Chapter 2. Master Responses: Discussions of Recurring Themes

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INTRODUCTION

This chapter discusses several subjects that were mentioned frequently in comment letters on the 1995 DEIR/EIS and the 2000 REIR/EIS. Each of the following sections summarizes the individual comments that refer to a single theme and provides a comprehensive discussion of that theme that serves as a "master response" to those individual comments. These master responses to groups of individual comments are being provided for two purposes:

- to simplify the responses to comments by avoiding unnecessary repetition in individual responses, and

- to address issues in a broader context than might be required by individual comments.

When issues are addressed in this broader context, the interrelationships between some of the individual issues raised can be better clarified; it is also possible to provide a single explanation of an issue that is more thorough and comprehensive than separate, narrowly focused responses would be.

The following themes are discussed in the master responses:

- Project Objectives: Analyzing Effects of Water Transfers, Banking, and Augmenting Outflow;

- Integration of the Delta Wetlands Project with Federal and State Water Project Operations, including the CALFED Bay-Delta Program;

- Areas of End Use and Potential Growth-Inducement Effects of Delta Wetlands Water Deliveries;

- Impacts on Fisheries Identified in the 1995 DEIR/EIS and Adoption of Biological Opinions;

- Mitigation of Environmental Effects Related to Use of Recreation and Boat Facilities;

- Significance Criteria Used for the Water Quality Impact Analysis;

Analysis of Effects of the Delta Wetlands Project on Disinfection Byproducts; and

Levee Stability Analysis and Worst-Case Conditions.

MASTER RESPONSE 1. PROJECT OBJECTIVES: ANALYZING EFFECTS OF WATER TRANSFERS, BANKING, AND AUGMENTING OUTFLOW

The purpose of the Delta Wetlands Project, as stated in the 1995 DEIR/EIS and the 2000 REIR/EIS, is "to divert surplus Delta inflows, transferred water, or banked water for later sale and/or release for Delta export or to meet water quality or flow requirements for the Bay-Delta estuary". Several commenters note that these documents did not analyze the environmental effects associated with using the reservoir islands for transferring and banking water or using the Delta Wetlands water for environmental purposes (i.e., to augment Delta outflow).

Transfers and Banking

Delta Wetlands has applied to the SWRCB for the right to divert water in excess of the rights of senior water right holders and of fish and wildlife requirements; the aim of Delta Wetlands is to sell the water to purveyors or users in the Central Valley Project (CVP) and State Water Project (SWP) service areas or the Bay-Delta estuary (see Appendix 2 of the 1995 DEIR/EIS).

SWRCB approval of Delta Wetlands' water rights applications does not constitute approval of transfers or banking of other water right holders' water. However, if Delta Wetlands' permit applications are approved and the project is built, other water right holders could use the reservoir islands to store water temporarily under agreement with Delta Wetlands, as long as the water right holders obtain the appropriate authorizations from the SWRCB. Any parties wishing to temporarily store or bank water on the Delta Wetlands Project islands would be required to apply to the SWRCB for points of rediversion on the Delta Wetlands Project islands for their specific water rights. Before granting this authorization, the SWRCB would determine whether the new points of rediversion could cause significant environmental impacts. To make such a determination, the SWRCB may need to complete additional environmental documentation addressing the impacts of the transfers and banking on fisheries, hydrodynamics, and water quality.

Although the 1995 DEIR/EIS and 2000 REIR/EIS indicate that the reservoir islands may be used for transfers or banking in the future, such uses are too speculative to be analyzed at this time. Sections 15144 and 15145 of the State CEQA Guidelines state that an agency must use its best efforts to predict impacts but is not required to predict the unforeseeable. If the agency finds, after a thorough investigation, that an impact is too speculative to evaluate, it should note this conclusion and proceed. Additionally, Section 15146 states that the specificity of an EIR should correspond to the specificity of the underlying activity being evaluated. Therefore, the NEPA and CEQA analysis of the project has been limited to addressing the effects of project operations using water that would

be diverted, stored, and discharged under Delta Wetlands' own appropriative permits. See also the discussion of project integration under Master Response 2, "Integration of the Delta Wetlands Project with Federal and State Water Project Operations, including the CALFED Bay-Delta Program".

Use of Delta Wetlands Discharges to Provide Water for Outflow

Although one of the proposed uses of water stored on the Delta Wetlands reservoir islands is "to meet water quality or flow requirements for the Bay-Delta estuary", the 1995 DEIR/EIS and 2000 REIR/EIS did not quantitatively analyze the potential use of Delta Wetlands Project water to provide environmental benefits. The purpose of the environmental impact analysis is to identify significant environmental impacts associated with implementing the proposed project. Therefore, the modeling of Delta Wetlands Project operations used a "worst-case" scenario under which all water discharged by the Delta Wetlands Project was simulated as being exported through the SWP and CVP pumps. This assumption was used to allow for simulation of the greatest detrimental effects on water supply, water quality, and fishery resources.

It is not known at this time in what specific ways Delta Wetlands Project operations could contribute to outflow for environmental purposes. However, it is reasonable to assume that releasing Delta Wetlands Project water to augment outflow would *benefit* fisheries and water quality; therefore, no quantitative impact analysis of Delta Wetlands releases of water for outflow augmentation is required.

Chapter 3F of the 1995 DEIR/EIS in Volume 1 of this FEIS also suggests that if the Delta Wetlands Project is integrated into CVP and SWP operations, water may be discharged from the Delta Wetlands reservoir islands to substitute for releases from Shasta, Oroville, and Folsom Dams to help meet Bay-Delta outflow requirements, resulting in changes in riverine conditions. However, no proposals for which the lead agencies could reasonably assess the environmental effects have been made to coordinate Delta Wetlands Project operations with, or integrate them into, upstream water facility operations.

Although Delta Wetlands Project operations could be integrated with operation of SWP and CVP or other facilities to benefit the environment in addition to water supply, the NEPA and CEQA analysis does not speculate on the variety of ways that the project could be incorporated into other water operations. The environmental effects of such potential future integrated operations of the project would need to be addressed in additional environmental documentation when specific proposals for integration are made that would require additional permits and authorizations. See the discussion of project integration under Master Response 2, "Integration of the Delta Wetlands Project with Federal and State Water Project Operations, including the CALFED Bay-Delta Program".

MASTER RESPONSE 2. INTEGRATION OF THE DELTA WETLANDS PROJECT WITH FEDERAL AND STATE WATER PROJECT OPERATIONS, INCLUDING THE CALFED BAY-DELTA PROGRAM

Several commenters on the 1995 DEIR/EIS commented on the potential for integrating Delta Wetlands Project operations with other water facility operations, such as transfers and banking or substitution of Delta Wetlands discharges for upstream releases to augment outflow. They noted that for such an integration to occur, Delta Wetlands operations would have to be coordinated or integrated with SWP and CVP operations. Commenters also requested information about the possible relationship of Delta Wetlands Project operations to the CALFED Bay-Delta Program (CALFED).

For purposes of the NEPA and CEQA (and biological assessment) analysis, the Delta Wetlands Project is analyzed as a stand-alone water storage facility, operated independently of the SWP and the CVP and without regard to the specific entities to which the water could be sold. It is reasonable to assume that Delta Wetlands Project operations could be integrated in the future with operation of the SWP and CVP or other facilities to benefit the environment in addition to water supply. Several potential opportunities exist to operate the Delta Wetlands Project in conjunction with the CVP and SWP or in coordination with CALFED; however, no specific proposals have been made for which the lead agencies could reasonably assess the environmental effects. Therefore, discussion of such arrangements would be speculative. Additional environmental documentation would be needed to address the environmental effects of potential future integrated operations of the project when specific proposals for integration are made that would require additional permits and authorizations.

As described in Chapter 2 of the 2000 REIR/EIS and in Volume 1, Chapter 2 of this FEIS, CALFED has identified providing new storage of surface water and groundwater as a possible action to be included in its program; it has also identified the possibility of using in-Delta storage for diversions and to manage Delta flows. CALFED's Phase II report, published in 1998, identified storing 230 thousand acre-feet (TAF) of water on Delta islands as one of 14 ways to provide water supply, flood control, water quality, and ecosystem benefits. The Delta Wetlands Project could be included as part of the CALFED in-Delta storage element.

CALFED has undertaken an Integrated Storage Investigation (ISI) to evaluate various types of water storage projects and the possible role of in-Delta, onstream, and offstream water storage projects in overall water management. The Delta Wetlands Project may be one option for in-Delta storage and is a candidate for consideration by the ISI. CALFED may use some of the information presented in the 1995 DEIR/EIS and the 2000 REIR/EIS to determine whether it could include the Delta Wetlands Project in its in-Delta storage element; however, assumed project operations under this CALFED element would differ from the independent operations analyzed in these documents, and CALFED would need to analyze the project separately.

In May 2000, the U.S. Bureau of Reclamation (USBR) prepared and distributed an appraisal report that offers a preliminary assessment of the Delta Wetlands Project's feasibility in terms of

water supply capability, operational flexibility, project cost, and issues critical to implementation. The report recommends that USBR management seek authority and funding to begin investigating the project's feasibility and notes that the project's cost compares favorably with the cost of other surface storage options being investigated by CALFED.

Additional environmental review and permitting decisions would be required before the Delta Wetlands Project could be incorporated into CALFED and/or SWP and CVP operations or before the California Department of Water Resources (DWR), USBR, or CALFED could implement the project. These uses of the Delta Wetlands Project are too speculative to be addressed at this time; therefore, they were not included in the NEPA and CEQA analysis.

MASTER RESPONSE 3. AREAS OF END USE AND POTENTIAL GROWTH-INDUCEMENT EFFECTS OF DELTA WETLANDS WATER DELIVERIES

Several commenters on the 1995 DEIR/EIS and the 2000 REIR/EIS requested additional analysis of the potential environmental impacts associated with use of water discharged by Delta Wetlands for export. Although the 1995 DEIR/EIS states that exporting Delta Wetlands Project water could induce growth, the document does not identify buyers of the water or specify the locations within the CVP and SWP service areas where the water would be put to beneficial use. The 1995 DEIR/EIS states that the identity of the end user of the Delta Wetlands water remains speculative because of the diverse interests and competing demands for water for municipal, agricultural, and environmental needs. This issue was identified as an area of known controversy in the 1995 DEIR/EIS and the 2000 REIR/EIS.

Commenters requested that the NEPA and CEQA analysis describe the impacts associated with the end use of the Delta Wetlands water delivered in the SWP/CVP service area. Some commenters on the 1995 DEIR/EIS also suggested that the lead agencies adopt mitigation, such as the preparation of regional multispecies conservation plans, to offset the effects of growth on fish and wildlife in the SWP/CVP service area. Another commenter was concerned that delivering additional water to the west side of the San Joaquin Valley would compound water quality problems in the San Joaquin River associated with agricultural return flows.

The purpose of this master response is to comprehensively address issues associated with use of water exported from the Delta Wetlands Project and to provide additional information to the reviewers about CEQA and NEPA requirements for analysis of indirect and growth-inducing effects.

CEQA and NEPA Requirements for Analysis of Indirect and Growth-Inducing Effects

CEQA and NEPA require that an EIR/EIS address the secondary effects that could result from growth indirectly induced by a project. According to the State CEQA Guidelines

(Section 15126[g]), an EIR must discuss how a project could directly or indirectly lead to economic, population, or housing growth. A project can be considered growth inducing if it removes obstacles to growth, increases the demands on community service facilities, or encourages other activities that cause significant environmental effects.

Additionally, NEPA requires that an EIS address the indirect effects of an action or project, which may include growth-inducing effects and other effects related to induced changes in the pattern of land use; population density or growth rate; and related effects on air, water, and other natural systems or ecosystems (40 CFR 1508[b]). An EIS must identify the effects that are known and make a good-faith effort to explain these effects; however, if there is uncertainty about these effects, an agency is not required to engage in speculation but should make a judgment based on reasonably foreseeable occurrences.

Sections 15144 and 15145 of the State CEQA Guidelines state that an agency must use its best efforts to predict impacts but is not required to predict the unforeseeable. If the agency finds, after a thorough investigation, that an impact is too speculative to evaluate, it should note this conclusion and proceed. Section 15146 states that the specificity of an EIR should correspond to the specificity of the underlying activity being evaluated.

The lead agencies prepared the 1995 DEIR/EIS and the 2000 REIR/EIS based on the assumption that there is currently unmet demand for water in the SWP/CVP service area and that such demand will exist in the future. For purposes of impact assessment, it was therefore assumed that water stored on Delta Wetlands' reservoir islands would be exported using the SWP and CVP facilities. However, the lead agencies consider the areas of delivery and end use of Delta Wetlands Project water to be too unforeseeable and speculative for site-specific analysis. The following section describes the variety of potential uses of Delta Wetlands Project water based on current and anticipated unmet demands, and the resulting uncertainty in predicting the amounts of project water that could be delivered to the SWP/CVP service area and the areas in which they would be used.

The subsequent section describes a general approach for determining potential growth-inducing impacts of the project based on two worst-case assumptions: first, that all project water would be delivered as exports to the SWP/CVP service area; and second, that such water would constitute a new source of water that could induce growth.

Demand for Water and Potential End Uses

According to DWR (California Department of Water Resources 1998), California water supplies (with existing facilities and programs) are expected to annually average 78.1 million acre-feet (MAF) in 2020. Average water demand in the state is projected to total 81 MAF by 2020. These supply-and-demand conditions indicate that water shortages are expected to occur during both average water years and drought years. Areas of California that rely on the Delta for all or a portion of their supplies are expected to experience not only shortages but reliability problems (California

Department of Water Resources 1998). Shortages could be especially acute in the South Coast region, including Los Angeles, Orange, and San Diego Counties.

As documented in the 2000 REIR/EIS, Delta Wetlands Project operations were analyzed using a 1995 level of demand for water. The analysis showed that south-of-Delta delivery deficits (demands not met by SWP and CVP deliveries) exist in most years under this assumed level of demand. However, demand for water has already increased above this level, and future demands can be expected to be greater as well. For example, in the last year, the Central Valley Project Improvement Act (CVPIA) b(2) rules have been interpreted much more strictly than before; as a result, projected effects on CVP agricultural contractors (i.e., delivery deficits) are greater than they were a few years ago. In addition, the CVP must obtain and wheel "Level 4" water supplies of about 200 TAF to wildlife refuges. Also, the CALFED Environmental Water Account (EWA) represents a new, potential purchaser of stored water. The Metropolitan Water District of Southern California (MWD) has begun filling the Eastside Reservoir, which represents an addition to overall demand not accounted for in DWR's operations planning model DWRSIM. These changes all reflect greater demand for water than the demand assumed for the 2000 REIR/EIS simulations of Delta Wetlands Project operations.

The environmental effects of using Delta Wetlands project water to meet these different needs could vary significantly. Based on simulated delivery deficits reported in Chapter 3 of the 2000 REIR/EIS and Chapter 3A of FEIS Volume 1, there are substantial existing shortages in SWP and CVP contract deliveries, and the programs described above are likely to result in less reliability of CVP contracted water in the future. New sources of water, such as the Delta Wetlands Project, may replace these diminishing supplies for contractors and may help improve reliability. Although this use of Delta Wetlands Project water may not support new development per se, it could increase the frequency of environmental impacts associated with existing water use in the contract areas; water quality impacts in the San Joaquin River watershed are one example of an existing problem in a CVP contract area. On the other hand, use of Delta Wetlands Project water for environmental purposes (e.g., the CALFED EWA) may benefit fisheries, water quality, and other resources.

The specific beneficial uses of water from Delta Wetlands are still too varied and speculative for an analysis of site-specific impacts to be performed. Nevertheless, the lead agencies recognize that delivery of Delta Wetlands Project water could result in growth-inducing impacts, as described below.

Growth Inducement

The proposed project could be growth inducing for two reasons:

It would add water directly for export to municipal water supplies or agricultural production that may support growth.

Delta Wetlands Project water could be used to meet water quality or environmental requirements as a substitute for other water that could be used to support growth.

Water stored on the Delta Wetlands reservoir islands could be discharged into Delta channels and then exported through SWP or CVP facilities for sale to participating water purveyors. It is estimated that the annual average of the mean monthly Delta Wetlands discharges would range from approximately 114 TAF under the proposed project to 302 TAF under Alternative 3.

The future purchasers and users of Delta Wetlands Project water are not known; however, project water could be exported to any of the following:

municipal water agencies that provide water to residential, commercial, and industrial customers;

irrigation districts that provide water to farms; or

areas where the water is needed to meet water quality or environmental requirements.

The increase in water supplies and in reliability of supplies provided by the Delta Wetlands Project could encourage and accommodate additional population growth and housing development, commercial and industrial development, and expansion of areas under agricultural cultivation in the SWP/CVP service area south of the Delta.

State Water Project and Central Valley Project Service Areas

The SWP service area consists of 29 contractors in six local service areas; there are 24 contractors in four service areas south of the Delta (the South Bay, San Joaquin Valley, Central Coastal, and Southern California service areas). These four local service areas supply water to portions of 14 counties (Alameda, Santa Clara, Stanislaus, Kings, Kern, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Bernardino, Riverside, Imperial, and San Diego).

Each SWP contractor has its own political boundaries, and SWP supplies may be used in only a portion of a contractor's service area. Many contractors (such as MWD and the Kern County Water Agency) act as wholesalers of SWP supplies and sell water to other agencies. (California Department of Water Resources 1995.)

The CVP provides water to 250 long-term contractors in portions of 29 counties statewide, including areas of counties that are south of the Delta, such as Contra Costa, Santa Clara, Santa Cruz, San Benito, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern Counties.

About 90% of CVP water has gone to agricultural uses in the recent past; however, increasing quantities of water are currently being provided to municipal customers, including urban areas such as Tracy, northeastern Contra Costa County, and Fresno.

Potential Growth Accommodated by Delivery of Delta Wetlands Project Water

Water stored on the Delta Wetlands islands and exported from the Delta could partially offset projected water shortages in areas south of the Delta, allowing growth and increased crop cultivation in areas otherwise constrained by future water shortages. The amount of growth that could be accommodated by Delta Wetlands Project discharges is impossible to estimate.

One method of evaluating the quantitative relationship between population growth and water supplies is the "population-supported" method (California Department of Water Resources 1995). This method uses per capita water-use estimates to determine the amount of growth supported by a given volume of water, based on the assumption that a specific water volume can physically support a certain number of people per year. This approach oversimplifies the relationship between water supplies and growth because it does not take into account the ability of people to adjust to changes in water supplies; however, it provides a simple tool for evaluating project effects.

Per capita water use in regions that could receive Delta Wetlands Project water is projected to average approximately 230 gallons daily for all urban uses in 2020 (California Department of Water Resources 1998). Based on this per capita usage and using the very conservative assumption that all Delta Wetlands Project water is used for urban purposes, it is estimated that the average of 114–302 TAF of water annually provided under the project alternatives could support population growth ranging from 442,000 to 1,172,000 persons. This estimate is probably substantially greater than the growth that could actually occur as a result of Delta Wetlands Project implementation because Delta Wetlands Project water would likely be used to offset water delivery shortages in existing developed areas and also may be used for agricultural and environmental purposes. This worst-case estimate, however, indicates that growth supported by Delta Wetlands Project implementation could be substantial, even when spread over a large area and over many years.

An unreasonable amount of speculation would be required to determine where the Delta Wetlands Project could induce growth. As discussed above, water could be purchased and distributed in portions of counties served by the SWP and CVP south of the Delta. Furthermore, numerous factors would dictate where future growth supported by Delta Wetlands water would occur within those areas. These factors include:

- local government growth policies and plans,
- local and regional fiscal and economic conditions,
- employment growth locations,
- housing affordability and availability,
- quality of life considerations,
- climate, and
- the availability of supporting infrastructure.

Based on future growth projections, it can be assumed that much of any growth supported by Delta Wetlands Project discharges would probably occur in the South Coast region, primarily

within the Los Angeles metropolitan area. DWR (California Department of Water Resources 1998) projects that the population of the South Coast region will increase by more than 6 million people by 2020.

Potential Environmental Effects of Growth

The secondary impacts that could result from urban growth and increased crop cultivation in the CVP and SWP service areas vary depending on site-specific conditions. In general, housing growth and commercial and industrial development could result in the following types of environmental impacts:

- loss of vegetation and wildlife habitat and related effects on plant communities and wildlife, including threatened and endangered species;
- decreased air quality caused by automobile emissions and industrial pollutants;
- reduced water quality caused by increased urban runoff and industrial discharges;
- destruction of cultural and historical resources located at development sites;
- conversion of prime and productive agricultural lands to nonagricultural uses, and related losses of agricultural employment;
- increased demand for government services, including educational services and police and fire protection services; and
- increased need for public infrastructure, including wastewater treatment facilities, parks, and roadways.

Additionally, if new water sources are used to bring existing fallow or natural lands into production, irrigating and cultivating more farmland could result in similar types of impacts, including:

- the loss of natural vegetation and wildlife habitat and related effects on plant communities and wildlife, including threatened and endangered species;
- decreased air quality resulting from generation of dust and applications of pesticides; and
- reduced water quality caused by agricultural runoff to streams and rivers, and related impacts on fish species and habitat.

The environmental documentation prepared by local, state, and federal agencies that approve and provide permits for residential, commercial, and industrial projects would identify the site- and issue-specific growth-inducement impacts resulting from the provision of Delta Wetlands Project

water. Public involvement and agency consultation would occur during the environmental documentation process for site-specific projects.

As part of the environmental process required by CEQA and NEPA, the significant impacts of projects would be identified and mitigation of impacts would be adopted and implemented if available and feasible. The responsibility for implementing and monitoring mitigation measures would lie with local, state, or federal agencies with discretionary authority over projects. Some projects may result in impacts that cannot be mitigated or reduced to less-than-significant levels; in such cases, growth inducement associated with implementation of the Delta Wetlands Project could result in residual impacts.

Conclusion

In summary, the additional water supply that could be provided by the Delta Wetlands Project may induce growth in areas south of the Delta, resulting in secondary environmental impacts. More farmland could also be brought into production if water supplies expanded or became more reliable as a result of Delta Wetlands Project implementation. As stated previously, the environmental documentation prepared by local, state, and federal agencies that approve and provide permits for residential, commercial, and industrial projects in the SWP and CVP service areas would identify site- and resource-specific growth inducement impacts resulting from the provision of Delta Wetlands Project water. Mitigation measures implemented by agencies with jurisdiction over urban development projects would address many of the secondary impacts associated with the growth induced by the Delta Wetlands Project.

An unreasonable amount of speculation would be required to determine where the Delta Wetlands Project could induce growth and what the site- and resource-specific unmitigable impacts of growth would be. Although the Delta Wetlands Project could contribute to impacts related to growth inducement, Delta Wetlands cannot be required to provide the framework for statewide mitigation or to prepare regional mitigation plans for undetermined impacts.

MASTER RESPONSE 4. IMPACTS ON FISHERIES IDENTIFIED IN THE 1995 DEIR/EIS AND ADOPTION OF BIOLOGICAL OPINIONS

Numerous comments on the 1995 DEIR/EIS focused on that document's analysis of potential effects of the Delta Wetlands Project on fish species. Following the end of the comment period on the 1995 DEIR/EIS, the SWRCB and USACE concluded formal consultation with the California Department of Fish and Game (DFG), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS) on potential adverse effects of the project on fish species listed or proposed for listing under the California and federal Endangered Species Acts (ESAs).

The following two sections summarize the results of formal consultation and describe how the terms of the biological opinions reduce potential project effects on fish species and habitat to a less-than-significant level.

Biological Opinions Issued Pursuant to the Federal and California Endangered Species Acts

Biological Opinions for Project Effects on Delta Smelt and Winter-Run Chinook Salmon

In 1997 and 1998, the following no-jeopardy biological opinions were issued that addressed effects of the Delta Wetlands Project, as modified by the project operating parameters referred to as the Delta Wetlands final operations criteria (FOC), on delta smelt and winter-run chinook salmon:

- **USFWS opinion (May 1997).** USFWS addressed project effects on delta smelt and critical habitat for delta smelt; this biological opinion also incorporated a conference opinion on project effects on splittail, which had been proposed for listing as threatened.

- **NMFS opinion (May 1997).** NMFS addressed project effects on winter-run chinook salmon and its critical habitat; this biological opinion also incorporated a draft conference opinion on project effects on the Central Valley steelhead evolutionarily significant unit (ESU), which had been proposed for listing as endangered.

- **DFG opinion (August 1998).** DFG addressed project effects on state-listed species, including delta smelt and winter-run chinook salmon.

These biological opinions are contained in Appendices C, D, and E of the 2000 REIR/EIS.

Consultation on Species Listed Since Issuance of the Biological Opinions for Project Effects on Delta Smelt and Winter-Run Chinook Salmon

Since USFWS, NMFS, and DFG issued the biological opinions for project effects on delta smelt and winter-run chinook salmon, USFWS and NMFS have also listed splittail, Central Valley steelhead ESU, and spring-run chinook salmon as threatened under the federal ESA. Spring-run chinook salmon has also been listed as threatened under the California ESA. In addition, the Delta has been designated critical habitat for steelhead and spring-run chinook salmon under the federal ESA.

Splittail and Steelhead. Because splittail and steelhead had been proposed for listing at the time that the biological assessment for fish species was prepared for the Delta Wetlands Project, the biological assessment analyzed project effects on these species. Consequently, the 1995 DEIR/EIS, which included the biological assessment, fully addressed potential effects of the Delta Wetlands Project on splittail and steelhead.

As noted above, the USFWS and NMFS biological opinions incorporated conference opinions on splittail and steelhead, respectively. The conference opinions found that the Delta Wetlands Project, as modified by the FOC, would not jeopardize the continued existence of these species. USFWS formally adopted the conference opinion as its biological opinion on splittail for the Delta Wetlands Project in April 2000. USFWS's letter notifying USACE of the adoption was included in Appendix E of the 2000 REIR/EIS. NMFS formally adopted the conference opinion as its biological opinion on steelhead for the project in May 2000. NMFS's letter notifying USACE of the adoption is included in the appendix to this volume.

Spring-Run Chinook Salmon. In 1999, to address potential project effects on Central Valley spring-run chinook salmon ESU, USACE requested consultation with NMFS in accordance with Section 7 of the federal ESA. USACE noted that the protective measures included in the biological opinions for previously listed species cover the period when spring-run chinook salmon occur in the Delta and concluded that these measures therefore would also minimize adverse effects of the project on spring-run chinook salmon.

NMFS concurred with this conclusion; in August 2000, NMFS issued a biological opinion that states that the project is not likely to jeopardize the continued existence of spring-run chinook salmon or result in the adverse modification of its critical habitat or that of Central Valley steelhead ESU. NMFS's biological opinion on spring-run chinook salmon is included in the appendix to this volume.

DFG's biological opinion on project effects on delta smelt and winter-run chinook salmon also assessed Delta Wetlands' impacts on spring-run chinook salmon, but made no conclusions about effects on this species because the species was not listed at the time. The reasonable and prudent measures (RPMs) described in the biological opinion were indicated as minimizing adverse impacts of the incidental taking of spring-run chinook salmon and of the fish species that were then listed. In accordance with Section 2081 of the California Fish and Game Code, Delta Wetlands has requested concurrence directly from DFG that the protective measures in the existing biological opinion adequately address potential project effects on spring-run chinook salmon.

Final Operations Criteria and Reasonable and Prudent Measures

DFG, USFWS, and NMFS issued their findings of no jeopardy for delta smelt and winter-run chinook salmon and their habitats, and USFWS and NMFS issued their subsequent biological opinions for splittail, steelhead, and spring-run chinook salmon, on the assumption that Delta Wetlands would incorporate the terms collectively referred to as the FOC into the proposed project. As described in Chapter 2 of Volume 1 of this FEIS, the FOC terms were developed as a part of the consultation process and consist of detailed criteria that govern Delta Wetlands Project operations. The FOC terms primarily specify the allowable timing and magnitude of project diversions for storage and discharges for export or outflow. The biological opinions require Delta Wetlands to operate according to the FOC terms; they also describe reasonable and prudent measures (RPMs) that Delta Wetlands must implement to minimize the adverse impacts of incidental take of listed species. The full FOC text is included in Appendix B of the 2000 REIR/EIS.

The terms included in the FOC and RPMs are more restrictive than the project operating parameters analyzed in the 1995 DEIR/EIS. As described in the 2000 REIR/EIS, incorporating the FOC and RPMs into the proposed project reduces to a less-than-significant level the impacts on fish habitat and populations that were identified as significant in the 1995 DEIR/EIS analysis. The FOC and RPMs also provide adequate protection to prevent significant impacts on nonlisted fish species (e.g., striped bass and American shad).

Summary of Impacts Identified in the 1995 DEIR/EIS and Biological Opinion Measures that Reduce Those Impacts

The following sections summarize the FOC terms and RPMs that relate to the project effects identified in the 1995 DEIR/EIS.

Alteration of Habitat

The 1995 DEIR/EIS identified alteration of habitat under the proposed project as Impact F-1. As described in the 1995 DEIR/EIS, construction of intake facilities and fish screens, discharge facilities, and boat docks could adversely change spawning and rearing habitat used by Delta fish species. This impact was considered significant, and mitigation was proposed to reduce it to a less-than-significant level.

Alteration of habitat under cumulative conditions was identified as Impact F-17 in the 1995 DEIR/EIS and was considered less than significant. Incorporating the following FOC terms into the proposed project reduces this direct and cumulative impact to a less-than-significant level by ensuring that Delta Wetlands would avoid or minimize effects on habitat and would replace lost habitat:

- Conserve in perpetuity 200 acres of shallow-water rearing and spawning habitat.
- Contribute $100 per year for each boat berth constructed beyond preproject conditions to mitigate erosion of habitat from boat wakes.
- Mitigate on a 3:1 basis for the loss of aquatic habitat to construction activities.
- Limit in-water construction to June through November.

Including the following RPMs from the DFG, NMFS, and USFWS biological opinions in the proposed project further reduces project impacts on habitat:

- Provide employee orientation on protection of sensitive species (DFG).
- Report and confirm compliance with DFG construction guidelines (DFG).

Allow DFG personnel access to the project site (DFG).

Establish an aquatic habitat restoration fund (DFG).

Conduct project construction, operation, and maintenance in a manner that does not degrade Delta habitat (NMFS).

Avoid areas of immersed plants where riprap is being placed and where recreation, diversion, and discharge structures are built (USFWS).

Avoid areas of submersed plants where riprap is being placed and where recreation, diversion, and discharge structures are built; limit in-water work to June through November (USFWS).

Increase in Temperature-Related Mortality of Juvenile Chinook Salmon

The 1995 DEIR/EIS identified an increase in temperature-related mortality of juvenile chinook salmon under the proposed project as Impact F-2; this impact was considered significant, and mitigation was proposed to reduce it to a less-than-significant level. Incorporating the following FOC term into the proposed project reduces the potential temperature-related effects of the project on juvenile chinook salmon to a less-than-significant level:

Minimize and avoid adverse effects of discharge through changes in water temperature:

  – When the temperature differential between the discharge and receiving water is greater than 20EF, Delta Wetlands will not discharge.

  – When channel water temperature is 55EF or higher and is less than 66EF, Delta Wetlands discharges will not increase the temperature by more than 4EF.

  – When channel water temperature is 66EF or higher and is less than 77EF, Delta Wetlands discharges will not increase the temperature by more than 2EF.

  – When channel water temperature is 77EF or higher, Delta Wetlands discharges will not increase the temperature by more than 1EF.

  – Delta Wetlands will develop and implement water temperature monitoring.

Potential Increase in Accidental Spills of Fuel and Other Materials

The 1995 DEIR/EIS identified the potential increase in accidental spills of fuel and other materials related to recreational boat use under the proposed project as Impact F-3 and as Impact F-18 for cumulative conditions. Both the direct and cumulative impact were considered less

than significant. Incorporating the following FOC terms into the proposed project further minimizes this potential effect of project implementation:

- Conserve in perpetuity 200 acres of shallow-water rearing and spawning habitat.

- Contribute $100 per year for each additional boat berth constructed beyond preproject conditions to mitigate erosion of habitat from boat wakes.

Indirect Effects of Delta Wetlands Project Diversions and Discharges on Flows, Downstream Transport, Area of Optimal Salinity Habitat, and Entrainment

The 1995 DEIR/EIS addressed the effects of the Delta Wetlands Project on fish habitat, transport, and entrainment, including:

- effects of project diversions on outflow and salinity and, therefore, on habitat availability;

- effects of project diversions and discharges on Delta channel flow patterns, which affect transport of fish to suitable habitat and to pumping facilities where they may be vulnerable to entrainment; and

- effects of project diversions and discharges on percentage of Delta inflow diverted, which is associated with fish entrainment at the CVP and SWP export pumping facilities.

The 1995 DEIR/EIS identified the following significant impacts related to indirect effects of the proposed project on flows, downstream transport of species, and entrainment. Mitigation was proposed to reduce the impacts to a less-than-significant level.

- **Impact F-4 (proposed project) and Impact F-19 (cumulative conditions):** Potential Increase in the Mortality of Chinook Salmon Resulting from the Indirect Effects of Delta Wetlands Project Diversions and Discharges on Flows

- **Impact F-5 (proposed project) and Impact F-20 (cumulative conditions):** Reduction in Downstream Transport and Increase in Entrainment Loss of Striped Bass Eggs and Larvae, Delta Smelt Larvae, and Longfin Smelt Larvae

- **Impact F-7 (proposed project) and Impact F-22 (cumulative conditions):** Increase in Entrainment Loss of Juvenile Striped Bass and Delta Smelt

The following impacts were identified in the 1995 DEIR/EIS as less than significant:

- **Impact F-6 (proposed project) and Impact F-21 (cumulative conditions):** Change in Area of Optimal Salinity Habitat

Impact F-8 (proposed project) and Impact F-23 (cumulative conditions): Increase in Entrainment Loss of Juvenile American Shad and Other Species

These potential impacts are addressed by the interrelated FOC terms and RPMs summarized below. Including these measures in the proposed project reduces Impacts F-4 through F-8 to a less-than-significant level.

Total export criteria:

– Annual export of Delta Wetlands stored water will not exceed 250,000 acre-feet (af). This FOC term limits the maximum operation effect that could occur in any given year, and therefore applies to Impacts F-4 through F-8.

Diversion criteria:

– The maximum X2 value limits the start of Delta Wetlands diversions in September through November. This FOC term applies to Impacts F-4, F-6, F-7, and F-8.

– The maximum X2 value limits the magnitude of Delta Wetlands diversions in September through March. This FOC term applies to Impacts F-4 through F-8.

– Delta Wetlands diversions are limited by a maximum allowable change in X2 in October through March. This FOC term applies to Impacts F-4 through F-8.

– Delta Wetlands diversions to storage are limited by QWEST in March. This DFG RPM applies to Impacts F-4, F-5, F-6, and F-7.

– Delta Wetlands will not divert water in April and May. This FOC term applies to Impacts F-4, F-5, F-6, and F-8.

– If the delta smelt fall midwater trawl (FMWT) index is less than 239, Delta Wetlands will not divert water from February 15 through June. This FOC term applies to Impacts F-4, F-5, F-6, and F-8.

– Diversions are limited to a percentage of Delta surplus year round. This FOC term applies to Impacts F-4 through F-8.

– Diversions are limited to a percentage of Delta outflow year round. This FOC term applies to Impacts F-4 through F-8.

– Diversions are limited to a percentage of San Joaquin River inflow in December through March. This FOC term applies to Impacts F-4 through F-8.

- Diversions are reduced when monitoring detects the presence of delta smelt in December through August. This FOC term applies to Impacts F-4 through F-8.

- Diversions are limited if the Delta Cross Channel (DCC) is closed for fish protection in November through January. This FOC term applies to Impacts F-4, F-6, F-7, and F-8.

Discharge criteria:

- Discharges for export from Bacon Island are limited to 50% of San Joaquin River inflow in April through June. This FOC term applies to Impacts F-4, F-5, and F-8.

- Discharges for export from Webb Tract are prohibited in January through June. This FOC term applies to Impacts F-4, F-5, F-7, and F-8.

- Discharges for export or rediversion from the habitat islands (Bouldin Island and Holland Tract) are prohibited all year. This FOC term applies to Impacts F-4, F-5, F-7, and F-8.

- Discharges are limited to a percentage of available unused export capacity in February through July. This FOC term applies to Impacts F-4, F-5, F-7, and F-8.

- Environmental water will be set aside and provided as a percentage of discharge in February through June. This FOC term applies to Impacts F-5, F-6, and F-8.

- Discharges will be reduced when monitoring detects the presence of delta smelt in April through August. This FOC term applies to Impacts F-4, F-5, and F-8.

Other criteria:

- Delta Wetlands will meet a design criterion for fish screens for an approach velocity of 0.2 foot per second (fps). This FOC term applies to Impacts F-7 and F-8.

- Delta Wetlands will conserve in perpetuity 200 acres of shallow-water rearing and spawning habitat. This FOC term applies to Impact F-6.

- To compensate for incidental entrainment losses of listed fish species, Delta Wetlands will provide funds based on the amount of water diverted to storage in January through March and June through August (no diversions are permitted in April and May). This FOC term applies to Impacts F-7 and F-8.

– Delta Wetlands will implement a fish monitoring program that includes:

  - in-channel monitoring during diversions from December through August,
  - on-island monitoring during diversions,
  - monitoring during discharge for export from April through August,
  - reporting,
  - sample handling protocol,
  - coordination with Interagency Ecological Program (IEP) monitoring, and
  - a monitoring technical advisory committee.

  This program, required by the FOC, applies to Impacts F-4 through F-8.

– Delta Wetlands will provide an environmental water fund based on the amount of water diverted from October through March and the amount discharged by the project (DFG biological opinion). This DFG RPM applies to Impacts F-4 through F-8.

– Delta Wetlands will implement aquatic habitat development measures to offset the impacts of moving X2 upstream from February through June (DFG biological opinion). This DFG RPM applies to Impact F-6.

Project Effects on Dissolved Oxygen Levels

The 1995 DEIR/EIS analysis assumed that proposed project operations would not result in significant changes in dissolved oxygen (DO) levels (see "Effects on Water Quality" on pages 3F-16 and 3F-17 in Chapter 3F of the 1995 DEIR/EIS [page 3F-17 in Chapter 3F of FEIS Volume 1). The water in the Delta Wetlands reservoirs would be relatively shallow (generally less than 20 feet deep) and well mixed. It was assumed that DO levels in the reservoirs would be similar to those in the Delta channels; the 1995 DEIR/EIS did note, however, that algal blooms on the reservoir islands could cause periodic differences between the levels of DO on the reservoir islands and those in the channels.

The FOC terms direct Delta Wetlands to implement a program for DO that includes the following components:

Delta Wetlands will not discharge water for export if the discharge level is less than 6.0 milligrams per liter (mg/l) without authorization from the resource agencies.

Delta Wetlands will not discharge water for export if the discharge would cause the DO level in adjacent channels to fall below 5.0 mg/l.

Delta Wetlands will develop and implement a plan for monitoring DO in water stored on the reservoir islands and DO in Delta channels.

Incorporating this FOC term into the proposed project ensures that effects of project operations on DO would be less than significant.

MASTER RESPONSE 5. MITIGATION OF ENVIRONMENTAL EFFECTS RELATED TO USE OF RECREATION AND BOAT FACILITIES

In the 1995 DEIR/EIS, Delta Wetlands proposed to construct recreation facilities along the perimeter levees on all four Delta Wetlands Project islands. These facilities were included as part of the project description when Delta Wetlands submitted its application for water rights to the SWRCB and applied to USACE for authorization under the Clean Water Act (CWA) and Rivers and Harbors Act of 1899. Both the 1995 DEIR/EIS and the 2000 REIR/EIS provided conceptual descriptions of the recreation facilities and analyzed the effects that facility construction and operation would have on the environment. As described below, the water right permit issued by the SWRCB and the biological opinions issued by USFWS, NMFS, and DFG for the proposed project include terms and conditions governing construction and operation of these facilities.

The lead agencies received several comments on the 1995 DEIR/EIS about the effects of increased boating that would result from the implementation of the Delta Wetlands Project. There is a concern that if Delta Wetlands provided the number of proposed boat berths included in the design of recreational facilities on the project islands, boat use in the Delta would increase, resulting in increased impacts on aquatic resources. Many commenters voiced the concern that impacts created by wakes and wave wash from increased boat use could lead to erosion of levees and degradation of near-shore habitat and midchannel islands and shoals. Commenters also expressed a concern that boat use resulting from project implementation could increase turbidity and affect sensitive aquatic species that reside in or migrate through the Delta. The comment letters also described other potential effects of boat use on aquatic habitats that relate to an increase in the concentration of pollutants near docks resulting from improper dumping and potential fuel spills.

In addition to concerns about impacts on physical habitat, several comments focused on the concern that increased recreational opportunities on the Delta Wetlands Project islands would increase recreation-related vehicular traffic on Delta roadways, adversely affecting roadway safety and increasing the need for roadway maintenance. There was also concern that the addition of new recreation and boat facilities would increase the demand for public services, including fire and police protection and sewage systems to serve the boaters and the recreation andboat facilities. Commenters suggested that implementation of the project would result in an overall degradation of recreational boating experiences in the Delta.

In May 2001, Delta Wetlands removed construction of recreation facilities from its CWA and Rivers and Harbors Act permit applications; therefore, USACE will not include construction or operation of such facilities in any permit issued pursuant to Delta Wetlands' current application. Nevertheless, as information for the reader, this FEIS includes the conceptual descriptions of the recreation facilities, the analysis of their environmental effects, and responses to comments on the 1995 DEIR/EIS and 2000 REIR/EIS about the facilities. Delta Wetlands may subsequently apply

for CWA and Rivers and Harbors Act permits for some or all of these recreation facilities; in such a case, separate environmental analysis would be required. The information developed in this EIS may be used in any subsequent environmental assessment as appropriate.

Issues Addressed in the 1995 DEIR/EIS and the 2000 REIR/EIS

The effects of increased recreational activities, including boating, that could result from implementation of the Delta Wetlands Project were discussed and analyzed in the following chapters of the 1995 DEIR/EIS:

- Chapter 2, " Delta Wetlands Project Alternatives", provided a generalized description of the proposed recreation and boat facilities and boat docks as part of the project description. Recreation and boat facilities were described in more detail in Appendix 2, "Supplemental Description of the Delta Wetlands Project Alternatives".

- Chapter 3J, "Recreation and Visual Resources", provided an analysis of impacts related to boat congestion and to a general decrease in the quality of the recreational boating experience in the Delta.

- Chapter 3L, "Traffic and Navigation", addressed impacts generated by increased recreational traffic from vehicles and boats.

- Chapter 3O, "Air Quality", provided an analysis of pollutant emissions from increased boating and recreational traffic on Delta roadways.

- Chapter 3E, "Utilities and Highways", provided a discussion of impacts associated with the need for increased police and fire services that would result from project implementation. This chapter also addressed sewage disposal needs required by the proposed recreation and boat facilities.

This information is presented again in Chapters 2, 3J, 3L, 3O, and 3E in Volume 1 of this FEIS.

In response to comments on the 1995 DEIR/EIS, additional information about the issue of boat wake was included in Chapter 6, "Levee Stability and Seepage", of the 2000 REIR/EIS. A literature search and conversations with individuals with expertise in this area revealed that there are no current data on the impacts of wake action on channel islands. Because no data are available to quantify the relationship between boating and wake effects, it is not currently possible to estimate the effects that increased wake action resulting from increased boating use under the proposed project would have on erosion or habitat. However, the lead agencies recognize the potential for such effects. Therefore, additional consideration is given here to lessening the significance of adverse impacts created by boat wake that would result from project implementation. In addition, new information on the effects of the Delta Wetlands Project facilities on fish predation was included

in Chapter 5, "Fisheries", of the 2000 REIR/EIS. This information on wake action and fish predation is included in Chapters 3D and 3F, respectively, in Volume I of this FEIS.

Effects of Boat Wake on Aquatic and Channel Island Habitat

The wakes produced by boats propagate outward until they dissipate at the shoreline. Wave height and other characteristics vary with speed, size, type of watercraft, size of engine, hull displacement, and distance from shore (Asplund 2000). The resulting waves have the potential to deliver large amounts of erosive energy to the shoreline in a short period of time (Dorava and Moore 1997). The rate at which this erosion occurs depends largely on the shoreline substrate and the frequency and magnitude of the waves produced. Shoreline erosion may affect water clarity in near-shore areas by shading submerged aquatic plants and providing nutrients for algal growth. This erosion also can interfere with the use of shallow-water habitat by resident and migrant fish species, as well as wildlife species, at the land-water edge.

Boat wakes could adversely affect channel islands and shoals and marsh and riparian habitat along Delta sloughs. These habitats are described briefly below.

Channel Islands and Shoals

Channel islands and shoals are remnants of naturally occurring islands that existed before reclamation or of natural or old levees. They typically support tule marsh and, to a lesser extent, willow scrub and tidal mudflat habitats and associated wildlife and fish species. Some of these islands also support small patches of riparian woodlands with oaks, cottonwoods, alders, and willows. The relative isolation of these islands makes them important wildlife refuge areas during peak recreation months in spring and summer.

Channel islands and shoals are a complex habitat type that provides high habitat values for both terrestrial and aquatic species. Channel islands must be described individually because their physical features depend on parameters such elevation, width, location, and amount of human disturbance. To a large extent, an island's isolation from disturbance will determine how useful it will be in supporting wildlife habitat. Other important ecological functions of the islands include natural sediment supply, nutrient input, and areas of primary and secondary production. A variety of Delta fish species, including the federally listed and state-listed splittail and delta smelt, spawn in shallow water. Therefore, the channel island and shoal habitat provides the diversity, nutrients, and shelter from aquatic predators necessary for Delta fish to survive and to spawn successfully. Special-status plant species, including Suisun marsh aster, Delta tule pea, Delta mudwort, Suisun thistle, soft bird's-beak, and Mason's lilaeopsis, are also supported by these habitats.

Marsh and Riparian Habitat along Delta Sloughs

Sloughs are tidal channels of the Delta that create a link between upland rivers and San Francisco Bay. They are characterized as low-velocity, natural tributaries of Delta rivers that vary in width and depth, have gently sloped, vegetated sides, and are connected to the Delta (CALFED Bay-Delta Program 1999a). These areas supply high habitat values for both aquatic and terrestrial species by providing cover and protection from high velocity flows and wind. Marsh and riparian corridors associated with the sloughs are important nesting, refuge, breeding, and feeding areas for waterfowl. Riparian scrub, riparian forest, and open-water habitats associated with sloughs provide the complex habitat requirements for protected wildlife species, including the federally listed and state-listed giant garter snake, and special-status plant species, such as rose-mallow. In addition, several resident fish species, including splittail and delta smelt, may use the sloughs as spawning habitat. Wildlife use of these areas varies with the amount of open water and marsh, the extent and type of vegetation present, and surrounding land uses.

Mitigation Identified in the Final Operations Criteria to Address the Effects of Boat Wake

The issue of boating and wake effects was considered during endangered species consultation between the lead agencies and DFG, NMFS, and USFWS. As a result, the FOC terms developed in the consultation process include a measure (number 53) specifically intended to mitigate the effects of boat wake. Under this term, Delta Wetlands is required to contribute $100 per year for each net additional boat berth beyond pre-project conditions added to any of the four project islands. These funds will be in January 1996 dollars and adjusted annually for inflation. The monies collected as a result of this measure will be included as part of an aquatic habitat restoration fund. This fund will be used to purchase habitat from a mitigation bank or acquire and manage habitat in an alternative ownership and management arrangement acceptable to DFG. (See also page 55 of the DFG biological opinion in Appendix C of the 2000 REIR/EIS.)

This measure is an addition to the requirement that Delta Wetlands mitigate the effects of project construction and operation on aquatic habitat and shallow shoal habitat. The FOC terms have been adopted as part of the federal and state biological opinions for Delta Wetlands Project effects on listed fish species, and Delta Wetlands is required to incorporate these terms into the proposed project.

Additional Mitigation of Potential Impacts: Reduction in Boat Slips at Recreation and Boat Facilities

Comments received on the 1995 DEIR/EIS prompted the lead agencies and the project proponent to reexamine impacts created by increased recreational boating opportunities. As discussed above, the effects of increased recreational boating created by the Delta Wetlands Project

were discussed and analyzed in several chapters in the 1995 DEIR/EIS. A listing of each 1995 DEIR/EIS impact and finding of significance related to increased recreational boat use is shown in Table 2-1 of this volume. The following additional mitigation has been proposed in an attempt to reduce these impacts to a less-than-significant level.

> **Mitigation Measure RJ-1: Reduce the Number of Outward Boat Slips Located at the Proposed Recreation and Boat Facilities**. Delta Wetlands shall reduce the total number of outward (channel-side) boat slips proposed on the Delta Wetlands islands by 50%.

As stated above, Delta Wetlands has removed construction of recreation facilities from its CWA and Rivers and Harbors Act permit applications, and USACE will not include the construction of such facilities in any permits issued for the project at this time. Nevertheless, a discussion of the effectiveness of this mitigation measure is presented below. This information may be used in any subsequent environmental assessment of the recreation facilities as appropriate.

Delta boating use attributable to the Delta Wetlands Project would originate from the recreation facility boat docks. With the addition of this mitigation measure, the number of permanent docking spaces provided by the recreation and boat facilities would decline from 1,140 to 570 slips under Alternatives 1 and 2. Assuming 70% occupancy, this would reduce the number of boats that are provided permanent docking space under the proposed project (Alternative 1 or 2) from 798 to 400.

The following sections describe how implementing this mitigation measure can address the concerns raised in comment letters and would change the impact conclusions presented in the 1995 DEIR/EIS. The revised impact conclusions are shown in the last column of Table 2-1 and are reflected in impact discussions in Volume 1 of this FEIS.

Recreation-Related Vehicle and Boat Traffic

Projected boating use at the Delta Wetlands Project islands would contribute substantially to increases in boat traffic on Delta waterways and vehicle traffic on Delta roadways (see Chapter 3L). As described in Chapter 3L, implementation of the Delta Wetlands Project would increase peak-hour roadway traffic volumes during project operation (see Table 2-1 of this volume). The majority of trips generated under these alternatives would be created by summer recreationists (e.g., boaters). Based on the significance criteria and the impact assessment methodology presented in Chapter 3L, the increase in peak-hour traffic volumes on Delta roadways without mitigation was considered to result in a significant impact.

Table 2-2 of this volume presents a comparison of recreational vehicle and boat trip generation (trips per day per season) that would result from implementation of the proposed project (Alternative 1 or 2) with and without the proposed 50% reduction in external boat slips. As shown in the table, implementation of the proposed mitigation measure would reduce recreational boater trips by 50%. However, implementation of the proposed project would still exceed the significance

Table 2-1. Impacts Discussed in the 1995 DEIR/EIS Related to Recreational Boat Use

Chapter	Impact #	Impact	1995 DEIR/EIS CEQA Finding	Finding After New Mitigation
3C	C-24	Increase in Pollutant Loading in Delta Channels	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
3E	E-8	Increase in Demand for Police Services on the Delta Wetlands Project Islands	Less than significant with proposed mitigation	Less than significant with proposed mitigation
	E-9	Increase in Demand for Fire Protection Services on the Delta Wetlands Project Islands	Less than significant with proposed mitigation	Less than significant with proposed mitigation
	E-11	Increase in Demand for Sewage Disposal Services	Less than significant with proposed mitigation	Less than significant with proposed mitigation
3F	F-3	Potential Increase in Accidental Spills of Fuel and Other Materials	Less than significant	Less than significant
3J	J-4	Change in the Quality of the Recreational Boating Experience in Delta Channels	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
3L	L-2	Increase in Traffic on Delta Roadways during Project Operation	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
	L-7	Increase in Boat Traffic and Congestion on Delta Waterways during Delta Wetlands Project Operation	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
	L-21	Increase in Traffic on Delta Roadways during Operation of Future Projects, Including the Delta Wetlands Project	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
3O	O-2	Increase in CO Emissions on the Delta Wetlands Project Islands during Project Operation	Less than significant	Less than significant
	O-5	Increase in ROG Emissions on the Delta Wetlands Project Islands during Project Operation	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
	O-6	Increase in NO_x Emissions on the Delta Wetlands Project Islands during Project Operation	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance
	O-17	Increase in Cumulative Production of Ozone Precursors and CO in the Delta	Significant and unavoidable	Adverse impacts are lessened, but not below a level of significance

Note: Although Delta Wetlands has removed construction of recreation facilities from its Clean Water Act permit application, the impact conclusions presented in this table assume that the recreation facilities would be constructed and operated.

Table 2-2. Comparison of Recreational Vehicle and Boat Trip Generation (trips/day) for Alternatives 1 and 2 with and without a 50% Reduction of Boat Slips

		Bacon		Webb		Bouldin		Holland	
Vehicle or Boat Type	Season	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation
Hunting-related vehicles	Nov-Jan	18	18	17	17	22	93	14	43
	Feb-May	0	0	0	0	0	0	0	0
	Jun-Aug	0	0	0	0	0	0	0	0
	Sept-Oct	0	0	0	0	0	0	0	0
Boating-related vehicles	Nov-Jan	34	68	34	68	27	58	17	36
	Feb-May	139	277	139	277	126	252	67	151
	Jun-Aug	243	485	243	485	221	441	132	265
	Sept-Oct	173	347	173	347	158	315	95	189
Other recreation-related vehicles	Nov-Jan	2	2	2	2	2	2	2	1
	Feb-May	8	8	8	8	8	8	6	5
	Jun-Aug	36	36	36	36	33	33	26	20
	Sept-Oct	16	16	16	16	14	14	11	9
Total recreation-related vehicles	Nov-Jan	54	88	53	87	51	153	32	80
	Feb-May	147	286	147	286	134	260	73	156
	Jun-Aug	279	521	279	521	254	474	158	284
	Sept-Oct	189	362	189	362	172	329	106	198
Hunting-related boats	Nov-Jan	18	18	18	18	22	93	14	43
	Feb-May	0	0	0	0	0	0	0	0
	Jun-Aug	0	0	0	0	0	0	0	0
	Sept-Oct	0	0	0	0	0	0	0	0
Boating-related boats	Nov-Jan	23	46	23	46	21	42	13	25
	Feb-May	93	185	93	185	84	168	51	101
	Jun-Aug	161	323	161	323	147	294	88	176
	Sept-Oct	116	231	116	231	105	210	63	126

Table 2-2. Continued

		Bacon		Webb		Bouldin		Holland	
Vehicle or Boat Type	Season	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation
Other recreation-related boats	Nov-Jan	0	0	0	0	0	0	0	0
	Feb-May	0	0	0	0	0	0	0	0
	Jun-Aug	0	0	0	0	0	0	0	0
	Sept-Oct	0	0	0	0	0	0	0	0
Total recreation-related boats	Nov-Jan	41	64	41	65	43	135	27	68
	Feb-May	93	185	93	185	84	168	51	101
	Jun-Aug	161	323	161	323	147	294	88	176
	Sept-Oct	116	231	116	231	105	210	63	126

Notes: 1) Although 10% of other recreationists would boat to the project islands, these boat trips are not included in this analysis because their origin is unknown.
2) Hunting-related boat trips are made on the interior of the project islands and are of much shorter duration than boating-related boat trips, which are made on the exterior of the islands.
3) Hunting-related boat trips would be made in small outboard fishing boats, whereas boating-related boat trips would be made in larger inboard-engine boats.

Sources: Anderson, Boyce, Camper, Cochrell, Holmes, Ruth, Wagner, Williams, and Winther pers. comms. See also Table 3L-5 of the 1995 DEIR/EIS.

criteria for peak-hour traffic volumes on local roadways. Therefore, the project impact on traffic would be lessened, but not below a significant level.

The impact of the proposed project on waterway traffic, described in Chapter 3L, is considered significant and unavoidable. As with roadway traffic, implementation of the proposed mitigation would greatly reduce the magnitude of this impact. However, it is still considered significant and unavoidable.

Roadway Safety and Maintenance

Several comments focused on concerns that increased traffic on local roadways, such as Jersey Island Road and Bacon Island Road, would decrease roadway safety and increase the need for roadway maintenance. One commenter also expressed concern that increased vehicle and boat traffic would require additional opening and closing movements of local bridges, specifically the Bacon Island Road bridge across Middle River, which could accelerate deterioration of recent bridge improvements. The 1995 DEIR/EIS reports that project implementation would reduce agricultural vehicle traffic on Delta roadways (see Impact L-4). Operation of slow-moving, heavy agricultural vehicles on public roadways can increase the frequency of traffic accidents and increase the frequency of routine roadway maintenance (i.e., repaving). Removing agricultural vehicles from the roadways would improve those conditions. However, increased vehicular traffic associated with use of the recreation and boat facilities would somewhat offset the improvements gained by removing agricultural traffic on the roadways. As described above, reducing the number of boat facilities would result in a corresponding reduction in recreational vehicle and boat traffic. Implementation of the proposed mitigation measure would therefore reduce the potential for wear and tear on local roadways and bridges associated with recreation-related vehicle and boat traffic. Impacts on roadway safety and maintenance resulting from project implementation would be considered less than significant with the proposed mitigation.

Air Quality

The reduction in the number of recreational boater trips and reduction in boat use that would accompany implementation of the proposed mitigation measure would reduce projected impacts on air quality. However, the impacts would remain significant and unavoidable (Table 2-1 of this volume).

Demand for Police and Fire Protection Services

A reduction in the number of boats using Delta Wetlands recreation and boat facilities would also correspond to a decrease in demand for police and fire services. Impacts related to the need for increased police and fire protection on the project islands are identified in the 1995 DEIR/EIS as Impacts E-8 and E-9 (see Table 2-1 in this volume). The proposed mitigation of these impacts includes the following measures:

- **Mitigation Measure E-3:** Delta Wetlands would provide adequate lighting in and around buildings, walkways, parking areas, and boat berths.

- **Mitigation Measure E-4:** Delta Wetlands would provide private security services for recreation and boat facilities and boat docks.

- **Mitigation Measure E-5:** Delta Wetlands would incorporate design features from the Uniform Building Codes and Uniform Fire Codes into the design of the recreation and boat facilities and boat docks.

- **Mitigation Measure E-6:** Delta Wetlands would coordinate with the county and the Local Agency Formation Commission (LAFCO) to incorporate Webb Tract and Bacon Island into an existing fire protection district or create a new fire protection district to serve these islands.

With the implementation of these measures, in addition to the new mitigation reducing the number of boat berths provided at recreation and boat facilities on project islands, the increase in demand for police and fire protection services would remain less than significant.

Demand for Sewage Facilities and the Potential for Accidental Spills

The potential for increased pollutant loading associated with recreational boat use is described as a significant and unavoidable impact on page 3C-36 in Chapter 3C of the 1995 DEIR/EIS (page 3C-40 in Chapter 3C of FEIS Volume 1). Pollutants could be discharged into channels adjacent to the Delta Wetlands Project islands and in other Delta channels from fueling and sewage pumping activities, domestic gray water, and litter. The frequency, magnitude, and precise location of incidental fuel and sewage discharges associated with these activities are unknown, but such discharges are likely to occur at the proposed boat docks. However, the relatively strong tidal currents in the channels that surround the Delta Wetlands habitat and reservoir islands would disperse most spills quickly.

Reducing the number of permanent docking spaces provided at the recreation and boat facilities would decrease the potential for accidental spills in Delta channels and reduce the need for sewage pump-out facilities. Impacts related to the potential increase in accidental spills of fuel and other materials are identified in the 1995 DEIR/EIS and FEIS Volume 1 as Impacts C-24 and F-3. The impact related to the increased demand for sewage disposal facilities is identified as Impact E-11. The Delta Wetlands Project would not provide sewage pump-out facilities because these facilities are widely available in the vicinity of the project islands and other locations throughout the Delta (see Figure 3E-4 in Chapter 3E in Volume 1 of this FEIS). As noted above, accidental spills of fuel and other materials related to recreational boating would have localized effects. With the addition of the proposed mitigation measure, the need for sewage facilities and the potential for accidental spills would be reduced substantially.

Permit Requirements for Recreation and Boat Facilities

The 1995 DEIR/EIS disclosed the adverse environmental effects of constructing and operating the proposed recreation and boat facilities on the Delta Wetlands Project islands. Although approval of the construction of these facilities was not part of the SWRCB's water right decision, the placement of docks in the channels would require a USACE permit under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act. Therefore, the 1995 DEIR/EIS and 2000 REIR/EIS addressed the environmental effects of constructing and operating the facilities.

The design details, square footage, and berth lengths given in the 1995 DEIR/EIS are preliminary; the analysis assumed a maximum facility size and maximum number of facilities to provide a worst-case analysis of potential effects of the recreation and boat facilities. The actual facility design and total number of facilities built would not exceed the assumptions in the analysis. However, specific design features for a particular facility may be subject to change before Delta Wetlands applies for entitlements and permits from regulating agencies (e.g., Contra Costa or San Joaquin County, the California State Lands Commission [SLC], and USACE).

In May 2001, Delta Wetlands removed construction of the recreation facilities from its permit application under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act; therefore, USACE will not approve construction of such facilities at this time. Delta Wetlands may subsequently apply for CWA and Rivers and Harbors Act permits for some or all of these facilities when specific designs for the facilities are complete. In such a case, separate environmental analysis would be required. Delta Wetlands would not be able to build recreation facilities without obtaining permits from USACE. The information developed in this FEIS may be used in any subsequent environmental assessment as appropriate.

Delta Wetlands also would not be able to build recreation and boat facilities without obtaining the development permits deemed necessary by Contra Costa or San Joaquin County. If, when specific design details are submitted, a local regulating agency determines that the NEPA and CEQA documentation already prepared for the project does not cover site-specific environmental impacts in enough detail, the agency may require additional environmental documentation before it will approve permits or entitlements.

Conclusion

With the implementation of the proposed mitigation measure described above and the terms and conditions of the biological opinions (i.e., the FOC), in addition to the mitigation measures described in the 1995 DEIR/EIS, the impacts associated with increased recreational boating resulting from project implementation would be greatly reduced. A reduction in the number of boat slips at the proposed recreation and boat facilities would lessen the adverse effects of boat wake on sensitive aquatic species and their habitats. To further mitigate the impacts of boat wake, DFG would collect fees to restore aquatic habitat such as channel islands and shoals. The proposed mitigation would

also lessen impacts on waterway and roadway traffic and air quality, but not to a less-than-significant level.

Demands for public services like sewage pump-out facilities and police and fire protection would also be greatly reduced. It should be noted that if, when specific recreation facility design details are submitted, USACE or a local regulating agency determines that the NEPA and CEQA analysis already performed for the project does not cover site-specific environmental impacts in enough detail, the agency may require additional environmental documentation before it will approve permits or entitlements.

MASTER RESPONSE 6. SIGNIFICANCE CRITERIA USED FOR THE WATER QUALITY IMPACT ANALYSIS

Summary of Comments

Several comments on the 1995 DEIR/EIS and the 2000 REIR/EIS questioned the appropriateness of the significance criteria that were used in the impact analysis for water quality. Specifically, commenters challenged the use of a 20% change in the existing numerical limit or mean value (for variables without numerical limits) of a water quality variable as a threshold for significance. Their challenges are based on the concern that any change for some constituents may unacceptably degrade resources that are already impaired. Commenters also misunderstood the assumptions on which the 20% significance threshold was based.

Master Response 7, "Analysis of Effects of the Delta Wetlands Project on Disinfection Byproducts", addresses the significance criteria used to evaluate effects of the project on disinfection byproducts (DBPs), including trihalomethanes (THMs). Comments related to the significance of project effects on water treatment costs are also included in Master Response 7.

Requirements for Establishing Significance Criteria

The State CEQA Guidelines encourage each public agency to develop and publish thresholds of significance. The SWRCB has not published specific significance criteria for projects that affect Delta water quality; however, the SWRCB and U.S. Environmental Protection Agency (EPA) have established regulatory objectives and numerical standards, such as those contained in the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (1995 WQCP), to protect beneficial uses of Delta waters.

The State CEQA Guidelines direct that a change in the environment is not significant if it complies with a "standard". A standard is defined as, among other things, a quantitative requirement adopted by a public agency through a public review process. The criteria used to determine the

significance of effects of Delta Wetlands Project operations on water quality have been set to conform with existing objectives and standards. For Delta water quality variables for which no regulatory objectives or numerical standards have been set, the selected significance threshold is a percentage change from existing measured values that encompasses natural variability in water quality constituents.

Some commenters argue that the State CEQA Guidelines require that significance criteria be determined through a public forum. However, the requirement for a public review process applies only to thresholds of significance adopted "for general use as part of the lead agency's environmental review process" (State CEQA Guidelines 15064.7). This section of the State CEQA Guidelines encourages agencies to develop "general use" thresholds as a means of standardizing their environmental assessments. However, the SWRCB, in developing thresholds of significance for the Delta Wetlands Project, was not establishing thresholds for general use. Therefore, no public review process was required other than the CEQA requirements for review of an EIR.

Additionally, NEPA requires that an EIS disclose the direct, indirect, and cumulative effects of the proposed action but does not require significance determinations for individual project effects (40 CFR 1502.16).

Significance Criteria Used in the 1995 DEIR/EIS and the 2000 REIR/EIS

The significance criteria used for the analysis in the 2000 REIR/EIS are identical to those presented in the analysis of water quality effects in the 1995 DEIR/EIS, except that the THM criterion has been updated in response to changes in the federal Disinfection/Disinfection Byproducts (D/DBPs) Rule (see Master Response 7).

For the impact assessment analysis, it was assumed that there are benefits to maintaining water quality better than that specified by the numerical water quality criteria. Therefore, significance thresholds for variables with numerical water quality criteria were established at 90% of the specified water quality standards. A second significance criterion was based on the assumption that some changes may be substantial compared with the natural variability of the water quality variable under no-project conditions and could be considered significant impacts. This criterion, which was set at 20% of the applicable standard or mean condition, was challenged by commenters on the 1995 DEIR/EIS and 2000 REIR/EIS as too lenient. The description of this criterion in Chapter 4 of the 2000 REIR/EIS contained language that was misunderstood by reviewers; this text has been corrected and clarified in Chapter 3C of this FEIS as follows:

> A second significance criterion was based on the assumption that some changes may be substantial compared with the natural variability of the water quality variable under no-project conditions and could be considered significant impacts. Natural variability caused by tidal flows, river inflows, agricultural drainage, and biological processes in the Delta channels is sometimes quite large relative to the numerical

standards or mean values of water quality variables. Natural variability was assumed to be at least 10% of the specified numerical limit for variables with numerical limits or 10% of the mean value for variables without numerical limits. Measurement errors and modeling uncertainties were likewise assumed to be ~~about~~ at least 10% of the measured or modeled values. It would be unreasonable to establish a significance threshold that does not allow for project effects that fall within the range of natural variablity of the constituents in question; doing so would make effects attributed to the project indistinguishable from no-project conditions. Therefore, simulated changes that were less than 10% of either the numerical limit or the measured or simulated mean value of the variable were not considered to be ~~changes~~ identifiable. In other words, these changes ~~are not greater than~~ would be indistinguishable from the minimum range of assumed natural variability and model uncertainty. Based on professional experience, ~~the second (i.e., incremental) significance criterion~~ it was further considered reasonable that distinguishable changes from no-project conditions would be identified as significant when they would result in a variance greater than 10% of the mean or standard condition. This adds 10%, adding up to 20% of the numerical limits for water quality variables with numerical limits or 20% of the mean value for variables without numerical limits.

As discussed in Chapter 4, "Water Quality", of the 2000 REIR/EIS (see Chapter 3C of Volume 1 of this FEIS), the significance criteria for the project's water quality effects exceed the minimum requirements set by CEQA and NEPA in the following ways:

- When regulatory standards exist for a given variable, the significance criteria are more restrictive than the established standards.

- In the case of variables for which no standards exist, the significance criteria encompass the range of natural variability, measurement errors, and modeling uncertainty.

Assumptions Used in Establishing the Significance Thresholds

Natural Variability

Several comments challenged the inclusion of natural variability as a factor in the determination of impact significance.

As described in Chapter 3C of the 1995 DEIR/EIS and Chapter 4 of the 2000 REIR/EIS (see Chapter 3C of FEIS Volume I), natural variability caused by tidal flows, agricultural drainage, and biological processes in the Delta channels is sometimes quite large relative to the numerical standards or mean values of water quality variables. The significance threshold described above was based on the assumption that natural variability is *at least 10%*. As noted in Comment R8-26 from Contra Costa Water District (CCWD), natural variability in the Delta may range substantially higher than 10%; CCWD states that "all water quality parameters presented in [Chapter 4 of the 2000

REIR/EIS] have a 'natural variability' of at least 50%". The fact that levels of water quality parameters may vary widely, however, does not preclude the consideration of some range of natural variability in the significance threshold.

Confidence Intervals for Monthly Modeling

The impact assessment uses quantitative modeling to evaluate potential project impacts. An analytical tool such as the Delta Standards, Operations, and Quality model (DeltaSOQ) is inherently imprecise, and a level of uncertainty should be considered when the results of the model are reviewed. The level of uncertainty for DeltaSOQ was assumed to be at least 10%. Several commenters on the 1995 DEIR/EIS and 2000 REIR/EIS did not agree with the determination of modeling uncertainty or found it unacceptable. Some commenters note that the modeling uncertainty is likely higher than reported in the NEPA and CEQA documentation for the project (see, for example, Comment B7-14). Other commenters note that during project operations, the use of real-time field data and more precise computer modeling results should result in baseline confidence intervals of ±5%.

The purpose of the monthly DeltaSOQ modeling is to determine when differences between no-project and with-project conditions would occur and to estimate the relative magnitude of those differences. There are many unpredictable processes and events that may affect water quality in the Delta and cannot be simulated with available impact assessment models. Examples of such factors, which would influence conditions under both the No-Project Alternative and the project alternatives, include the following:

- occasional slugs of relatively high-salinity San Joaquin River inflows,
- intensive agricultural salt leaching following periods of drought, and
- increases in dissolved organic carbon (DOC) concentrations in storm runoff.

In impact assessment modeling, however, these processes would influence the precision of the model results in the simulations of both the no-project condition and with-project conditions. Therefore, the simulated change between the no-project and with-project conditions is still valid for impact assessment purposes.

Although unpredictable conditions are not simulated in the monthly modeling, they would be considered in actual project operations because they would be detected through real-time monitoring. Delta Wetlands would be required to conduct such monitoring to demonstrate compliance with terms and conditions for project operations; this issue is discussed further in the next section.

The Distinction Between Significance Criteria and Mitigation Requirements

It should be noted that there is a distinction between significance criteria and the mitigation requirements for the project's water quality effects. The water quality significance criteria are used to develop mitigation measures on a monthly time step for evaluation based on the results of the monthly model. The actual implementation of the mitigation measure would require adjustment of the project's operations each day in response to daily monitoring of actual Delta conditions and the quality of water stored on the Delta Wetlands islands. The mitigation performance requirements used to trigger changes in project operations under the terms and conditions of the water right permit differ from the significance criteria. For example, the averaging period used for triggering mitigation has been adjusted to best match applicable standards or conditions (e.g., daily, 14-day averages, monthly, quarterly, annually, or long-term).

The significance criteria used in the NEPA and CEQA analysis are applied to *monthly* project operations. The Delta Wetlands Project generally would divert water for about 1 month each year and discharge for about 2 months each year. If the project were allowed a maximum monthly increase in variables of concern in exported water equal to 20% of the applicable objective or mean value in each of these 3 months, the overall change in the annual average export water quality would be only one-fourth (i.e., 3/12) of the maximum allowed monthly change, or less than 5% of the applicable objective or mean value annually.

Additionally, as shown in the evaluations of project impacts on water quality presented in the 1995 DEIR/EIS and the 2000 REIR/EIS, changes in water quality (salinity and DOC) under project operations may be higher or lower in any given month than concentrations under no-project conditions. Therefore, the net effects of the project on annual water quality may be less than the reported monthly increases.

Impact Conclusions

Some commenters request that the significance criteria be adjusted to identify *any* change in water quality parameters from no-project conditions as significant. In recognition that there is uncertainty in the modeling of project effects, these commenters suggest that the significance criterion be set at 5%. However, there is no evidence to suggest that any change in water quality that is *detectable* (i.e., greater than the modeling uncertainty) constitutes a significant water quality impact.

Changing the thresholds of significance as suggested by commenters would not change the significance findings for most of the project effects evaluated in the NEPA and CEQA analysis. Increases in export DOC, treatment plant THMs, and salinity are already identified as significant impacts in the impact analysis.

Mitigation Requirements in the Delta Wetlands Project Water Quality Management Plan

The Delta Wetlands Project Water Quality Management Plan (WQMP) negotiated by Delta Wetlands and California Urban Water Agencies (CUWA) clearly defines specific mitigation requirements for water quality variables, as well as a comprehensive approach to modeling, monitoring, and implementing mitigation measures. Monitoring and mitigation are to be based on both short-term (14-day) and long-term (3-year) project effects. For example, the WQMP requires that Delta Wetlands implement additional mitigation of long-term water quality impacts if project operations cause more than a 5% net increase in total organic carbon (TOC), total dissolved solids (TDS), bromide, and chloride in water diverted from the Delta for urban uses, averaged over 3 years.

These operating rules are described further in Master Response 7, "Analysis of Delta Wetlands Project Effects on Disinfection Byproducts", and in the WQMP, which is included in the Delta Wetlands–CUWA agreement in the Appendix to the Responses to Comments. The SWRCB included most of the terms and conditions specified in the WQMP into Delta Wetlands' water right permits.

MASTER RESPONSE 7. ANALYSIS OF EFFECTS OF THE DELTA WETLANDS PROJECT ON DISINFECTION BYPRODUCTS

Summary of Issues

The lead agencies received several comments on the 1995 DEIR/EIS and 2000 REIR/EIS about the methodology used to evaluate the potential effects of the Delta Wetlands Project on DBPs, including THMs and bromate. The comments focused on:

- appropriate methods of estimating DBP formation at water treatment plants,
- incorporation of the revised EPA rules adopted since publication of the 1995 DEIR/EIS, and
- economic effects of increased water treatment costs.

These comments are discussed below.

Additionally, the Delta Wetlands Project WQMP negotiated by Delta Wetlands and CUWA in October 2000 includes rules governing project operations to minimize or avoid project effects on DBPs, including THM and bromate. Inclusion of the operating parameters and DBP prediction methods described in the WQMP addresses the concerns expressed in comments on the 1995 DEIR/EIS and 2000 REIR/EIS. These operating parameters are summarized below. The full text

of the WQMP is provided in the Delta Wetlands–CUWA agreement in the Appendix to the Responses to Comments.

Results of the 1995 DEIR/EIS and 2000 REIR/EIS Analyses

One of the major variables assessed in Chapter 3C, "Water Quality", of the 1995 DEIR/EIS is DOC, the major THM precursor in water treated by chlorination for municipal use.

Project effects on DOC and THMs were reconsidered in the 2000 REIR/EIS. Chapter 4 of the 2000 REIR/EIS (see Chapter 3C of FEIS Volume I) and Appendix G of the 2000 REIR/EIS described the methods and assumptions used in the updated analysis. The 2000 REIR/EIS considered:

- the range of DOC loading estimates that were presented in the 1995 DEIR/EIS,
- new data on Delta water quality collected since the 1995 DEIR/EIS was released, and
- the range of DOC loading estimates calculated from the results of laboratory experiments using flooded peat soil and the estimates presented by expert witnesses in testimony at the SWRCB water right hearing in 1997.

Because of the substantial disagreement among experts about the appropriate levels of DOC loading to use in estimates of Delta Wetlands Project effects, the analysis in Chapter 4 evaluated effects for a wide range of DOC loading estimates. The range encompassed the loading rates observed in Delta agricultural drainage and in field and laboratory studies of DOC loading from peat soil on Delta islands.

As reported in the 1995 DEIR/EIS, the evaluation found project impacts on DOC and THMs to be significant. The same mitigation measures that were recommended in the 1995 DEIR/EIS were recommended in the 2000 REIR/EIS to reduce these impacts to a less-than-significant level. This mitigation is designed to accommodate the uncertainty about the loading of DOC from the project islands; it consists of reducing and/or delaying project discharges to minimize effects on concentrations of export DOC and bromide and resulting effects on THM formation at treatment plants. Thus, the mitigation is designed to be effective regardless of the actual increases in bromide and DOC concentrations observed under project implementation.

Chapter 4 of the 2000 REIR/EIS (see Chapter 3C of FEIS Volume I) described how the proposed mitigation of DOC increases would be implemented to control Delta Wetlands Project effects on export DOC concentrations under extreme (worst-case) DOC loading conditions. It also discussed how the mitigation would be adjusted to meet any mitigation requirement specified in water right permit terms for the project.

The WQMP uses a similar method for mitigating project impacts on TOC. See "Delta Wetlands Project Water Quality Management Plan" below.

Disinfection Byproduct Prediction Methods

Commenters on the 1995 DEIR/EIS and 2000 REIR/EIS and parties to the water right hearing disputed the accuracy of the methods for determining the formation of DBPs, including THMs, as a function of export salinity (bromide) and DOC concentration. They suggested that project effects could be estimated more accurately by using revised methods for predicting the relationship between levels of DOC and salinity and the formation of THMs and other DBPs at municipal water treatment plants. Appendix G of the 2000 REIR/EIS describes the updated methods recommended by commenters on the 1995 DEIR/EIS. The accuracy of these methods remains an area of controversy.

Trihalomethane Calculations

Commenters on the 1995 DEIR/EIS requested that the method used to predict THM formation be revised based on a new equation developed by Malcolm Pirnie. Appendix G of the 2000 REIR/EIS compared the revised THM equation with the original THM equation; see "Calculations Using the Malcolm Pirnie Equation". The new equation is more sensitive to a change in bromide, but less sensitive to a change in DOC.

As discussed in Appendix G, the new Malcolm Pirnie equation was simplified for use in the 2000 REIR/EIS impact analysis. Several commenters on the 2000 REIR/EIS disagreed with the simplification of the equation. The simplification addressed two difficulties encountered in the use of the new equation for the impact analysis.

Applying the new equation to the available data of actual treatment plant (Penitencia Treatment Plant) operations provided by CUWA to the lead agencies showed that under the operating conditions documented by CUWA, the treatment would have violated the THM standard; however, in actual practice, treatment plant operators do not allow the standard to be violated. It must be assumed for purposes of the impact assessment that under no-project conditions, treatment would not result in exceedances of the standard.

Furthermore, the new equation contains several variables of treatment plant operating conditions, such as temperature, pH, treatment time, and ultraviolet absorbance (UVA), that cannot be predicted in the analysis and must be assumed for impact assessment purposes to be held constant. The equation was therefore simplified to represent the relationship between THM and those equation terms that are independent of decisions by treatment plant operators (levels of export chloride and DOC) and to recognize that the existing standard would be met under no-project conditions. It is important to note that this modification did not change the sensitivity of the relationships between THM and DOC or THM and bromide found in the new Malcolm Pirnie equation.

The impact analysis evaluates changes between no-project and with-project conditions; using this simplified equation allowed for a more meaningful evaluation of whether project impacts would increase THM concentrations to within 90% of the standard because it allowed with-project conditions to be compared to no-project conditions that meet the standard.

The THM concentrations estimated with either the old or the new Malcolm Pirnie equation are much more sensitive to the operational parameters of treatment plants than to the small expected changes in DOC or bromide caused by Delta Wetlands operations. Nevertheless, the impact analyses in both the 1995 DEIR/EIS and 2000 REIR/EIS conclude that increases in THM concentrations resulting from proposed project operations are a significant impact and that mitigation would be required.

The WQMP includes a recommended method for monitoring DOC and salinity (bromide) and predicting THM formation using the new Malcolm Pirnie equation (see "Delta Wetlands Project Water Quality Management Plan" below).

Bromate Formation

Commenters on the 2000 REIR/EIS also questioned why the analysis of project effects did not include a quantitative analysis of potential impacts of the proposed project on bromate formation. Appendix G of the 2000 REIR/EIS includes an evaluation of the Ozekin equation, a quantitative method used to predict bromate formation at water treatment plants. An evaluation of the bromate formation data indicated that the Ozekin equation overpredicts bromate formation.

Delta Wetlands Project operations would not directly result in bromate formation. Project operations could affect DOC and salinity, which are believed to contribute to bromate formation at water treatment plants. As described above for THM, bromate concentrations estimated with the Ozekin equation are much more sensitive to the operational parameters of treatment plants than to the small expected changes in DOC or bromide caused by Delta Wetlands operations. Additionally, changes in DOC and salinity caused by the project would result in more dramatic changes in the formation of THM predicted using the simplified new Malcolm Pirnie equation than the change in bromate predicted using the Ozekin equation. Therefore, mitigation measures implemented to reduce or avoid project effects on THM would be more stringent than mitigation measures used to reduce predicted bromate formation. Although the analysis in the 2000 REIR/EIS recognizes that formation of bromate at the water treatment plants is a potential effect of the project, the evaluation of potential project effects on THM concentrations is comprehensive enough to address commenters' concerns about DBPs in general.

The WQMP includes a recommended method for monitoring DOC and salinity (bromide) and predicting bromate formation using a modified Ozekin equation (see "Delta Wetlands Project Water Quality Management Plan" below).

Haloacetic Acid Formation

Formation of haloacetic acids is a function of the bromide and DOC concentration but is strongly dependent on the treatment process employed. Also, there is no available model for estimating the formation of haloacetic acids. The 1995 DEIR/EIS and 2000 REIR/EIS analyses therefore focused on changes in bromide and DOC concentrations as the most important indicators of potential project effects on treated drinking water supplies.

U.S. Environmental Protection Agency Rules for Disinfection Byproducts

Commenters stated that the NEPA and CEQA analysis should acknowledge revisions to drinking water standards for DBPs that have been adopted or proposed by EPA since the 1995 DEIR/EIS was published.

The section in Chapter 4 of the 2000 REIR/EIS entitled "Changes in Disinfection Byproduct Rules" (see page 3C-64 of Chapter 3C in FEIS Volume I) described new or revised standards that have been adopted or proposed regarding DBPs in treated drinking water since the 1995 DEIR/EIS was released. EPA's maximum contaminant level (MCL) for THM concentrations in drinking water has been revised from 100 to 80 micrograms per liter (Fg/l). Because THM concentrations vary seasonally, the THM standard is applied to a moving annual average based on quarterly or monthly samples at the treatment plants.

The new rules ("Stage 1" rules) also require drinking water utilities to remove TOC from influent before treatment. These changes in DBP rules have led to increased costs for water treatment plant operations. In response to these changes, the significance threshold for THM effects was modified in the 2000 REIR/EIS impact assessment to reflect the more stringent (Stage 1) rules for DBPs that EPA adopted after the 1995 DEIR/EIS was released.

EPA has also proposed future ("Stage 2") DBP rules. According to CUWA in comments on the 2000 REIR/EIS, the proposed Stage 2 rules, which are expected to go into effect in 2002, would retain the numerical THM standard of 80 Fg/l established in Stage 1; however, the Stage 2 rules may revise the averaging method used to monitor compliance (see Comment Letter R4). CUWA reports that using the newly proposed averaging method results in an equivalent THM standard of 67 Fg/l.

Commenters on the 2000 REIR/EIS acknowledge that future DBP rules (including the Stage 2 rules) are uncertain, but they request that the lead agencies revise the thresholds of significance and mitigation strategies presented in the document to consider a treatment plant operator's ability to comply with future standards and the impact on water treatment costs.

The analysis of Delta Wetlands Project impacts looked at Delta Wetlands' *proportional* contribution to THM formation at treatment plants; the significance thresholds are therefore based on changes in the levels of THM precursors. Adopting more stringent THM standards in the future would change the ability of a water treatment operator to meet the standard under both the baseline,

or no-project, conditions and the with-project conditions. The relative contribution of project operations to THM precursors would remain the same.

In addition, water treatment utilities will be required to adjust the treatment process (e.g., eliminate prechlorination) to meet future standards that are more stringent. These adjustments would reduce THM concentrations under both no-project and with-project conditions.

Lastly, it is not appropriate for the lead agencies to speculate on potential future standards for drinking water. As exemplified by CUWA's comments on the description of potential Stage 2 rules provided in the 2000 REIR/EIS, changes to standards to regulate DBPs—including THMs—are still being considered; the proposed standards are likely to change before being adopted by EPA.

The Delta Wetlands WQMP includes operational screening criteria that are based on existing state and federal standards for DBPs and their precursors. The WQMP states, "Should drinking water DBPs, contaminants or precursors, or any other drinking water contaminants be further regulated under state or federal law, the [water quality management and action board] shall recommend that the SWRCB amend the screening criteria to ensure that the intent of the [WQMP] drinking water quality protection principles continues to be met". Therefore, changes in future DBP rules would be used to modify the operational constraints on the project under the WQMP.

Economic Impacts

Some commenters on the 1995 DEIR/EIS and 2000 REIR/EIS and parties to the water right hearing have argued that economic effects on treatment plant operators (i.e., increases in treatment costs) that could result from project-related increases in salinity and DOC concentrations should be considered significant impacts. They request that the significance criteria for evaluating project effects on TOC be adjusted to account for increased treatment plant costs associated with TOC removal requirements and higher disinfectant doses.

The issue of addressing changes in treatment plant costs was discussed in the section on impact significance criteria in Chapter 4 of the 2000 REIR/EIS, and in that chapter's evaluation of project effects on THM formation (see Chapter 3C in FEIS Volume 1). As discussed in these sections, the State CEQA Guidelines state that economic changes resulting from a project shall not be treated as significant effects on the environment except when the economic changes lead to environmental impacts. Similarly, NEPA requires discussion of economic effects only to the extent that they are interrelated with environmental impacts. CEQA and NEPA do not require a significance determination of the economic impacts on treatment plant operators. Therefore, although this discussion acknowledges that the Delta Wetlands Project may have an effect on the water treatment costs for downstream water users, the economic effect alone is not treated as a significant environmental effect and does not require separate mitigation.

The State CEQA Guidelines also state that lead agencies may consider economic changes when they determine that a physical change is considered significant. Even without considering

economic effects, the environmental impact of the Delta Wetlands Project on water quality degradation is deemed significant, and mitigation has been proposed. Therefore, no changes to the significance criteria are needed. See also Master Response 6, "Significance Criteria Used for the Water Quality Impact Analysis".

Delta Wetlands Project Water Quality Management Plan

In October 2000, Delta Wetlands submitted a WQMP to the SWRCB that further addresses the potential effects of project operations on DOC and salinity concentrations at the export pumps and CCWD diversions. The WQMP was included in a protest dismissal agreement with CCWD and in an agreement to resolve certain permit issues with CUWA; the full text of the agreements is provided in the Appendix to the Responses to Comments. These agreements address these parties' concerns about the potential effects of the project on water quality parameters, including salinity, DOC, and THMs.

By entering into the agreements, Delta Wetlands has committed to following an adaptive management approach that includes the following:

- an annual plan;
- monitoring water quality parameters, including salinity and DOC concentrations; and
- implementing operational controls if Delta Wetlands Project operations result in significant effects, including causing unacceptable increases in THM precursors at any water treatment plant.

Specific operating rules related to project effects on DOC, DBPs, and salinity are described below.

Total Organic Carbon

The WQMP requires monitoring of project-related TOC loading that could cause an increase in water treatment costs. The WQMP states that the operational screening criteria for TOC, calculated as a 14-day average or the average for the duration of the discharge (whichever time period is shorter), are triggered when project operations would cause:

- an increase in TOC of more than 1.0 mg/l at the urban intakes; or
- TOC concentrations at the urban intakes to exceed 4.0 mg/L (±0.2 mg/l); and
- TOC concentrations at a water treatment plant to exceed 4.0 mg/L (±0.2 mg/l).

If project operations were predicted to exceed these criteria, Delta Wetlands would modify operations (e.g., reduce or reschedule discharges) as necessary to reduce project impacts on TOC. The WQMP also requires that Delta Wetlands implement additional mitigation of long-term

water quality impacts if project operations cause more than a 5% net increase in TOC concentration in water diverted from the Delta for urban uses, averaged over 3 years.

Formation of Disinfection Byproducts

The Delta Wetlands WQMP includes screening criteria intended to prevent project-related DBP precursor loading that may affect the health of water users or contribute to a violation of a health regulation by a water treatment plant. As described above for TOC, Delta Wetlands would be required to modify project operations if it caused or contributed to the following conditions, calculated as a 14-day average or the average for duration of the discharge (whichever time period is shorter):

- # modeled total THM (TTHM) concentrations in drinking water in excess of 64 Fg/l (±3.2 Fg/l), as calculated in the raw water of an urban intake in the Delta;

- # modeled bromate concentrations in drinking water in excess of 8 Fg/l (±0.4 Fg/l), as calculated in the raw water of an urban intake in the Delta;

- # predicted TTHM concentrations in drinking water in excess of 64 Fg/l (±3.2 Fg/l), as calculated from measurements at the outlet of a water treatment plant; or

- # predicted bromate concentrations in drinking water in excess of 8 Fg/l (±0.4 Fg/l), as calculated from measurements at the outlet of a water treatment plant.

The WQMP outlines the initial assumptions that would be used to model TTHM and bromate. The revised Malcolm Pirnie model and a modified Ozekin equation model are used as the basis for predicting changes in TTHM and bromate concentrations; see Attachment 3 to the WQMP for more details.

Salinity

The Delta Wetlands WQMP includes screening criteria intended to minimize salinity impacts associated with project discharges. As described above for TOC, Delta Wetlands would be required to modify project operations when project operations cause the following conditions, calculated as a 14-day average or the average for duration of the discharge (whichever time period is shorter):

- # an increase in salinity of more than 10 mg/l chloride at one or more of the urban intakes, or

- # a salinity increase at the urban intakes in the Delta that exceeds 90% of an adopted salinity standard.

The protest dismissal agreement between Delta Wetlands and CCWD includes additional restrictions on project operations related to salinity impacts, including restrictions on Delta Wetlands diversions as a function of X2 location.

The WQMP also requires that Delta Wetlands implement additional mitigation for long-term water quality impacts if project operations cause more than a 5% net increase in TDS, bromide, and chloride in water diverted from the Delta for urban uses, averaged over 3 years.

Relationship between the Delta Wetlands Water Quality Management Plan and Mitigation Proposed in the NEPA and CEQA Analysis

The terms of the WQMP add specificity to the mitigation proposed in the 1995 DEIR/EIS and 2000 REIR/EIS analyses; therefore, they provide a greater level of protection than Mitigation Measures C-4 (export salinity), C-5 (export DOC), and C-6 (THMs in treated drinking water). Many of the comments on the water quality impact analysis have been resolved through adoption of Delta Wetlands' agreements with CUWA and CCWD. The SWRCB included the terms of these agreements as replacement mitigation for Mitigation Measures C-4, C-5, and C-6 in the terms and conditions of the Delta Wetlands water right permit.

MASTER RESPONSE 8. LEVEE STABILITY ANALYSIS AND WORST-CASE CONDITIONS

Several commenters on the 2000 REIR/EIS noted that the levee stability analysis presented in Appendix H, "Levee Stability and Seepage Technical Report", does not assess the most severe levee and soil conditions that may be encountered on the reservoir islands. Commenters stated that "a levee system is only as good as its weakest link" and that, therefore, the levee analysis should address the most extreme or worst-case conditions. The elements of the long-term levee stability analysis questioned by commenters include:

- existing levee geometry, specifically water-side slopes;
- soil conditions, including soil strength and permeability and potential for liquefaction;
- water level in the adjacent slough under flood stage; and
- the magnitude of the design earthquake.

This master response addresses questions about the levee stability analysis presented in the 2000 REIR/EIS and describes the conservative assumptions used in the analysis. The response also provides information about CEQA and NEPA requirements for analysis of environmental impacts.

CEQA and NEPA Requirements for Analysis of Worst-Case Conditions

CEQA and NEPA require an agency to use its best efforts to analyze and disclose the potential environmental effects of a proposed project; an exhaustive treatment of issues is not required as part of the CEQA-NEPA analysis. CEQA states that an EIR should discuss the significant effects on the environment with "emphasis in proportion to their severity and probability of occurrence". (State CEQA Guidelines Section 15143.) CEQA requires that lead agencies make a good-faith effort to fully disclose the project's foreseeable environmental effects; however, lead agencies are not required to speculate on unlikely effects. The lead agency is not required to perform a "worst-case" analysis if, after thorough investigation, it determines that an evaluation of certain environmental effects would be too remote and speculative. In these instances, the EIR must only note that the analysis is not reasonable within the agency's good-faith effort at full disclosure. (State CEQA Guidelines Sections 15144, 15145.) Throughout the 1995 DEIR/EIS and 2000 REIR/EIS, the lead agencies make a good-faith effort to fully disclose the foreseeable environmental effects of the Delta Wetlands Project. The recommended mitigation measures were designed both to address the effects that could occur under the project's most likely scenario and to ensure environmental protection under extreme conditions.

In 1996, the NEPA regulations were revised to remove the requirement of a "worst-case"analysis because the requirement often resulted in expensive and unreasonable technical studies and analyses. NEPA currently contains a provision that refers to unforeseeable effects as "incomplete or unavailable information". Environmental effects must be studied and discussed in an EIS only when the cost of the analysis is not "exorbitant". If the information is not available at an appropriate cost, the EIS must disclose that the information is unavailable and indicate how the subject for which information is unavailable relates to the assessment of reasonably foreseeable environmental effects. (40 CFR 1502.22.)

Levee-Stability Analysis Presented in the 2000 REIR/EIS

The levee-stability analysis presented in the 2000 REIR/EIS considered both the dynamic and static stability of the proposed levee improvements by using four cross sections, two for each of the reservoir islands. The cross sections were selected to be reasonably representative of conditions that would be encountered on the reservoir islands and to allow for conservative estimates for stability issues; however, these cross sections would not reflect the worst-case scenario. For this reason, the results of the analyses can be considered representative of stability conditions in most parts of the subject levees, but not representative of the worst-case conditions.

The purpose of the levee stability analysis is to:

- evaluate Delta Wetlands' proposed levee design,
- determine whether there is a potential for a fatal design flaw, and
- evaluate the project's environmental impacts.

The levee stability analyses were designed to conservatively model conditions that exemplify most of the extent of the levees. The extremes (i.e., worst-case conditions) are expected to represent only a small percentage (less than 10%) of the extent of the levees. Because these critical cases are expected to represent a small percentage of the reservoir islands' levees, they are not expected to have significant engineering, environmental, or financial impacts, and they can be addressed during the final design phase of the project (see "Role of Final Design" below).

Although they do not make up a worst-case analysis, the levee stability analyses conducted for the 2000 REIR/EIS are conservative. A conservative slope stability analysis is one that uses estimates of the various parameters affecting stability that are expected to yield factors of safety (FSs) on the low (i.e., conservative) side of the most probable value. These parameters include the geometry and stratigraphy of the levee sections analyzed; the shear strengths of various soil layers; the water tables in the slough and in the reservoir island; and the earthquake loads for dynamic stability. Responses to specific questions about some of these parameters and the assumptions that went into the levee stability analysis are provided below.

Existing Water-Side Slopes

Commenters indicated that, based on their experience, the existing conditions for the water-side slopes do not represent worst-case conditions. The cross sections used in the analysis were selected to be representative of typical conditions for the reservoir islands. The steepest channel-side slopes analyzed were about 2.2H:1V (horizontal:vertical). In some places, primarily on the outside banks of curved channel reaches, existing channel-side levee slopes are steeper than 2.2:1; however, gentler slopes are also present in some places. A slope of 2.2:1 is a representative average of observed channel-side levee slopes.

Soil Strength Parameters

Soil shear strength parameters used in the levee stability analyses were derived from a combination of sources. These include:

- strength tests on soils in the area conducted by Harding Lawson Associates (HLA);
- published correlations between the index properties of soils (e.g., water content, density, grain size, plasticity), their resistance to penetration by drilling, and their shear strength; and
- published and unpublished results of various laboratory tests.

Shear strength parameters for sandy soils were based on a combination of published experimental data on the relationship between shear strength and penetration resistance (based on field measurements), professional judgment, and experience with similar materials.

Shear strength parameters for peat were estimated using:

- the results of HLA's strength tests on peat in the area;
- published data on similar materials; and
- unpublished research data from the University of California, Davis.

Each of the sources cited above provides a range of shear strength values. The geotechnical engineers who performed the levee stability analyses chose drained and undrained (saturated) shear strength values conservatively. In other words, shear strength values used in the analysis were selected at the low end of the range of values provided in the sources listed above. Section 3.3.4 of Appendix H provides a description of the soil parameters used in the levee stability analysis.

Potential for Liquefaction

Liquefaction refers to the condition in which soils or sediments lose their effective strength and behave much like a liquid. Liquefaction commonly occurs as a result of seismic load, and it occurs only in saturated materials (those that contain groundwater). Several commenters note that Appendix H of the REIR/EIS understates the potential for liquefaction of soils found in the Delta. Additionally, a few commenters point out that there is a potential for shallow deposits of Holocene sand, which may have a high potential for liquefaction.

The commenters are correct that the text of Appendix H understates the potential for liquefaction in the Delta; however, the analysis of dynamic levee stability accurately reflects a high potential for liquefaction in the analyzed soils. The review of the borings drilled in the proposed reservoir islands indicates that the upper 5–10 feet of the shallow sand alluvium are loose and saturated. Therefore, the potential for liquefaction is high. Should there be a severe earthquake in the region, liquefaction-induced damage to the Delta levees could be substantial under both the no-project and with-project condition.

The residual strength of the upper sand alluvium after liquefaction was incorporated into the dynamic levee stability model (see Appendix H of the 2000 REIR/EIS). A soft/loose foundation layer under the levees was used in the model to represent both the peat and the loose sands that are subject to liquefaction. The deeper portion of the sand alluvium is described as dense to very dense and hence not susceptible to liquefaction. These foundation conditions are the same under the baseline (no project) and proposed project.

The description of levee foundation materials used in the stability analyses was based on a review of the borings drilled in the proposed reservoir islands. No deposits of Holocene soil were located in the cross sections analyzed. During final design, site-specific subsurface testing would be conducted (see "Role of Final Design" below).

Water Table Elevations

As stated in Appendix H of the 2000 REIR/EIS, reservoir island and slough-side water levels were selected to produce critical cases. For the analysis of the existing condition of the slope toward the island, the water level in the slough was assumed to be at a flood elevation level of +6 feet. Several commenters state that the maximum peak flood elevation of +7.2 feet should have been used instead. As noted in Appendix H, the flood stage condition of +7.2 feet is a short-term condition. Gage recordings and historical data confirm that the maximum peak flood occurs for a short period of time (i.e., hours). The 7.2-foot flood-stage condition does not last long enough to establish the subsurface conditions that affect levee stability in the long term. Therefore, the 7.2-foot flood-stage condition does not represent the steady-state condition. The flood-stage level of 6.0 feet was used in the levee stability analyses to avoid the compounding of conservative assumptions that result in an unrealistically conservative level of evaluation.

Design Earthquake

The design earthquake used in the seismic evaluation of the reservoir levees is appropriate for the NEPA and CEQA analysis. The ground motions at the project site for the earthquake event with a 10% probability of exceedance in 50 years is also the maximum credible earthquake on the Midland Thrust fault, which is the controlling fault for the project islands. The ground motions used for the project are similar to the ground motions considered in the evaluation of the seismic vulnerability of the Delta levees conducted by the CALFED Levees and Channels Technical Team, Seismic Vulnerability Sub-Team (CALFED Bay-Delta Program 1999b).

Recommended Mitigation Measures to Improve Levee Stability

The mitigation measure on page 6-21 in Chapter 6 of the 2000 REIR/EIS (page 3D-4O of FEIS Volume 1) requires that Delta Wetlands adopt a final levee design that achieves a recommended FS of 1.3 and reduces the risk of levee failure on the water-side slopes. The recommended minimum FS of 1.3 is consistent with DWR's recommendations under Bulletin 192-82 for rehabilitation of nonproject levees in the Delta; this standard is more conservative than USACE's standard for nonfederal Delta levees of 1.25. This mitigation measure was designed to address the reduction in FS that could occur under either typical or extreme levee and soil conditions. Therefore, the NEPA and CEQA analysis addresses the "worst-case" condition by requiring Delta Wetlands to design levees that meet the recommended minimum FS, regardless of existing levee conditions.

Additionally, the lead agencies recognize that if water is stored above +4 feet elevation on the reservoir islands, Delta Wetlands will need to propose final levee designs that meet the design criteria of DWR's Division of Safety of Dams (DSOD). The DSOD criteria for design and construction would be more conservative than the minimum standard recommended in the mitigation measure.

Role of Final Design

The level of project detail presented in the 2000 REIR/EIS is appropriate for purposes of CEQA and NEPA impact analysis and for determining the general feasibility of Delta Wetlands' proposal for levee stability and seepage control. However, the detailed aspects of the Delta Wetlands Project's levee design would be worked out as a part of the final design phase of the project. Further analyses are typically carried out as a part of the final design phase, and are much more detailed than the preliminary analyses required for the NEPA and CEQA evaluation.

During the detailed design phase, Delta Wetlands plans to implement an extensive and detailed subsurface exploration program along the reservoir island levees, followed by further site-specific stability analyses. These detailed studies will identify extreme soil and levee conditions and will aid in the development of detailed site-specific designs, including designs for steepness of slope and overall geometry, to ensure levee stability.

Delta Wetlands presented more information about its plans for a final design (see Exhibit DW-95 [Tillis testimony 2000]). The steps for final design described by Delta Wetlands include the following:

- Characterize levee materials.
- Identify locations for onsite borrow pits.
- Complete detailed surveys to determine existing geometry.
- Collect data on local wind conditions and currents.
- Evaluate the level of ground motions expected during seismic events.
- Perform analyses of stability and settlement.
- Identify high-seepage areas and consider methods to control high seepage (e.g., cutoff walls).
- Design erosion protection for interior and exterior levee slopes.

The results of these steps would be documented in design reports, construction plans, and technical specifications.

Additionally, the water right protest dismissal agreement between Delta Wetlands and East Bay Municipal Utility District (EBMUD) establishes a Design Review Board. The duties of the Design Review Board include reviewing plans and specifications for levee designs, reviewing construction monitoring results, and confirming that the project design and implementation meets the design objectives. The full text of the Delta Wetlands–EBMUD protest dismissal agreement is provided in the appendix to this volume of the FEIS.