within the range changes, depending on how outflow changes.

Next slide.

This is the results of the entrainment loss model for Delta smelt. Again, reenforcing what this includes as input is the movement of water through areas where Delta smelt is distributed during the period that Delta smelt is most

sensitive to movement of water in the Delta. So this is during larval and early juvenile stages for Delta smelt, primarily during the months of --

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MS. LEIDIGH: This is Figure 6?

MR. SHAUL: This is Figure 6. This is from Exhibit 15, which was March 25th analysis that we did on behalf of the State Board.

MS. LEIDIGH: Thank you.

MR. SHAUL: Again, so the factors that affect entrainment that are incorporated in these results include the distribution of timing and geographical distribution and the affects of water project operations on flow conditions throughout the Delta.

On this axis, this is a percent. Again, I need to stress that this is not a -- should not be interpreted as entrainment. This does not necessarily mean that 30 percent of all the Delta smelt population is entrained. This is really an index of the conditions. If you go higher on the axis means that you will have conditions that can lead to higher entrainment. If you go lower on this axis, you have conditions that lead to lower entrainment.

The dark line is the no-project condition; that is entrainment that is estimated to occur without the Delta Wetlands Project. The kind of pink line or brown line is the line -- the change in the conditions with Delta Wetlands' operation under the conditions that were described in the EIR/EIS. And the green line shown here, which is Delta Wetlands' operation under the final operation criteria

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for the biological opinions. And then the kind of bluish line is the effects on conditions under the operations criteria proposed by California Department of Fish and Game.

It is important when you look at this, too, that this must be kept in perspective. That this axis you cannot just look at the differences between these lines. You must look at where this line lays and how Delta Wetlands affects that, where the change occurs. Because you are looking at conditions. You are not looking at just an entrainment index, any number of fish entrained.

One of the reasons that these -- with the final operations criteria in place, why this lane drops down, is because with the final operations criteria, the Delta Wetlands' operations are avoided during sensitive periods, which primarily, largely is no diversion at all during April and May. And, also, then minimizing operations during other periods where the fish are less sensitive, but still sensitive to entrainment in diversions.

This line also, not only incorporates the effects of Delta Wetlands' diversion, but also the effects of Delta Wetlands' discharge and entrainment in diversions other than Delta Wetlands itself. So, entrainment in state and federal exports, but, also, how does it affect the level of entrainment that might occur in Delta agricultural

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diversions, too? All that is incorporated or reflected in

this index.
MS. MURRAY: Can I get a point of clarification? This figure is not included in my copy of Exhibit 15. Is this --
MR. SHAUL: It is not in Exhibit 15; it is in DW-4, the March 20th.
Next slide. This is Figure 7, also from Exhibit DW-4. This is mortality index for juvenile winter-run chinook salmon. A similar picture to entrain. Again, this axis should not be interpreted as being an estimate of actual mortality for winter-run chinook salmon. This is an index and primarily an index of conditions that could lead to increased mortality. If you are higher on this axis, means that you have higher mortality. If you are lower, means that you have lower mortality.
HEARING OFFICER STUBCHAER: I just want to interrupt for a question. Why is it percent if it is just an index that doesn't mean a percentage?
MR. SHAUL: Because it calculates -- it's an index, so it's indexed between 0 and 100. So it can be interpreted as a percent, too. It is an entrainment model itself that is actually a percent of water from a specific part of the Delta. It does give you as a percentage of the water.
HEARING OFFICER STUBCHAER: Thank you.
MR. SHAUL: The last model I wanted to show the results

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for, this is also from Exhibit DW-4. This is Table IV from that document. And this shows the average optimal salinity habitat. So this is estimated habitat area that met the salinity need for the species. And as you can see, there was not much difference in habitat area, regardless of which alternative or which operations you look at. There was not a big change in habitat area. That is because of the period over which habitat is provided in the Delta. The period of Delta Wetlands' operations does not cover that, does not affect every month during the period of habitat importance, so the effect of Delta Wetlands' operations is not as great as you might think it would be.
In conclusion, I just want to stress that the models were developed from the best available information, and they were developed openly, with help and criticism, from the resource agencies. The models are continued to be applied in one form or another. At least the method is applied in ongoing assessments that I am involved with or the team leader on in CVPIA and for CAL/FED. And the models and methods are valuable for providing, really, a really clear picture of how flood conditions vary in the Delta and how they might affect distribution of the fish and possibility for entrainment.
For the Delta Wetlands Project the models showed that Delta Wetlands could contribute to an adverse impact, or

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conditions that could lead to an adverse impact to several Delta species, including Delta smelt and winter-run chinook salmon. With the final operations criteria, however, the most sensitive periods are avoided, particularly for Delta smelt, and operations during other periods were minimized. So that the potential for contributing to entrainment and

mortality and loss of habitat was reduced.
MS. SCHNEIDER: Thank you, Mr. Shaul.
Our next two witnesses are --
HEARING OFFICER STUBCHAER: Excuse me.
Ms. Leidigh.
MS. LEIDIGH: Actually, Mr. Sutton has a point of clarification.
MR. SUTTON: Mr. Shaul, just a point of clarification. Some of the figures you showed up there showed a line identified as California Department of Fish and Game conditions, or Endangered Species Act.
I want to clarify that those conditions that you modeled there were done earlier this year, and that those were conditions requested by the Department of Fish and Game to analyze as a set of test conditions. Is that correct?
MR. SHAUL: That is correct. They were the criteria proposed, I guess, preliminary proposed criteria that we received through the State Water Resources Board.
MR. SUTTON: Those are not necessarily the same sets of

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criteria that were used in the final biological opinion from Department of Fish and Game; is that correct?
MR. SHAUL: They are not exactly the same. But from my review of the biological opinion, I guess it is called, that you provided me they seemed to be fairly close.
MR. SUTTON: But you have not done a specific analysis analogous to this with the final biological opinion criteria?
MR. SHAUL: No, I have not.
MR. SUTTON: Thank you.
MS. SCHNEIDER: Thank you, Mr. Shaul.
For the record, we want to clarify that Figures 6 and 7 that Mr. Shaul referred to all came out of Exhibit DW-5. That is good for Table V as well. I think he said four. We meant 5. I am sorry for the confusion.
Next is Mr. Vogel.
Would please state your name and briefly summarize your professional experience?
MR. VOGEL: My name is Dave Vogel. I have a Bachelor of Science degree in biology from Bowling Green State University received in 1974, and a Master of Science degree in natural resources in fisheries from the University of Michigan received in 1979. I have 22 years of work experience associated with fishery resources. I am presently a senior scientist with Natural Resource

0195

Scientists. However, for a prior 15-year period, I worked for both the U.S. Fish and Wildlife Service and the National Marine Fishery Service. For the last seven years I have been working primarily on fishery resource issues in the Western United States. During the period of 1981 to 1990, I was the principal biologist in charge on behalf of the Fish and Wildlife Service performing research of salmon in the Sacramento River Basin.
MS. SCHNEIDER: Did you prepare portions of Exhibit DW-16 which describes fish protection measures for the Delta Wetlands Project?

MR. VOGEL: Yes, I did.
MS. SCHNEIDER: Would you please summarize your written testimony?
MR. VOGEL: I and Mr. Marine, who is with me, also works for NRS, have worked with Delta Wetlands since 1991 on fishery resource issues associated with the project. Our primary task has been associated with providing the Delta Wetlands's team with technical assistance as requested on fishery resource matters. These matters were primarily associated with Endangered Species Act issues with both the state and federal government.
I will discuss issues here associated with winter-run chinook salmon, and Mr. Marine will follow me with issues associated with the Delta smelt and water quality issues.

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We will simply provide a summary of several of the most important components of the Delta Wetlands Project and how impacts on important fish can be minimized or avoided. I would like emphasize that most of those protective measures were developed by the fishery resource agencies in consultation with the Board's staff, the Corps' staff and the Delta Wetlands' team.
This overhead does not have an exhibit; it is simply a talking point overhead.
Mr. Marin and I will briefly discuss two critically important aspects of the Delta Wetlands Project that are designed to be protective for fish; and those are project feature protections and operational protections. First referring to the project feature protections. Certain project feature protections were not incorporated in the project during the time period when the Delta Wetlands Project would divert water under the reservoir islands. Some fish species could suffer direct mortality or mortality from both entrainment and impingement at those reservoir island intakes.
As an initial matter, Delta Wetlands will be reducing the risk of potential entrainment by eliminating presently unscreened agricultural diversions. Those presently unscreened versions on all four islands include the diversion of water through 92 unscreened intakes. In this

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case, all Delta Wetlands' diversions will be screened with a positive barrier fish screen that meets or exceeds the criteria established by the three fish agencies.
These fish screens will be designed to maintain a water velocity of .2 feet per second or less. An approach velocity here is to find as a water velocity immediately in front of the screen, just prior to entry through the fish screens. This criterion I would like to point out greatly exceeds the protective standard for avoiding impingement of fry-sized salmonids, which is .33 feet per second. It also meets the criterion for avoiding or minimizing impingement of adult Delta smelt, juvenile-sized American shad, and many other species found in the Delta.
It is also important to recognize that as the islands begin to fill through the siphon stations, those approach velocities will decline. In this case, this will help even

lower reduction in those approach velocities below those afforded by the fishery agencies' criteria for protecting the important fish species.

Also, I would like to point out that the fish screens will not require a structural fish bypass system. The reason that is important is that most engineered designed structural bypass systems on fish screens which I have been associated with are quite problematic for fish protection. The reason they are not required on these fish screens is

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that the bypass channels themselves within the Delta will serve as bypass facility to move the fish past the screening structure.

Moving on to operational protections associated with the project, these operational protections were developed by the fishery resource agencies to protect winter-run as well many other fish species. Although they were intended to be protective for the listed species, Delta smelt and winter-run salmon, they are also quite protective for other races of salmon, such as the fall, and late fall-run, and spring-run, as well as steelhead trout.

Next overhead.

Dave Forkel previously provided written and oral testimony concerning operations of the Delta Wetlands Project; and I will simply refer back to his exhibit shown here, which is Table 1 in DW-7, for illustrative purposes.

Our intent here is to simply provide some examples and highlights of how certain important components associated with the project are designed to avoid or protect fish species of concern. Those areas where you see the arrows are some that I am going to refer to in examples forthcoming here.

The purpose of these fixed measures is to avoid impacts to fish species of concern through the best available information on data on the presence or absence of fish

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within specific locations in the Delta or their proportional distribution in the vicinity of the project vicinity.

Basically, this is referring to the potential location, timing, and magnitude of those fish species of concern in the vicinity that may be affected by the Delta Wetlands Project operation. Give you a recent example. This type of fixed operational measure that is associated with both the CVP and the State Water Project would be tie enclosures of the Delta Cross Channel gates to protect entrainment of salmon into the interior Delta.

Now, moving on to examples of operational protection for the Delta Wetlands Project, those conclude that prohibition or restriction of diversions and discharges during important periods for fish. Again, this one does not have an exhibit number. It is simply a talking point.

Of the many protective measures incorporated into the DW Project, I will simply give you four specific operational measures important for anadromous salmonids. The first example here is associated with the initial diversion restrictions. Now, initial freshets during any particular water year are known to stimulate the downstream migration

of young salmon. Much of that knowledge was derived from research I performed on behalf of the Fish and Wildlife Service during the 1980s.

An operational measure was developed by the fishery resource agencies to project the desirable ecological attributes of this initial freshet through the Delta. In many cases, Delta Wetlands will not be allowed to divert until after that first ten days the initial freshet has moved through the Delta.

A second example, which David Forkel previously mentioned, is associated with the timing of Delta Cross Channel gate closures. During the time period of November, December, and January, when the Delta Cross Channel gates are closed for fishery resource protection, the project will not be allowed to -- the Delta inflows, 30,000 cfs, the Delta Wetlands Project would be limited to a two-island instantaneous maximum of only 3,000 cfs. Also for the same period, when inflow is between 30 and 50,000 cfs, that same instantaneous maximum diversion rate would be 4,000 cfs. My understanding, that this measure was primarily developed by the National Marine Fishery Service to protect salmon.

A third example shown here, and this gets into some major protective feature for salmon, would be the Webb Tract and Bacon Island diversion prohibitions during the two months of April and May. As the Board and everybody here amply knows, for the last decade of testimonies and exhibits provided to the State Board, April and May are critically important months for salmon migration through the Delta. Any potential diversion effects on salmon migration through the Delta will be completely avoided by total prohibition on diversion onto the two reservoir islands during this two-month period.

The fourth and last example I will give you is a prohibition on Webb Tract discharges during the entire six-month period of January through June. As is well known, some young salmon from Central Valley rivers and streams can rear in the Delta during the winter and spring months. The fishery rate agencies have subsequently developed an operational measure for the Delta Wetlands Project to prevent the inadvertent displacement of those rearing salmon from the Central Delta to the South Delta by providing that prohibition on discharges from Webb Tract during those critically important months.

Although we know that young salmon do not behave as particles of water, it is believed that this operational measure will provide further benefits to protection salmonid species. In particular, this measure is expected to be particularly beneficial to those salmon immigrating from the Delta east side tributaries and the San Joaquin River Basin because those fish have no choice. They have to migrate past Webb Tract on the San Joaquin side of the Delta.

I would like to emphasize that these measures are imposed even if certain life phases are present, or, in some instances, even if the fish aren't even present. Building

these measures is also an additional buffer that when two or more measures are in place, the most restrictive measure takes charge.

Again, this has no exhibit number; another talking point.

The purpose of the proposed adaptive measures mentioned here at the bottom of this graphic was incorporated into the Delta Wetlands Project to acquire data as the project was operated, to further avoid or minimize any potential effects on fish. An example of an adaptive management measure to avoid impacts on fish include real or near time monitoring of water diverted under the project islands. This monitoring program, I would like to emphasize, was developed in close consultation with the fishery resource agencies. We are not going to go into it here in any detail. It is provided and appended to the back of our DW-16.

In conclusion, I would like to point out that the final operations criteria developed for the project are based on the best available data on the timing and magnitude of the important fish species and life phases at certain locations on the Delta. These data were developed and provided by the fishery resource agencies. Simply stated, if it is expected that significant numbers of a fish species are concerned are within a vicinity of the Delta Wetlands Project where they may be impacted, prohibitions or restrictions are imposed on

0203

the project to avoid or minimize those impacts. This approach provides the greatest protection of fish species during periods when it is most biologically relevant.

The final operations criteria developed for the DW Project are more than adequate to protect fish species in the Delta.

At this point I would like to turn the testimony over to Mr. Marine who will discuss Delta smelt and water quality issues.

MS. SCHNEIDER: Mr. Marine, would you please state your name and briefly summarize your professional experience?

MR. MARINE: My name is Keith Marine. I've worked as a professional scientist for 12 years, five of which I spent with the U.S. Fish and Wildlife Service as a fishery management research biologist working on Central Valley salmon issues. And for the last seven years, I have worked as a consulting aquatic ecologist. I have a B.S. in wildlife and fisheries biology from the U.C. Davis and I am currently completing an M.S. at U.C. Davis, as well. I have designed, directed, and conducted, and assisted with numerous studies and monitoring programs that have been focused on assessing the physiological and behavioral responses of a number of California fishes and their responses to important environmental factors. These have included assessments on the effects of water temperature on

0204

the fresh water life stages of Central Valley salmon stocks.

MS. SCHNEIDER: Did you prepare portions of exhibit DW-16, which describes fish protection measures of the project?

MR. MARINE: Yes, I did.

MS. SCHNEIDER: Would you please summarize your written testimony?

MR. MARINE: As indicated by Mr. Vogel, I will summarize our testimony on key fish protection features and operations criteria of the Delta Wetlands Project providing specific protection for Delta smelt, which, along with that, for winter-run that Mr. Vogel described, will convey a very high degree of fish protection for all fish species that inhabit the Delta. I will discuss Delta Wetlands' plans for managing specific water quality criteria during the discharge for export, which will provide additional protection for Delta fishes.

Key fish protection features and operations are predicated on the best available data from the fishery agencies on the life history, timing, and magnitude of occurrence of Delta smelt and other key fish species in the Delta. These data allow for an identification of particularly critical periods of seasonal abundance and vulnerable life stages, such as small larval fishes.

First overhead, please.

0205

My first overhead is Table F-2 from Appendix A of the Draft Environmental Document produced by Jones & Stokes and is part of the Draft Environmental Documentation.

This table illustrates the principles and approach taken for protection of Delta smelt. And I would like to draw your attention that these are data for larvae and eggs of the special species that show, essentially, seasonal and monthly distributions of these life stages in the Delta. Larvae and eggs are considered particularly vulnerable because of their habit of being fairly passive and moving with the flow and they are particularly vulnerable to alteration of hydraulic conditions in the Delta.

This table is based on the broadest distribution of these life species looking at a cumulative distribution over many, many years of data. In any one year, the distribution and timing presence of these life stages can vary by as much as two to four weeks. So, in any one year, we would expect this distribution to potentially be narrower than that as depicted in this table.

But what it does point out is that during the months of April and May, in particular for Delta smelt, the majority of the larvae are present. So protection features designed, based on these timings, will protect a majority of those fish. Table also depicts the fact that the timing for Delta smelt larvae is also reflective of that for other species,

0206

such as striped bass, in the Delta.

As Mr. Vogel described earlier, both fixed and adaptive management fish protection features are incorporated into the Delta Wetlands' operations criteria. And as Mr. Forkel illustrated earlier, built into these measures are buffers that, when two or more measures might apply, the most restrictive one will apply.

A couple of examples will serve to illustrate how the biological information in these life history patterns, tables, were used in the design of several key fixed

protection measures for Delta smelt.
Seasonal operations that were designed to avoid direct impacts on the most critical seasons and life stages include fixed prohibitions for discharges or diversions during the months of April and May. That could cover this period here, which you can see would, on an average basis, protect up to 60 percent of the larvae in the Delta.
This period would also benefit, provide benefits to a significant proportion of striped bass eggs in the Delta. This prohibition would be extended from mid February through June, during periods when the populations were determined to be particularly at risk, based on the Fish and Wildlife Services' proposal to utilize the fall mid water trawl index as an adaptive management measure.
Another fixed measure would be discharge prohibitions

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from Webb Tract, which is located along the main channel of the San Joaquin River for the months of January through June. This protects an extended period of time when the vulnerable larval life stages are present. It will also protect a major period of time when several species, including adult and juvenile smelt are in the vicinity of the Delta Wetlands islands, as well as juvenile salmon and steelhead.
The seasonal prohibition will avoid impacts to the fishes during known windows of presence, when less certainty exists to definitively know when significant numbers of fish might be expected in the vicinity of Delta Wetlands islands, additional protection, beyond that provided by the fixed fish protection measures, will be facilitated by real time or near real time fish monitoring to develop data on fish presence in the vicinity of the reservoir islands and incrementally increase protection in response to their presence. The periods of time, again using this table as an example, during which fish monitoring would be utilized to adjust Delta Wetlands' operations in response to fish presence, would from the month -- during the course of diversions, would be from the months of December through August, which would cover the entire period of time when the most vulnerable life stages are present, and then during the period from April through August for discharges from the

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islands.
The protocols that would be used for monitoring would be those that are consistent, that have been established by the interagency ecological program and would be overseen by a monitoring, technical advisory committee. Operations responses to the presence of Delta smelt, both during the course of diversions and discharges would be a reduction by 50 percent of the previous day's rate during the period of presence or detection of any of the life stages of Delta smelt. The fixed and adaptive management fish protection features of the Delta Wetlands Project, such as I have just described here, provide a very high level of fish protection and serve to completely avoid or greatly minimize impacts on Delta smelt during the most critical periods of their life history in the Delta.

Through the protection of the habitat values for Delta smelt, chinook salmon, and other Delta fish species, would be provided by measures in the management of important water quality parameters as identified as of special concern in the Delta; namely, water temperature and dissolved oxygen.

Management measures to protect critical water quality parameters were developed in consultation with the fisheries management agencies and contributions of supporting scientific background materials were solicited from all the parties to the consultation and incorporated in the plan,

0209

specific Water Quality Management Plans. Input was also obtained from University of California researchers familiar with the specific environmental tolerances of Delta smelt.

The Board has received testimony in past years' hearings regarding the importance of water temperatures to the biological activities of fishes, primarily salmon in the Central Valley streams and the Delta, since salmon are considered one of the most temperature sensitive species of fish inhabiting these waters. The 1991 Water Quality Control Plan for salinity recognized the potential seasonal upper threshold temperature objective for the protection of fall chinook salmon at a daily average water temperature of 68 degrees. At Freeport on the Sacramento River and Vernalis on the San Joaquin River to be invoked seasonally during the months of April through June and September through November to protect the adults on the spawning migration and juveniles during their out-migration periods.

Similarly, a somewhat more conservative potential upper threshold temperature objective for the protection of the listed winter-run was considered at 66 degrees Fahrenheit at Freeport on the Sacramento River during the critical out-migration months of January through March.

My experience with Central Valley salmon stocks and a review of the scientific literature on the subject of water temperature tolerances and chinook salmon is consistent in

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identifying 66 degrees as an upper critical threshold, below which chinook salmon generally appear to respond favorably; and above which some level of sublethal impairment consistently may be expected up to the upper lethal temperature which has been generally identified as around 77 degrees Fahrenheit.

Delta Wetlands proposes to use similar temperature level criteria for the protection of Delta fishes in application to operations for managing water quality during discharges for export. In effect, extending the geographical coverage of the temperature objectives downstream from the temperature control points identified in the '90, '91 Salinity Control Plan.

This overhead is being used as a talking point. It is essentially a summary of the water temperature management schedule that was analyzed in the federal biological opinions. It shows that there is -- the plan proposed by Delta Wetlands is a stratified, three-level plan with increasing restrictions at elevated temperature levels that have been established as critical thresholds for chinook

salmon. It utilizes the conservative 66 degree Fahrenheit temperature level criteria recognized by the State Board's 1991 Salinity Plan to institute an extra level of temperature control in discharge operations. This effectively extends the geographical coverage of water

0211

temperature protections and, yet, it will be implemented on a year round basis extending that protection temporarily as well, recognizing benefits to other Delta fishes over the course of the year.

The first term, if you keep temperature protection, and it provides protection from acute thermal shock, this level that discharges would be prohibited when water temperatures were equal to or greater than 12 degrees Fahrenheit above the receiving water temperature, which is well below the temperature range of 16 to 20 degrees Fahrenheit known to be a critical level of acute temperature exposure for chinook salmon, but meeting that critical maximum for Delta smelt that was established by the University of California researchers' research on Delta smelt. Critical thermal maximum levels are levels where fish will incur muscular impairment; and temperatures below that, this level impairment, does not occur. But these levels are generally used to provide for acute temperature thermal protection in other areas.

MS. LEIDIGH: Mr. Marine, could you tell us where this is in the biological opinion, for the purpose of the record?

MR. MARINE: It would be in the final operations criteria of the biological opinion.

MS. LEIDIGH: Do you have a page number?

0212

MR. MARINE: I don't have that with me.

MS. SCHNEIDER: We will provide that to you in a minute.

MS. LEIDIGH: Okay.

MR. MARINE: Fish and Wildlife Exhibit DW-1.

Second term, the temperature management objectives for protection of chinook salmon and the Delta smelt is designed to avoid biologically significant chronic water temperature changes in channels adjacent to the Delta Wetlands reservoir islands. The allowable temperature change increments are based on our current understanding of the thermal tolerances and scope for thermal adaptation, recognizing that as water temperatures increase, a threshold exists where chronic exposure results in sublethal, but physiological stressful effects, such as reductions in the scope to respond to water temperature changes or reduction in the magnitude of temperature change, reductions in the ability to cope with predacious and competitive interactions, the ability to undergo transformations to sea water existence. But within the tolerated temperature range and within certain limits, fish are able to adapt to water temperature changes in a manner that optimizes physiological processes at the new water temperature.

A rate of water temperature change to which fish are considered to be able to effectively adapt to raising water

0213
temperatures throughout tolerated range is approximately four degrees Fahrenheit. This rate of change -- four degrees Fahrenheit per day. This rate of change is one that has been empirically determined in psychological studies and is regularly employed to acclimate fish in the lab and has been found to be one that fish are able to acclimate to physiologically throughout the tolerated range.

A two degree level, which is the level that we would limit it or propose to limit it to in the sublethal but stressful range from 66 degrees to less than 77 is a conservative one, recognizing the fact that the fish are less able to deal with cumulative stressors at these elevated temperatures.

And the third level, limiting change caused by discharges to less than or equal to one degree above 77, we assume that this is the lethal temperature for chinook salmon and they would generally would not be found in the Delta when water temperatures are exceeding 77 degrees. So the one degree protection limit is to provide protection to other species inhabiting the Delta during these periods of time.

These criteria are based on biological, ecological, and operational context specific parameters in the vicinity of Delta Wetlands islands. The first one takes into account the thermal tolerance of what is considered to be the most

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sensitive, thermal sensitive, species in the Delta, chinook salmon and Delta smelt, for which the temperature tolerances are generally known and determined to be among the most sensitive of those fishes known to inhabit the Delta.

Operationally, on a seasonal basis, discharges would occur intermittently and would not be occurring year round. So, these exposures would not occur year round, and, generally, they would be of a duration less than about three to four weeks maximum.

And thirdly, these criteria are based on natural background variation in Delta water temperatures, which I would like to draw your attention to the figures behind me which are Figures 1 and 2 from our testimony, Exhibit DW-16, depicting the variation in water temperature over the course of -- an average daily water temperature over the course of the season for four years. And the second figure, Figure 2, depicts the magnitude of daily temperature change. In other words, the difference between the maximum and minimum temperatures over the course of the day.

HEARING OFFICER STUBCHAER: What is the scale on the right most chart. I can't see the scale.

MR. MARINE: The scale on the right most chart goes from 0 to 12 degrees Fahrenheit. The scale on Figure 1 goes from 30 to 90.

HEARING OFFICER STUBCHAER: I can see that. Thanks.

0215
MR. MARINE: What these two figures show, Figure 1 shows that over the course of a year, water temperatures in the Delta can vary quite widely, from near 40 degrees to over 80 degrees, or nearly 80 degrees. Over the course of a

single day, it can vary from 0, which generally may occur during the winter, to around 11 degrees during extreme periods of ambient air temperatures.

The purpose of the two background temperature exhibits is to put the permissible temperature increase intervals into the context of annual and daily changes, demonstrating that during the course of time that water temperatures would be a problem. Daily temperatures would probably be averaging somewhere between 4 and 6 degrees Fahrenheit each day. The temperature change that would be allowable is well within that range and much below the maximum that may occur over the course of a single day.

Comparing Delta Wetlands' Temperature Management Plan was several thermal objectives from the State of California's water temperature objectives and plans, I would like to illustrate that these temperature criteria are more restrictive than those stated in the Basin Plan, the Regional Water Quality Control Board's Basin Plan, which would limit surface water elevations to less than or equal to 5 degrees Fahrenheit. They are also comparable and more restrictive in terms of recognizing that there is a

0216

decreasing ability of fish to deal with temperature changes as water temperatures get into elevated sublethal ranges in comparison to the thermal plan, which provides for a temperature objective not to increase surface water temperatures by more than four degrees, and they also suggest that prohibition of discharges when water temperatures, between a discharge effluent and background receiving water temperatures, exceed 20 degrees Fahrenheit. That we also incorporate recognized thresholds for temperature protection that were promoted and proposed in the 1991 Salinity Plan.

The other water quality element that Delta Wetlands would incorporate into their final operations criteria is that for dissolved oxygen. This overhead provides the basics of that plan, which this overhead is provided as a talking point. These are also from the final operations criteria that were assessed in the federal biological opinions, and we can provide a page for that.

Localized, problematic dissolved oxygen levels in certain areas of the Delta have been identified and addressed by the Board in previous years' proceedings. In recognition of the importance of monitoring and managing DO levels and discharges of Delta waterways, Delta Wetlands incorporated specific operating criteria to manage for dissolved oxygen as follows:

0217

The first would be that discharges would be prohibited when reservoir discharge water was less than six milligrams per liters dissolved oxygen.

Secondly, discharges would be managed so as not to cause the receiving water dissolved oxygen level to fall below five milligrams. It is recognized this is a minimum threshold, one through which you do not want to fall below. The project would recognize that in its monitoring and management of discharges so as to not cause receiving waters

to drop below five parts per million dissolved oxygen.
The biological bases the low end threshold have been well established minimum levels, with many years of practical use of fish culture and water quality management experience. Specific regionally relevant example for the applicability of these levels, as a minimum threshold, results from work by the Department of Fish and Game during the 1970 study of adult salmon migration barriers in the San Joaquin, which found that normal migration resumed once water temperatures were at or above five parts per million.
To summarize, the overall discussion provided here by Mr. Vogel and myself, cumulatively, all the fish protection managers described and illustrated, specifically to protect winter-run and Delta smelt and subsequently convey protection to other species provide a sweep of protections that address all fishery impacts identified by the

0218

DEIR/EIS.
Comparatively, the proposed Delta Wetlands' operation criteria will provide among the highest levels of fish protection yet implemented by water projects in the Delta. These fish protection measures are highly conservative, in many cases avoiding direct impacts during particularly critical life history events for several key Delta fish species, such as Delta smelt and winter-run chinook salmon. In other cases, these fish protective measures greatly minimize effects often exceeding protections provided by existing regulations, such as extending restrictive temperature management criteria to a geographic region of the Delta Wetlands' islands in the Delta when elevated water temperatures occur.
This concludes summarization of our written testimony.
MS. SCHNEIDER: I would like to clarify that the temperature information that he was referring to can be found in DW Exhibit 1 at Page 19, DW-2 at Page 63, and DW-3 at Page 13. The dissolved oxygen information he was referring to can be found at DW-1, Page 19 to 20; DW-2 at Page 65; and DW-3 at Page 14.
Mr. Stubchaer, we have two more witnesses for today, and one who is not available today, but will be available tomorrow.
Ms. McGowan's and Mr. Rawlings' testimony combined

0219

should not exceed 20 minutes. And tomorrow's testimony by Dr. McLandress is expected to take about five minutes. And that will conclude, if we are able to put those three witnesses on our oral direct testimony.
HEARING OFFICER STUBCHAER: All right. You've obviously organized quite well trying to meet the time limit. You are not going to quite make it. You are close. So --
MS. SCHNEIDER: Mr. Nomellini is going to jump up and fight for me.
MR. NOMELLINI: You ought to give them the time they need, provided you give me the time I need for cross.
HEARING OFFICER STUBCHAER: Anyway, let's hear your next two witnesses. Then we will adjourn for the day. I

don't want -- it is too late to start cross-examination. Then we will have all witnesses completed before we start cross-examination.

MS. SCHNEIDER: Thank you very much.

Ms. McGowan, state your name and briefly summarize your professional expertise.

MS. McGOWAN: My name is Dana McGowan. I am the cultural resources team leader for Jones & Stokes Associates, and I am also the person who prepared this document. I have been working for Jones & Stokes for about seven years. The whole time I have been working on this

0220

project. I have a Master's degree and Bachelor's degree in anthropology from Sacramento State.

MS. SCHNEIDER: Did you prepare Exhibit DW-19, which describes the cultural resources review of the Delta Wetlands Project conducted by Jones & Stokes on behalf of the State Board and the U.S. Army Corps of Engineers?

MS. McGOWAN: Yes, I did.

MS. SCHNEIDER: Would you please summarize your written testimony?

MS. McGOWAN: Essentially, my role in this project was to develop a work program for cultural resources with the State Water Resources Control Board staff archeologist and the Corps of Engineers staff archeologist and other relevant agencies to address the requirements of CEQA, NEPA and Section 106 of the Natural Historic Prevention Act.

I oversaw the inventory and National Register evaluations and worked with both the archeologists to develop the mitigation measures that you see in the document. I also worked with them to develop a programatic agreement, which is required as a method of complying with Section 106 of the National Historic Prevention Act, which basically carries forward the recommendations that are embodied in the EIR/EIS. They are basically integrated in together.

The programatic agreement essentially outlines the

0221

roles of the agencies and responsibilities in timing for the completion of the stipulations in the agreement. It required a Historic Property's Management plan to be developed, which is essentially the meat of the mitigation measures and requirements. And essentially the status of the PA right now is that we prepared a final draft that is at the agencies, and we expect to have a signed final within the next, hopefully, few weeks.

That concludes my testimony.

MS. SCHNEIDER: Thank you very much.

Mr. Rawlings, would you please state your name and briefly summarize your professional expertise?

MR. RAWLINGS: My name is Marcus Rawlings. I am a wildlife biologist with Jones & Stokes Associates. I have a B.S. degree in wildlife management. And I have approximately 15 years of professional experience working as a wildlife biologist for state wildlife agencies as well as Jones & Stokes Associates.

MS. SCHNEIDER: Did you, with the assistance of Mr.

Chainey, prepare Exhibit DW-20, which describes the jurisdictional wetlands and wildlife review of the Delta Wetlands Project conducted by Jones & Stokes on behalf of the Board and the Corps of Engineers?

MR. RAWLINGS: Yes, I did.

MS. SCHNEIDER: Would you please summarize your written testimony?

MR. RAWLINGS: I would like to describe the approach we used to analyze project impacts of the project on terrestrial resources, describe the compensation provided by the Habitat Management Plan and present conclusions of the analysis.

To conduct the analysis, myself and other Jones & Stokes Associates staff worked closely with State Board staff to identify and describe potential effects of the project on vegetation and wildlife resources. Our basic approach for evaluating the potential impacts of the project was to compare existing vegetation conditions and wildlife values on project items against predicted future conditions and wildlife values under the proposed project.

We determined existent conditions by interpreting and ground proofing aerial photographs to identify and map habitat types and determine habitat acreages, delineating wetlands, conducting field surveys for wildlife and special-status plants and consulting with Department of Fish and Game, U.S. Fish and Wildlife Service, and other knowledgeable individuals with knowledge of terrestrial resources on Delta Wetlands island.

Prediction of future conditions on habitat islands were based on habitat types, acreages, and management practices prescribed in the Habitat Management Plan, or HMP. For the reservoir islands, because prediction of future habitat conditions are unreliable, we assumed that they would provide no vegetation or wildlife values that would offset project impacts.

Consequently, impacts associated with the reservoir islands are compensated on the habitat island. This conservative assumption allows us to present a worst case analysis of project impacts on vegetation and wildlife resources. Important project impacts include loss of jurisdictional wetlands, wintering waterfowl foraging habitat, and loss of foraging habitat for two state listed species, the Swainson's hawk and greater sandhill cranes. We found that no federal threatened or endangered species, terrestrial species, would be affected by the project, including the garter snake and Aleutian Canada goose. This finding was supported by the U.S. Fish and Wildlife Services biological opinion for the project.

Populations of four special-status plant species would also potentially be affected by the project, by project facilities, the site of along the exterior of island levees.

The HMP is designed to compensate for impacts associated with construction and operation of the Delta Wetlands Project, including reservoir islands, through management of wildlife habitats on habitat islands.

State Board staff attended a team composed of myself
0224
and other Jones & Stokes Associate staff and Mr. Frank Lynette of the California Department of Fish and Game, to develop the HMP. Preparation of the HMP was an intensive effort necessitating over 50 meetings to complete. The HMP team was primarily charged with designing a habitat restoration and management plan that would compensate the project impacts on Swainson's hawk, the greater sandhill crane, wintering waterfowl, and jurisdiction of wetlands.

On completion of the HMP, all team members agreed that the HMP, as designed, successfully compensated for project operations. The team identified project compensation needs, using Fish and Game mitigation guidelines for the Swainson's hawk, mitigation that has been required for impacts on similar resources identified for other projects and based on our understanding of the wildlife habitat values that would be affected by the project versus the wildlife habitat values we expected to be provided by compensation habitats. Various recognized experts meeting with the Delta environment and waterfowl and special-status species biology, including Department of Fish and Game experts and individuals acting in waterfowl and sportmen's groups were also consulted during the HMP process, to assure that the HMP would accomplish its objectives.

The HMP team identified three management goals to guide preparation of the document. The primary goal was to
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provide compensation for project impacts on species listed in as threatened or endangered under the California Endangered Species Act, wintering waterfowl habitat, and jurisdictional wetlands.

The second goal was to implement management practices that would provide the greatest benefits for upland gain, to restore waterfowl breeding habitats, create suitable roosting habitats for the greater sandhill cranes, and manage suitable habitats for other special-status species that occur or could occur in the Delta without compromising primary goal of compensating project impacts.

The third goal is to implement management practices that would enhance habitat conditions for other important species groups, such as riparian associated species, shore birds, and water birds that got compromised in the objectives of the first or second goals.

It is worth noting here that both the second and third objectives are designed specifically to provide wildlife benefits and aren't required to compensate for project impacts.

Some of the important design concepts incorporated into the HMP include restoring habitats and patterns that would increase overall habitat values for particular species of species groups, and providing variety of foraging habitats and conditions. And maybe just to show some examples of
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those considerations, if you see these two blue areas, three are large --

MS. SCHNEIDER: You are referring to Figure 2?

MR. RAWLINGS: Figure 2 of Appendix G-3 of the EIR/EIS.
These two large blue areas are permanent ponds, which are by virtue of the fact they are put in the center of high quality waterfowl foraging habitats, increases the overall habitat value of the areas by placing resting areas so close to foraging areas.
Another design consideration, for instance, are these small -- you can see them here. They are seasonal ponds that are scattered throughout the small polygons throughout the island habitat. These seasonal ponds are designed specifically to provide brood water for waterfowl and for the purpose of being placed within larger surrounding habitat units that provide suitable nesting cover for waterfowl, with the thought of increasing local waterfowl production on the island. This same pattern and logic was also used for Holland Tract.
In addition, these large colored blocks of habitat all are waterfowl foraging habitats and include corn fields, wheat fields, pasture, emergent marsh, and seasonal managed wetlands and the habitat type somewhat peculiar to the plan that we call mixed agriculture of seasonal managed wetlands, which is very similar to a seasonal managed wetland habitat

0227

type, except that they are within the wetland area to increase the abundance of waterfowl foraging in the areas. The effect of providing a wide variety of waterfowl foraging habitat is to provide a choice of preferences as well as meeting nutritional needs of the various, large number of waterfowl species that winter in the Delta.
In addition to habitat design considerations, the HMP also incorporates specific habitat management practices designed to maximize the value of island habitats for target species. A couple of examples would include the flooding and drawn down schedules for agricultural and wetland habitats, which were designed to ensure that sufficient forages is available for waterfowl throughout the winter period. Corn fields. Another example would be corn fields are also designed to be harvested to leave approximately one-third of the corn standing in fields to increase the availability and abundance of corn, but also harvested in a fashion that will allow optimal access for foraging waterfowl and greater sandhill cranes.
To ensure long term success of the habitat islands, the HMP also incorporates an adaptive management approach to island management that will enable operation of the islands to be changed in future years to improve land management, if such changes are supported by sufficient information. Unlike most project mitigation, this approach provides the

0228

flexibility to allow islands to be managed in future years based on actual, post project conditions and needs, rather than to permanently fix island management based on our best estimate of what future conditions will be in advance of the HMP being implemented.
This design of the HMP will substantially benefit wetland and wildlife resources that will be impacted by the project, as well as those that would not be affected by the

project. The total area dedicated for wildlife management is about 9,000 acres, which is a considerable area, compared to other lands dedicated to management in the Delta. For example, habitat islands provide several hundred more acres of managed wildlife habitat, compared to the combined total of the Yolo Basin Wildlife managed area and the Stone Lakes National Wildlife refuge.

Implementation of the HMP will provide approximately 1,000 more acres of Swainson's hawk foraging habitat, 650 more acres of greater sandhill foraging habitat, and 3,800 more acres of wetlands that are necessary to compensate for project impacts.

Because we used a conservative approach to identify project impacts on waterfowl, I also believe that waterfowl foraged values provided by the project are likely to be much greater than actually would be necessary for compensation.

In addition, habitats and managed practices prescribed

0229

in the HMP would provide suitable habitat for an additional 22 special-status species of wildlife that potentially could occur on habitat islands.

Implementation of the plan will also provide substantial amounts of waterfowl nesting and brood habitat, which is currently severely lacking within the Delta.

Based on our analysis, we concluded that the Delta Wetlands Project, with implementation of the HMP and mitigation measures identified in the project EIR/EIS would not significantly effect vegetation, wetland, and wildlife resources. In fact, would provide substantial benefits to Swainson's hawk, the greater sandhill crane, and also provide suitable habitats to other special-status species, such as yellow-billed cuckoo, giant garter snake, and short-eared owl.

The HMP will also provide substantial increase in the nesting habitat for dabbling ducks, and habitat for other wetland and riparian associated Delta wildlife, such as grebes, herons, egrets, shore birds, neotropical migrant birds, and rafters.

In closing, it is my opinion that, the HMP is more comprehensive in its design considerations and management prescriptions than most, if not all, state or federal wildlife management plans that I have reviewed in the course of my career and the implementation of the Delta Wetlands

0230

Project will provide substantial benefits to wildlife dependent on the Delta.

Thank you.

MS. SCHNEIDER: Thank you, Mr. Rawlings.

With the exception of Dr. McLandress tomorrow, that concludes our oral direction testimony.

HEARING OFFICER STUBCHAER: We will recess till 9:00 a.m. tomorrow, but before we do that, are there any questions that anyone has regarding the procedures?

MS. MURRAY: I have one question. The 20 minutes originally given for cross-examination was based on a two-hour presentation by the Delta Wetlands Project people.

The Department of Fish and Game believes that they

cannot do cross-examination in 20 minutes. We believe we need more like an hour. We need at least an hour.

HEARING OFFICER STUBCHAER: We are going to start with a 20-minute goal for each cross-examining party. If they can show us at the end of 20 minutes they need more time and making progress, and not repeating things, I will probably grant that additional time. But I am not going to grant a big block ahead of time. Because we need a goal, otherwise we won't finish in the allotted time.

MS. MURRAY: If one party is exceeds the 20 minutes substantially, will other parties also get --

HEARING OFFICER STUBCHAER: Not automatically. It's

0231

on demonstration and cross.

MS. MURRAY: Thank you.

HEARING OFFICER STUBCHAER: Anything else?

Mr. Turner.

MR. TURNER: Thank you, Mr. Stubchaer. Just had a question. Has there been or is there going to be a schedule established listing the order in which the protestants will be presenting their direct testimony?

HEARING OFFICER STUBCHAER: They will be presenting the direct testimony in the same order that I read the cross-examination order.

MR. TURNER: Thank you.

HEARING OFFICER STUBCHAER: Mr. Nomellini.

MR. NOMELLINI: For the record, I am Dante John Nomellini. The environmental document made a couple statements that I would like some clarification from staff on. Says, for purpose of the EIR/EIS analysis, the DW Project analyzed without consideration of subsequent environmental effects caused by the delivery or purchased DW water or by the storage of water under third party water rights.

HEARING OFFICER STUBCHAER: What you are reading from?

MR. NOMELLINI: From the summary at S6. There is another statement that says opportunities may exist to operate the DW Project conjunctively with CVP and SWPW, but

0232

these arrangements remain speculative and are beyond the scope of this EIR/EIS.

Does this mean that that is outside the scope of this hearing?

HEARING OFFICER STUBCHAER: Mr. Nomellini, I am only allowing discussion of procedural items, and we are not going to rule on that issue. You can bring it up at the appropriate time.

MR. NOMELLINI: Okay.

HEARING OFFICER STUBCHAER: Mr. Maddow was next.

MR. MADDOW: Just a brief procedural question, Mr. Stubchaer. I wanted to be sure that I understood about the point that was made earlier about the availability or lack of availability of at least one of the Delta Wetlands' witnesses. As I understood it, Dr. List is only available for a limited time tomorrow. Is that correct?

MS. SCHNEIDER: Dr. List is available tomorrow. He would like to be able to leave by noon, but if it is

absolutely necessary he can stay for the afternoon.
MR. MADDOW: Is he the only one of your several witnesses who has that kind of limitations?
MS. SCHNEIDER: Dr. McLandress, who is not here today, will be testifying first thing in the morning, is also unavailable after tomorrow. So Dr. List and Dr. McLandress will only be available tomorrow, and Dr. List would like to

0233

leave, if possible, by noon.
HEARING OFFICER STUBCHAER: One thing we might do tomorrow is see who does not want to cross-examine those particular witnesses and --
MS. SCHNEIDER: I was going to ask you about several people that are here for Jones & Stokes in that regard today. For instance, Dana McGowan who just testified about cultural resources, we don't believe there is any cross-examination for her nor for Mr. Shijo is who a traffic specialist.
HEARING OFFICER STUBCHAER: I don't think we can pole the audience and get an answer because several people left when we announced that we weren't going to have cross-examination today. So, I can't give you relief.
MS. SCHNEIDER: I will let them know. Thanks.
HEARING OFFICER STUBCHAER: Anything else.
We are in recess.
(Hearing adjourned at 4:45 p.m.)
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0234

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 7 through 233 herein constitute a complete, true and correct record of the proceedings.

IN WITNESS WHEREOF, I have subscribed this certificate at Sacramento, California, on this 16th day of July 1997.

ESTHER F. WIATRE
CSR NO. 1564