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July 28, 2014

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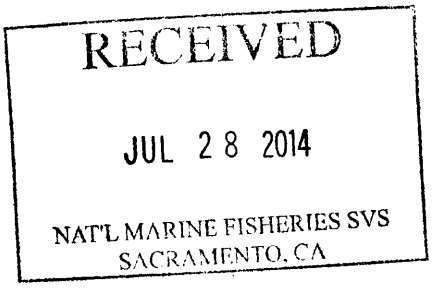

Ryan Wulff
National Marine Fisheries Service (NMFS)
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

VIA U.S. MAIL

The Honorable John Laird, Secretary
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, California 95814

The Honorable Sally Jewell, Secretary
U.S. Department of the Interior
1849 C Street, NW
Washington, DC 20240

Re: Sacramento County Comments on the Draft Bay Delta Conservation Plan (BDCP), EIR/EIS, and Implementing Agreement

Dear Secretaries Jewell and Laird, and Mr. Wulff:

The County of Sacramento and the Sacramento County Water Agency (hereinafter collectively referred to as "County" or "Sacramento County") provides the attached detailed comments and accompanying documentation on the public review draft of the Bay Delta Conservation Plan (BDCP) and associated draft environmental impact report/environmental impact statement (DEIR/EIS), as released on December 13, 2013.

The County's comments are representative of a holistic review of the massive volume of BDCP-related materials. It has become abundantly clear over the course of the eight-year BDCP planning process that future implementation of the Plan's proposed Conservation Measures (CMs) will irreversibly alter and, in many cases, permanently destroy the generation-old socioeconomic fabric and physical landscape of the Delta. As a result, the County has devoted countless hours of subject matter staff and legal counsel (both at significant cost) to the review of the draft documents and preparation of written comments. These comments focus on a wide range of near- and long-term water operations, flood control, water supply, land use, agricultural sustainability, socioeconomic effects, and governance issues and impacts.

As you know, based on comments prepared in response to previously released "administrative draft" environmental documents (i.e., in 2012 and 2013), Sacramento County repeatedly has expressed concern about the BDCP in general, and more specifically on the Plan's most invasive and impactful Conservation Measure (CM), CM-1 (Water Facilities and Operation).

Under the preferred alternative (Alternative #4), CM-1 will include three (3) 3,000 cfs, water intakes, pumping stations, forebay, isolated conveyance facilities, and thousands of acres of habitat restoration. It is both poor public policy and an unacceptable outcome for the State and federal governments to pursue a water operations project/habitat conservation plan of this scale when it will result in close to 50 significant unavoidable impacts and irreversible alteration of the physical, cultural, and socioeconomic landscape of the Delta community.

The County remains staunch in its position that: (1) the BDCP's proposed governance framework, described in Chapter 7 of the draft Plan, unacceptably relegates local governments to the decision-making sidelines, (2) the BDCP will not produce additional water for an ecosystem that is obviously dependent on a permanent and high quality source of water, nor will it aid in the recovery of Federal and State listed aquatic and terrestrial species, (3) the draft BDCP is based on flawed hydrologic modeling, and erroneous and biased scientific analysis, and (4) residents and communities of Sacramento County will bear a disproportionate burden of the impacts that will result from implementation of the Plan's CMs, that, in turn, will disproportionally serve/benefit agricultural and urban water users south of the Delta.

Notwithstanding the County's concerns about the Plan and the process the project proponents have undertaken in pursuing it, Sacramento County, along with its Delta Counties Coalition (DCC) partner counties (Contra Costa, San Joaquin, Solano and Yolo), will continue to advocate for reasonable, collaborative, and solution-based actions and alternatives that will preserve and enhance the Delta's unique and irreplaceable environs, while also addressing the statutory coequal goals mandate. The County remains committed to staying engaged as subsequent draft plans are released for comment and input. Should you have any questions regarding our initial comments, please contact Michael Peterson, Director, Department of Water Resources at (916) 874-8913 or Don Thomas, Senior Planner, Department of Water Resources at (916) 874-5140.

Sincerely,

Jimmie R. Yee, Chairman of the Board
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Board Member, District 4

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Sacramento County Comments on the Draft Bay Delta Conservation Plan (BDCP), EIR/EIS, and Implementing Agreement

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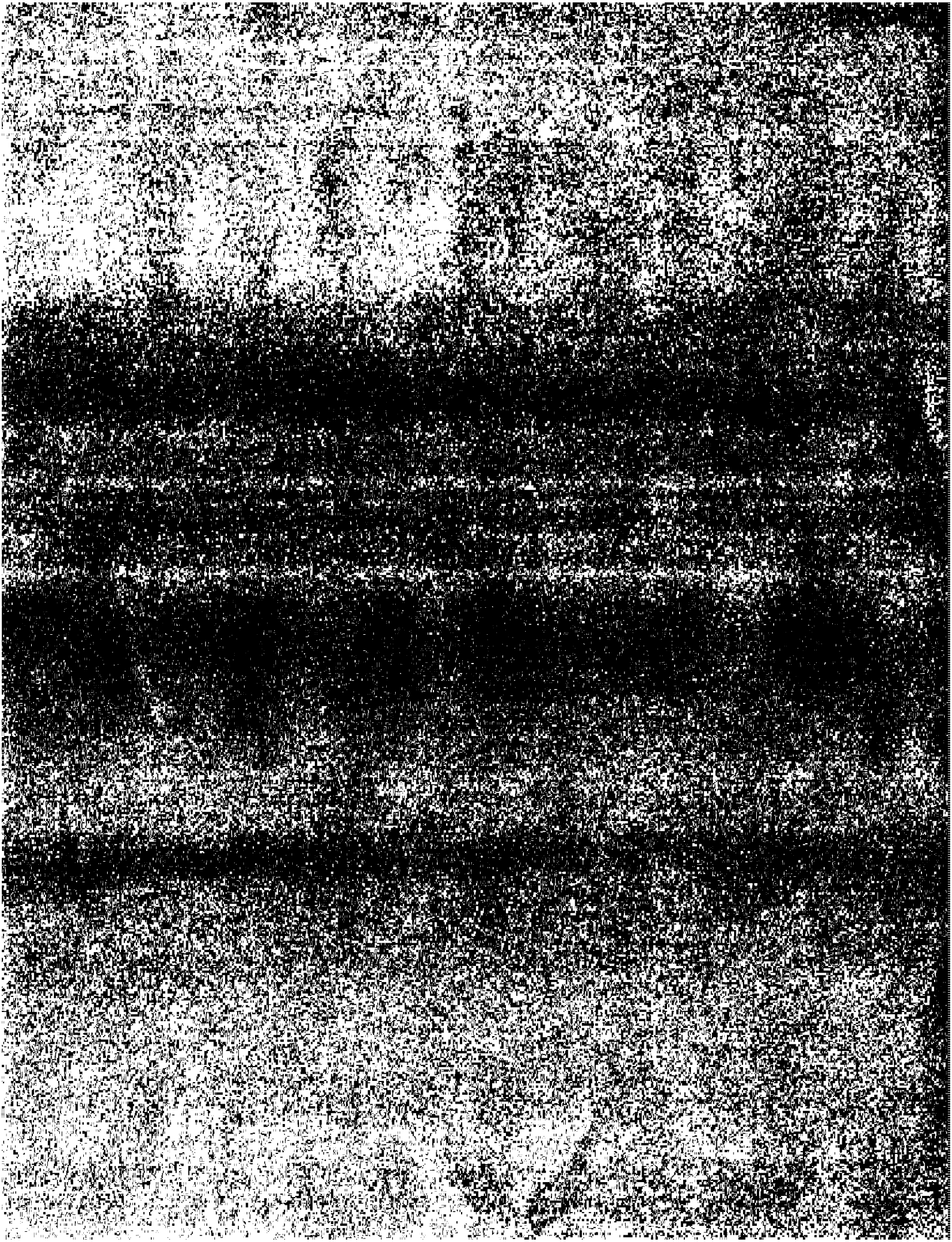

Sacramento County Comments on Draft Bay Delta Conservation Plan, Implementing Agreement and Draft EIR/EIS
July 28, 2014

The County of Sacramento and the Sacramento County Water Agency (hereinafter collectively referred to as "County" or "Sacramento County") provides these comments on the proposed Bay Delta Conservation Plan Public Review Draft of December 2013 (BDCP or Plan) and associated draft environmental impact report/environmental impact statement (DEIR/EIS). For the BDCP and DEIR/EIS we first summarize our major concerns with these documents. We then present our detailed comments on the BDCP, Implementing Agreement and DEIR/EIS. Because the BDCP states that the Plan and supporting documents are incorporated in the DEIR/EIS, our comments on the BDCP should also be considered comments on the DEIR/EIS.

INTRODUCTION

The BDCP intends to be one of the state's largest public works and environmental restoration projects. Sacramento County (County) is ground zero in terms of potential physical, environmental, and socioeconomic impacts of the proposed water infrastructure facilities, identified to be constructed in/near the communities of Freeport and Hood. The proposed BDCP and its water conveyance project, if adopted and constructed, will impact County businesses and residents in a myriad and far-reaching range of ways – some identified in the current BDCP documents and some that may not be apparent for years to come.

All current project and mitigation alternatives proposed by the BDCP process are inconsistent with existing Delta-specific policies and principles adopted by the County Board of Supervisors. Notably, the BDCP and its environmental documents evidence:

- No enforceable assurances or protections for Sacramento County
- Significant negative impacts to the short- and long-term prosperity and economic structure of the communities in the Delta
- Uncertainty for long-term water right holders upstream of the Delta
- Lost agricultural production and resulting lost property tax revenues as prime agricultural land is converted to natural habitat
- Significant impacts to existing infrastructure; for example, roadways and bridges, rail lines, Sacramento International Airport, natural gas wells, groundwater wells, and water lines

To protect Sacramento County, its residents, and its historical institutions, the County takes a careful, detailed, and strong position on its comments to the BDCP and DEIR/EIS. Significant County resources were devoted to the review, evaluation, and preparation of these comments. The County is well aware that improving the health of the Delta ecosystem and maintaining a reliable water supply is extremely critical, of statewide significance, and a statutory mandate. As a result, the County has never opposed finding solutions to address these issues. However, to date the BDCP process and documents have not effectively addressed the County's significant local concerns. Additionally, state and federal principals

have expended little effort in committing to including enforceable assurances and local protections.

At a minimum, any ecosystem restoration and water supply reliability plan for the Delta and areas south of the Delta must:

1. Not redirect unmitigated adverse environmental, economic, or social impacts to Sacramento County;
2. Honor and adhere to water right priorities and area-of-origin protections;
3. Have no adverse effect on the existing and future operations of the Sacramento Regional County Sanitation District facilities or the Freeport Regional Water Project; further, any other adverse impacts of water conveyance facilities routed through Sacramento County must be fully mitigated, with County staff fully involved with the routing and operational issues for such facilities within the County;
4. Protect Sacramento County's governmental prerogatives in the areas of its local land use authority, tax and related revenues, public health and safety, economic development, and agricultural stability;
5. Protect Sacramento County's ability to govern, as an elected body, from usurpation through governance by a non-elected, appointed council, commission or board by including voting membership for elected representatives from Sacramento County;
6. Be consistent with Sacramento County's land use planning, economic development, including agriculture, and the South County Habitat Conservation Plan (HCP);
7. Commit financial resources to maintain and enhance vital transportation, flood control infrastructure, and emergency response resources within those areas of the Sacramento County Delta;
8. Account for the multiple causes of the Delta's decline and not simply focus on one or a limited number.

The current BDCP draft is based on flawed hydrologic modeling and erroneous and biased scientific analysis. Significant errors in the underlying model, from which all effects were analyzed, call into question the analyses and conclusions throughout the entire BDCP and the DEIR/EIS. Indeed, the BDCP hydrologic model reveals that much of the text of the BDCP and DEIR/EIS are contradicted by information in the model, that some effects are understated or ignored completely, and that operations in the model violate the operational rules contained in the BDCP as currently proposed. One cannot help but conclude that the BDCP and the DEIR/EIS are simply a post hoc rationalization for an unsound concept.

Even with a flawed approach and analysis, the DEIR/EIS indicates that the BDCP will result in a lengthy list of significant and unavoidable impacts (at least 48 of them). The residents and communities of Sacramento County will bear a disproportionate burden of these impacts, which will benefit agricultural and urban water users south of the Delta.

Specifically, the proposed water operations (i.e., water intakes, pumps and water conveyance tunnels) will cause long-term and irreversible land use compatibility impacts, along with significant disruption (and likely permanent destruction) of the existing rural and agricultural lifestyle and land use pattern, along with future land uses contemplated under Sacramento County's 2030 General Plan.

As proposed, the BDCP will not produce additional water for an ecosystem that is obviously dependent on a permanent and high quality source of water, nor will it aid in the recovery of endangered aquatic species. Substantial questions have been raised about the BDCP's ability to meet any of the required standards for protecting listed species, and it depends on uncertain and speculative funding sources. As such, it does not meet any of the essential criteria for approval of a Habitat Conservation Plan (HCP) or Natural Communities Conservation Plan (NCCP), and it fails to comply with the Delta Reform Act.

Significantly, the DEIR/EIS fails to adequately address or answer basic questions regarding short- and long-term protection, enhancement, and mitigation for the loss of the many values and resources unique to the Sacramento River Delta (e.g., agriculture, recreational, cultural/tourism, and critical natural habitat). The DEIR/EIS is at times so general and so technical it provides no meaningful information about many of the Project's adverse effects and it omits consideration of many impacts of concern to the County. Despite (and in part due to) its vast length, the DEIR/EIS fails to summarize and convey information essential to the understanding of project impacts in a manner reasonably calculated to inform the readers and decisionmakers, in violation of NEPA's readability requirement and CEQA.

Given these shortfalls (not an all-inclusive list), the BDCP and DEIR/EIS fail to adequately provide the requisite accurate environmental documentation necessary for the local citizenry and public decisionmakers to reach an informed and thoughtful determination as to whether the BDCP will realistically address the statutory "coequal goals" mandate of "providing a reliable water supply for the State while restoring the Delta's ecosystem," without destroying the Delta's existing fragile and valuable socioeconomic and ecosystem framework.

I. COMMENTS ON THE BDCP

As a preliminary matter, developing comprehensive and detailed comments on the BDCP is a difficult task because of the significant and numerous flaws contained in the BDCP itself. The lack of any well-defined operating plan for the proposed north Delta intakes, errors in hydrologic modeling, modeling for an effects analysis that violates the very rules contained in the BDCP itself, and an effects analysis based on this flawed modeling leaves the public in a position of trying to correct the significant flaws in the document and trying to recreate what the true impacts of the project are going to be. In addition, Conservation Measures (CMs) 2 through 22 are discussed only at a programmatic level. While one could take away that the true purpose of this document is simply to get CM-1 built, if the intent of the BDCP is to satisfy the requirements of the Delta Reform Act, fulfill the co-

equal goals, and fulfill the Department of Water Resources' (DWR) public message about the BDCP, the BDCP should do a better job of articulating the specifics of *all* conservation measures in the plan – not only the single conservation measure that provides DWR's contractors with a reliable water supply.

The burden of producing a comprehensible HCP and supporting analysis should not fall on the public. Instead, the BDCP proponents should be required to provide an adequate and comprehensible public draft HCP for public comment. Once the significant flaws in the BDCP are addressed and the BDCP is recirculated for public review and comment, the County, and the rest of the public, will be in a better position to understand the true impacts of the BDCP and, in turn, provide detailed comments to help inform the draft plan and DEIR/EIS.

A. The BDCP Fails to Comply with Federal ESA Requirements

The BDCP fails to meet the requirements of Section 10(a)(2)(B) of the federal Endangered Species Act (ESA). In order to issue an incidental take permit (ITP) under Section 10, an HCP must demonstrate that the proposed taking "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild." (16 U.S.C. § 1539(a)(2)(B)(iv).) In addition, the HCP must assure that there is adequate funding available to implement its terms and conditions, as well as to address any unforeseen circumstances that may arise during the life of the plan.

The BDCP fails to fulfill these requirements. The overwhelming evidence demonstrates the BDCP will *not* adequately protect listed and threatened species and may in fact, reduce the likelihood of their survival and recovery in the wild. Further, the BDCP's "assurances" that funding is and will be available for its implementation are woefully inadequate. Despite the myriad of financial sources discussed in the BDCP, it is clear that the "adequate funding" required by the ESA and its implementing regulations has yet to be secured.

1. The Plan Fails to Meet the Standard for Protecting Listed Species

The California Advisory Committee on Salmon and Steelhead, an expert advisory committee to the California Department of Fish and Wildlife (CDFW), has recommended that the CDFW director deny any incidental take permit for the BDCP under State law because the Project will contribute to the further decline of two fish species protected under both the state and federal Endangered Species Acts: the Sacramento River Winter Run and Spring Run Chinook Salmon. Notably the Committee found: "Because Sacramento River Winter Run and Spring Run Chinook Salmon are already significantly depleted and BDCP will further reduce smolt survival, the Department of Fish and Wildlife cannot make a finding that the BDCP NCCP will lead to recovery of the species." (Letter from Vivian Helliwell, Chairman, to Charlton H. Bonham, February 26, 2014 (Helliwell Letter), Exhibit A.)

Significantly, the Committee further found that "BDCP promotes the unproven scientific hypothesis that habitat restoration can substitute for flow. . . . BDCP would reduce Delta outflow, which contributes to the decreases in salmon smolt revival rates modeled by BDCP." (Helliwell Letter at p. 2 & n. 4.) Further, "[t]he concept of habitat restoration measures to offset impacts from increased water withdrawals from the Delta (increased "reliability") is not supported by science . . . ." (Helliwell Letter at p. 4.)

2. The BDCP Fails to Adequately Discuss the Interplay Between DWR and the USBR as It Relates to the Operation of the Facility

The BDCP describes itself as a project proposed by the State, through DWR, and being owned and operated by the State. Reading the document it is easy to get the impression that the only difference between existing conditions and the operation of CM-1, once constructed, is a different place for diverting State Water Project (SWP) water. This, perhaps, is one of the most misleading aspects of the BDCP.

The purported benefits of CM-1 include the reduction in entrainment of fish in the south Delta that currently result from pumping operations in the south Delta, along with certain reverse flow conditions that occasionally result from south Delta pumping operations. To theoretically reap the benefits of CM-1 as proposed, the United States Bureau of Reclamation (USBR) would have to move Central Valley Project (CVP) water through the new north Delta facilities. In addition to this reality, BDCP modeling reveals that there will be significant operational changes at upstream reservoirs, including reservoirs for the CVP.

The BDCP fails to adequately discuss the nature and purpose of those changes and fails to discuss the impacts associated with those changes. The BDCP also fails to adequately describe how the Section 7 (consultation) process could impact the BDCP and the water supply expectations that form the water supply side of the BDCP. For example, the BDCP fails to adequately discuss the current Coordinated Operations Agreement (COA) between the state and federal government and any changes to the COA that will be necessitated by the BDCP. The BDCP's failure to reveal or discuss changes in upstream operations also prevents adequate consideration of environmental impacts in the DEIR/EIS – a fatal flaw in those documents as well.

The BDCP must be revised to discuss the nature of the relationship between the BDCP and the operation of various CVP facilities, including upstream reservoirs and federal pumping facilities in order to provide an understanding of likely changes needed to the COA. Additionally, the BDCP must be revised to discuss how future Section 7 consultations could impact the underlying assumptions in the BDCP. A thorough discussion of these issues is necessary so the public can understand how the impacts might differ between the SWP and CVP and whether there will be any certainty in the operations of the CVP.

3. The BDCP Lacks an Adequate and Reliable Source of Funding

Section 10 of the ESA requires the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to find that the applicant for an incidental take permit will ensure that sufficient funding be available to implement an HCP. (*Southwest Center for Biological Diversity v. Bartel* (S.D. Cal. 2006) 457 F.Supp.2d 1070, 1105.) While there is no requirement that an applicant have cash or a fully funded trust account available to implement an HCP, an applicant must demonstrate that there is adequate funding for the HCP and that funds are not speculative or dependent on the future actions of others.

Further, an HCP cannot be approved without identification of secured funding sources for activities contemplated by the HCP (i.e., funding for all 22 of the BDCP's proposed conservation measures). In particular, an HCP must ensure that there is adequate funding and specify the sources of funding available to implement the HCP's steps to minimize and mitigate impacts to its covered species. (16 U.S.C. §§ 1539(a)(2)(A), (B).) Thus, an HCP must detail the funding sources that will be available to implement any proposed mitigation program. For large-scale HCPs like the BDCP, funding issues present a real concern because of the geographic scope of the area affected and because the number and scope of activities contemplated typically require substantial budgets. Where perpetual funding is required to implement any mitigation measures, the HCP must establish programs or mechanisms to generate those funds. Importantly, an applicant for a permit cannot rely on the speculative future actions of others to fund activities related to an HCP. (*Southwest Center for Biological Diversity v. Bartel* (S.D. Cal. 2006) 470 F.Supp. 2d 1118, 1155, citing *National Wildlife Federation v. Babbit* (E.D. Cal. 2000) 128 F.Supp. 2d 1274, 1294-1295, and *Sierra Club v. Babbit* (S.D. Ala. 1998) 15 F.Supp. 1274, 1280-1282.)

The lack of adequate funding to ensure implementation of mitigation and other conditions of an HCP can be a fatal flaw and, in fact, the lack of adequate funding and appropriate funding assurances has resulted in the invalidation of HCPs. HCPs must include a funding plan that outlines mandatory funding measures and provides for potential future adjustments to account for increased costs. (*Southwest Center for Biological Diversity v. Bartel*, *supra*, 470 F.Supp. 2d at p. 1156.)

At least two HCPs in California were invalidated due to the uncertain nature of funding to support the activities contemplated in the HCP. The City of Sacramento's HCP for the Natomas area was invalidated due, in part, to inadequate funding assurances. (*National Wildlife Federation v. Babbit*, *supra*, 128 F.Supp. 2d at p. 1274.) The City of San Diego's HCP also was invalidated for lack of adequate funding. (*Southwest Center for Biological Diversity v. Bartel*, *supra*, 470 F.Supp. 2d at p. 1118.) There the City of San Diego prepared an HCP that needed funding to acquire land for a "preserve" and to administer the plan for the life of the ITP. San Diego's proposed source of funding relied on future actions, consisting of future regional plans with other local jurisdictions, raising the sales tax, or issuing bonds, which would require voter approval. While San Diego promised to use its "best efforts" to implement the financing and land acquisition components of the plan, San Diego's failure to

ensure funding for the plan was fatal. The federal court found that the proposed funding source was unreliable and speculative, and that the USFWS could not rationally conclude that the City would "ensure adequate funding" as contemplated by the ESA.

Like the San Diego and Natomas HCPs, the BDCP fails to demonstrate that adequate funding will be available not only to provide funding for land acquisition and administration but also to carry out the conservation measures that serve as the pillars of the plan. The BDCP does not fulfill even the most basic requirement that there be adequate funding available for any of the 22 conservation measures. Even the introductory paragraphs in the Funding Chapter (Chapter 8) qualify the entire funding discussion as being based on a "programmatic level" estimation of project costs. Identification of needed funding is deferred to an Implementation Office, which will, at some unspecified future time, develop annual capital and operating budgets. (BDCP, p. 8-1.)

The BDCP also is intended to serve as a Natural Communities Conservation Plan (NCCP) under California law. In this regard, the BDCP also fails to meet the funding mandates of the Natural Communities Conservation Planning Act (NCCPA). The NCCPA demands an Implementing Agreement detailing, among other things: 1) provisions "specifying the actions [the CDFW] shall take ... if the plan participant fails to provide adequate funding"; and 2) "mechanisms to ensure adequate funding to carry out the conservation actions identified in the plan." (Fish and Game Code, §2820(b)(3).) The BDCP fails to comply with this mandate.

A fatal defect in Chapter 8 is the assumption that funding responsibilities can simply be deferred to some future date. (BDCP, p. 8-2.) Without an understanding of *who* will pay and *what* funding is needed, there is no way to assess whether adequate funding exists sufficient to provide any regulatory assurances to the project proponents. Indeed, the BDCP itself admits that the BDCP is not intended to establish an allocation of costs or repayment responsibilities; instead, finance plans will be developed separately by "various funding agencies" through future discussions. (BDCP, p. 8-2.)

Moreover, the BDCP attempts to impose costs of certain conservation measures on the general public when those costs should be borne by the contractors receiving the benefit of the BDCP. For example, the BDCP suggests that the contractors should be responsible for 12.6% of the costs of CM-4. (BDCP, Table 8-41.) The rationale is that a small portion of restoration occurring under CM-4 is currently required by the USFWS Biological Opinion (BiOp) for the Long-Term Operational Criteria and Plan (OCAP). However, the BDCP fails to disclose that tidal restoration will also serve to mitigate the adverse impacts of relocating the diversion facilities to the north Delta. Without CM-4 (and CM-5), the relocation of pumping facilities to the north Delta would increase the frequency and severity of reverse flows in the Sacramento River. Restored tidal areas allow the incoming tide to dissipate and mask the affects of the new north Delta intakes. As such, the cost of CM-4 is more appropriately imposed on the contractors because CM-4 mitigates the operational impacts of the north Delta intake facilities.

Generally, the BDCP relies, in part, on various federal funding sources – sources that require action by Congress to authorize the ongoing expenditure of funds or new authorizations to provide funding for certain BDCP activities. The Antideficiency Act prohibits, among other things, the creation of obligations in excess of amounts already appropriated and committing the federal government to pay funds not yet appropriated. To the extent BDCP relies on any possible funding sources that are in excess of current federal authorizations or would require the appropriation of funds, that reliance would likely run afoul of the Antideficiency Act.

In addition to the above described funding flaws, nearly all of the identified funding sources are too speculative to support the issuance of take permits as requested by the project proponents. These funding sources are outlined in Section 8.3 of the BDCP. Below are some examples of speculative and uncertain funding for the BDCP:

- The BDCP contemplates that CVP contractors have "committed to fund construction, operation, and construction-related mitigation costs for implementation of CM-1 . . . ." (BDCP, p. 8-73.) However, according to the BDCP, USBR is not a permittee and there is no commitment to wheel federal water through the new facilities. As a result, there is no basis for assuming federal contractors will pay for facilities that will only wheel SWP water.

- To fund CM-1, the BDCP indicates that the state and federal contractors "could issue either general obligation or revenue bonds." (BDCP, p. 8-78.) However, and as recognized by the BDCP, general obligation bonds require voter approval and are therefore speculative.

- For State funding sources, the BDCP relies upon a significant contribution from a "water bond" that is currently scheduled for the 2014 ballot. (BDCP, p. 8-84.) BDCP attempts an analysis of prior bonds, concluding that bond passage is likely and others likely would be passed during the implementation period of the BDCP. (BDCP, p. 8-85.) Yet bond passage is not assured and any funding relied upon from a yet-to-be-passed bond measure is purely speculative, as the voters could reject the bond. Further, Sacramento County and its four Delta County Coalition partners will oppose any water bond that includes a funding earmark for the BDCP. Indeed, and as the BDCP recognizes, the current bond has already been delayed multiple years because the economic climate was not favorable for passage. In fact, the reality is that the bond would not have been passed by the voters. Given the history of *this* bond and the speculative nature generally of voter-approved financing, it is unreasonable for the BDCP to rely on this funding source.

- The BDCP then looks to existing bond source availability in California. (BDCP Section 8.3.5.2.) While not articulated, it appears that the BDCP anticipates that it will "corner the market" in existing bond funds – using all available bond funding for

the BDCP. (BDCP, pp. 8-86 – 8-91.) If this is the intent, the BDCP needs to discuss (both in the BDCP and DEIR/EIS) the other projects throughout the State that will not be able to receive funding from these bond sources. Generally, it is speculative to conclude that *all* of the remaining bond funds under the cited programs will be made available *only* to the BDCP. In any event, the remaining balances (monies) are small in comparison to the amount needed to fully fund the BDCP's proposed conservation measures.

- The BDCP assumes continued funding for programs/studies under the Interagency Ecological Program (IEP). (BDCP, p. 8-91.) The BDCP assumes an "overlap," without any factual support, of IEP work and the BDCP. Without any substantiation, the BDCP assumes that IEP funding will account for $55 million over the permit term. (BDCP, p. 8-91.) There is, of course, no requirement or guarantee that the State Legislature will continue to fund IEP efforts and those funds therefore cannot be relied upon to provide stable and secure funding over the life of the permit term.

- The BDCP assumes that nearly $2 million per year will be available from the Delta Stewardship Council (DSC) to support the BDCP. DSC funding is not certain, subject instead to the state's budget process. The DSC cannot provide assurances that any funding will be available to support the BDCP and certainly cannot assure $2 million per year for the life of the permit term. This funding source is speculative and uncertain.

- The BDCP assumes a roughly $2 million annual financial contribution from the Delta Bay Enhanced Enforcement Project (DBEEP) program. (BDCP, p. 8-93.) The BDCP indicates that, through the DBEEP program, DWR funds roughly $2 million annually for CDFW's enforcement efforts to reduce illegal take of fish species. (BDCP, p. 8-93.) While it is not clear from the text, this is part of the SWP Budget – and will be a funding requirement imposed on the SWP contractors. The document must discuss the underlying sources of this funding to provide an appropriate assurance that the funding will be available through the permit term. As revealed in the BDCP, the current agreement for the DBEEP is only three years. This funding is not certain for the 50-year term of the permit.

- The BDCP relies on funding provided through the 2010 Fish Restoration Program Agreement. (BDCP, p. 8-94.) The document, however, recognizes that subsequent agreements would need to be executed and that funding would need to be included. (BDCP, p. 8-94.) Funding is therefore not available from this program.

- The BDCP also relies on existing state grants for *possible* funding sources. (see BDCP, pp. 8-94 – 8-99 (Wildlife Conservation Board grants for work "relevant" to the BDCP; Ecosystem Restoration Program funding "applicable" to the BDCP; Environmental Enhancement Fund availability is "intermittent" and "not guaranteed"; Fisheries Restoration Grant Program has funding "uncertainties").) While certain of

these programs may provide a possible source of funds, none provides the financial certainty sufficient to issue the requested permits.

- One federal funding source relied upon by the BDCP is the Central Valley Project Improvement Act (CVPIA) Restoration Fund. (BDCP, p. 8-99.) The CVPIA Restoration Fund is necessarily connected to the CVP – and 75% of funds paid into the Fund are either reimbursed as a feature of the CVP or are a non-reimbursable expenditure. The BDCP purports to be a project that is State (SWP/DWR) owned and is not part of the CVP. The USBR is not a project proponent nor is it a party to the draft Implementing Agreement. It is therefore not appropriate to assume CVPIA funding to support DWR's project. Moreover, reliance on the continuous appropriation of these funds likely violates the Antideficiency Act.

- The BDCP also relies on speculative California Bay-Delta appropriations to fund portions of the BDCP. (BDCP, p. 8-103.) There are a host of problems associated with reliance on these funds, the foremost of which is the assumption that *any* federal appropriation of funds will be made through the expected term of the permit. Many of the identified funds are directed to federal agencies that are not parties to the BDCP or the Implementing Agreement. There is simply no stated basis to rely on federal funding for the term of the permit in a manner sufficient to provide assurances to authorize take of listed species. Moreover, any reliance on the continuous appropriation of these funds likely violates the Antideficiency Act.

- The BDCP relies on Regional Ecosystem Conservation through the National Marine Fisheries Service (NMFS). (BDCP, p. 8-108.) However, and as the BDCP expressly admits, there are *no current estimates* for funding that might be available to NMFS for projects in the San Francisco Bay area. (BDCP, p. 8-109.) There is no basis for relying on any funding from this source in support of the BDCP. Reliance on the continuous appropriation of these funds likely violates the Antideficiency Act.

- The BDCP's reliance on existing federal grants is speculative. (BDCP, pp. 8-110 – 8-118.) While certain grant programs might provide the BDCP with opportunities to compete for available grant funding, there is *no guarantee* that the BDCP will be awarded any grants under any of the programs identified in the document.

- The BDCP's reliance on possible future federal authorizations is too speculative to rely upon, as the permittees' "intent to collaborate and seek federal authorizations" provides no certainty in funding. (BDCP, p. 8-109.) Reliance on the appropriation of these funds likely violates the Antideficiency Act.

The speculative nature of this funding is fatal to the BDCP, as take authorization cannot be issued without greater certainty in funding. Not surprisingly, testimony of a DWR representative after release of the draft Plan confirmed the speculative nature of the BDCP funding. At the February 12, 2014, California Assembly Committee on Accountability and

Administrative Review oversight hearing on the BDCP (2/12/14 Hearing), DWR's representative, Laura King Moon, testified about the nature and certainty of funding to support the BDCP. Ms. King Moon explained that in the event funding is not available, the potential regulated entities will revisit the Plan, renegotiate ESA take permit scope of coverage and possibly scale back the project. (Laura King Moon Testimony, 2/12/14 Hearing, timestamp 00:19:00-00:19:40.) Testimony at this hearing revealed that funding is uncertain and relies upon the assumption that funding will be provided because, generally, state and federal governments have funded other significant restoration projects. (Laura King Moon Testimony, 2/12/14 Hearing, time stamp 00:18:23 – 00:18:30.)

In addition to the speculative funding sources, certain categories of expenses identified in the BDCP grossly underestimate the funds needed to complete the conservation measures. Land cost is one example. The BDCP makes assumptions about land acquisition that will occur over the life of the project. Inherent in these assumptions (not only in costs, but also in the implementation schedule referred to in Chapter 8 (BDCP, p. 8-5.)) is that there will be continued funding available for all conservation measures through the life of the permit. However, as DWR's representative testified, funding might not be available for the entire project, which will necessitate scaling back the BDCP. (Laura King Moon Testimony, 2/12/14 Hearing, time stamp 00:19:00-00:19:40.)

Another major flaw in this section is the cost assumption associated with land acquisition. Cost estimates are based upon data from the California Chapter of the American Society of Farm Managers and Rural Appraisers (Cal ASFMRA) published in 2009. Data published by Cal ASFMRA in 2009 indicated that land values were increasing through 2009 and the trend was for further increases. BDCP ignores this fact. Moreover, land values assume simple real estate market values for various types of cropland. This assumes a stable real estate market with normal demand and willing sellers of the property sought to be acquired. Those assumptions are unreasonable for a number of reasons. First, to the extent the BDCP creates a demand for 153,114 acres of property needed for various conservation measures and mitigation in the project area, prices will likely increase substantially. Second, and more importantly, the assumptions fail to take into account the very real likelihood that the project proponents will need to acquire the vast majority of needed property through condemnation. Once that process is initiated, prices will not be based on current use of the property, but instead on the highest and best use. Thus, real property values and the funding needed to purchase land are grossly underestimated.

Even after land is purchased, the BDCP is unclear about long-term funding for lands purchased for the BDCP. For example, when discussing the long-term protection of Reserve lands, the BDCP provides that this protection will be accomplished "using techniques identified in *CM-11 Natural Communities Enhancement and Management*, commensurate with funding limitations." (BDCP, p. 6-10.) It is unclear what type of funding limitations could exist (this could be tied to the uncertainties of funding, discussed above) and what impact the lack of adequate funding would have on the Reserve lands. The BDCP's failure to clearly articulate how financing and long-term protection will be accomplished in a way that

is accessible to the public is a significant flaw in the BDCP.

The discussion of Changed Circumstances, in Chapter 6, also reveals deficiencies in funding considerations. For example, when discussing Levee Failures as a changed circumstance under the BDCP, the BDCP assumes that the costs associated with the failure of a "non-BDCP" levee will fall on "the appropriate responsible entity." (BDCP, p. 6-35.) What the BDCP fails to reveal, however, is that it is DWR (or some combination of permittees) that will likely be the "appropriate responsible entity." Local levees are maintained by local reclamation districts, which themselves are comprised of local landowners who are protected by those levees. With DWR becoming a significant Delta landowner under the BDCP, DWR, as a result of its land ownership, will be responsible, like any other local landowner, for the operation and maintenance – even of these "non-BDCP" levees. BDCP's obfuscation of this issue misleads the public by suggesting the costs of remediation of a non-BDCP levee will not be part of the costs of the BDCP. Moreover, while the BDCP suggests that local reclamation districts will be financially responsible for reconstructing restored areas in the event of levee failure, DWR failed to analyze whether any of these local reclamation districts have the resources or financial capacity to reconstruct restoration areas. The BDCP should be required to include such an analysis if the BDCP is going to rely on these local agencies to act as a backstop in the event of levee failure. Otherwise the BDCP permittees cannot assure adequate funding for the project.

In addition, the BDCP anticipates that in the event of a levee failure, one possible corrective action would be to purchase and restore additional lands as a "replacement" project. Neither the BDCP nor the DEIR/EIS discusses the added costs of purchasing replacement lands, or discusses the additional impacts of taking additional productive agricultural land out of production in the Delta in the event restored lands are lost to a levee failure. The BDCP's failure to discuss these circumstances is quite troubling, particularly when DWR has been trumpeting the very likelihood of catastrophic Delta levee failure as creating the need for the proposed North Delta conveyance. If catastrophic Delta levee failure is so likely, surely DWR needs to have a financial plan in place, as a local landowner, to fund maintenance and restoration of local Delta levees and prepare for the likelihood of having to replace large restoration areas.

While the ESA demands that adequate funding be identified and available to implement the projects outlined in an HCP, the BDCP fails across the board to satisfy any funding requirement. Even the BDCP's reliance on funding from federal water contractors based upon the delivery of federal CVP water is flawed, as the USBR will not be a permittee and is not a party to the Implementing Agreement. The remaining sources of funding identified in the BDCP are too speculative to support the issuance of an ITP.

4. The BDCP Fails to Consider Future Water Supply Demands in Northern California

Generally, there are two types of circumstances relevant to the ESA's "No Surprises" rule: unforeseen circumstances and changed circumstances. Unforeseen circumstances, also called "extraordinary circumstances," are changes over the life of an HCP that were not or could not be anticipated by the applicants or by the USFWS. Changed circumstances, on the other hand, are not uncommon and can reasonably be anticipated and planned for. (50 CFR § 17.32 (b)(5).)

One such changed circumstance, as it relates to the BDCP, is that water supplies currently being exported by the CVP and SWP will be needed in the counties or areas wherein the water currently being exported originates. California law expressly recognizes the prior right of communities in those areas to water currently being exported, to the extent that water will be needed to adequately supply the beneficial needs of those areas. (Water Code, §§ 10505, 10505.5, 11460, 11463 and 11128; also §§ 12200-12220.) The State's own demographic data predicts significant population increase in counties North of the Delta during the proposed term of the BDCP, with counties such as Sacramento, San Joaquin, Nevada, Placer, Yolo and Yuba projected to grow by 50 percent or more. (*See* California Department of Finance, Demographic Research Unit, Report P-1 (County): State and County Population Projections, July 1, 2010-2060, available at http://www.dof.ca.gov/research/demographic/reports/projections/P-1/.) That demand for water will increase in and north of the Delta with this population growth, and thus the likelihood that less water will be available for export uses, is reasonably foreseeable. Thus the BDCP must account for this increased demand as a changed circumstance. Increased demands in the areas of origin have either been omitted entirely or are otherwise underestimated in the BDCP modeling. The BDCP must accurately describe future demands in the area of origin and disclose the impacts to species, under the BDCP, of less water being available for BDCP permittees/participants.

B. The BDCP Fails to Comply with NCCPA Requirements

As noted, the BDCP also is intended to serve as a NCCP under California law. The primary objective of an NCCP is to "identify and provide for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible and appropriate economic development, growth, and other human uses." (Fish & Game Code, §2805 (h).) As an NCCP, the BDCP must provide for the protection of habitat, natural communities, and species diversity, as well as contain specific conservation measures that are based on the best available science and that meet the biological needs of covered species. Like an HCP, an NCCP must also provide assurances with regard to its implementation and the sources of funding to be used to carry out proposed conservation actions. As discussed above and throughout these comments, the BDCP does not ensure protection of species diversity, is not based on the best available science, and fails to meet the funding assurance requirements of both the ESA and the NCCPA. As such, the BDCP fails to

meet the most basic standards to serve as an NCCP and cannot be relied on to support the taking of covered species under the NCCPA.

C. The Assurances Sought by the BDCP Violate California's No Injury Rule and Contravene the Priority of Water Rights

The BDCP self-describes the "assurances" the permittees will enjoy as a result of its implementation. The BDCP explains that the assurances provide "durability and reliability" to agreements reached with various agencies as part of the implementation of the BDCP. (BDCP, p. 6-28.) Generally speaking, "assurances" provided to a permittee are *guarantees* of sorts that, if a permittee lives up to its end of the bargain in implementing an HCP, it will not be required to undertake any additional measures for the benefit of the species covered by the HCP.

The BDCP casts these assurances in an interesting way. The BDCP suggests that, if the terms and conditions of the BDCP are being met, the federal government

> will not require additional conservation or mitigation measures, including land, water (including quantity and timing of delivery), money, or restrictions on the use of those resources.

(BDCP, p. 6-28.) The BDCP recognizes that these "assurances" will not and cannot apply to the USBR, so it is only DWR that will receive the assurance that it will not be required to commit any additional (water) resources for the benefit of species covered by the BDCP. However, the assurances that the BDCP seeks contravene California water law, violating the "no injury" rule and disregarding the rule of priority of water rights.

As part of the construction of CM-1, DWR will need to file a Petition for Change in Point of Rediversion of water to add the north Delta intakes as an additional point of diversion for SWP water. The same will certainly be true for USBR, as CM-1 will not be feasible without including CVP water as part of the operations of CM-1. In order to approve the requested change, the State Water Resources Control Board (SWRCB) will need to find, among other things, that the requested changes "will not injure any other legal user of water." (Wat. Code, §1701.2.) If DWR is correct in the BDCP, that constructing CM-1 relieves it of any further obligation to forego any storage or diversion of water for species covered by the BDCP, then any additional water required would have to be provided by senior water right holders. As species are likely to continue to decline in the foreseeable future, granting the requested changes will injure other legal users of water and will likely require senior water right holders to forego diversions for the benefit of DWR's continued diversion of water.

Any suggestion that senior water right holders should somehow be required to forego water diversions to make the BDCP a success is inconsistent with California law. The SWRCB recently attempted to impose a condition on senior water rights held by the El Dorado Irrigation District (EID) and the El Dorado County Water Agency (EDCWA) that

would have required EID and EDCWA to forego diversions for the benefit of junior users. EID and EDCWA challenged the SWRCB's action, arguing that the imposition of the condition (which effectively required senior water right holders EID and EDCWA to forego diversions to help meet Delta water quality standards that the CVP and SWP were responsible for meeting, while allowing junior users to continue to divert water), violated the long-standing principle of water right priorities. Both the lower and appellate courts sided with EID and EDCWA. (*El Dorado Irrigation District v. State Water Resources Control Board* (2006) 142 Cal.App.4th 937 (*EID v. SWRCB*).)

Importantly, the Court of Appeal held that the SWRCB's attempt to impose this condition "contravened the rule of priority, which is one of the fundamental principles of California water law." (*Id.* at p. 943.) Indeed, the court recognized prior pronouncements of the California Supreme Court explaining that a court's first concern when addressing water right controversies is to "recognize and protect the interests of those who have prior and paramount rights to the use of waters." (*EID v. SWRCB*, citing *Meridian, Ltd. v. San Francisco* (1939) 13 Cal.2d 424, 450.) While the Court recognized that the rule of priority is "not absolute," the Court was very clear in holding that the SWRCB is obligated to protect water right priorities unless doing so would result in the unreasonable use of water, violations of the public trust doctrine, or "other important principles" of California water law. (*EID v. SWRCB* at pp. 966-967.) When these circumstances present themselves, "every effort must be made to preserve water right priorities." (*EID v. SWRCB* at p. 966.) Thus, any attempt, through the BDCP, to undermine water right priorities, or to attempt to require upstream senior diverters to forego diversions to meet BDCP goals and objectives, thereby allowing the continued export of water by junior appropriators, will violate long-standing principles of California water law.

The California Supreme Court reached a similar conclusion in *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224 (*Barstow*). There, the Court rejected a "physical solution" as a method of settling a water right dispute where the physical solution relied on an "equitable apportionment" and did not consider prior rights. Importantly, the *Barstow* Court noted the need to protect and recognize prior rights when it opined: "In ordering a physical solution, therefore, a court may neither change priorities among the water rights holders nor eliminate vested rights in applying the solution without first considering them in relation to the reasonable use doctrine." (*Barstow* at p. 1250.) *Barstow* and *EID v. SWRCB* make clear that any suggestion that entities not parties to the BDCP must forego diversions to make BDCP a success violates California law.

In addition to the foregoing, "area of origin" statutes[1] mandate that water use within the area of origin – in this case Northern California – not yield to the export of water for use outside the area of origin. In fact, the water rights granted by the State for the operation of the SWP and CVP are conditioned upon compliance with area of origin laws. Any attempt to

[1] The area of origin statutes include Water Code sections 10500 et seq. and 11460 et seq.

subvert the area of origin statutes, whether through a private HCP process (via regulatory assurances) or through the CEQA/NEPA process, will result in clear violations of those statutes intended to protect areas of origin, including the protection of Northern California water supplies from injury by export projects.

D. The BDCP Improperly Relies on Actions by Parties Not Subject to the BDCP's Permits or the Implementing Agreement

The BDCP process is a private permitting exercise, and the permittees therefore cannot rely on any third parties to undertake measures to accomplish the goals of the BDCP. This is true even in the context of "adaptive management." If the BDCP relies on the actions of anyone not subject to the regulatory authority of the permittees (no authority to restrict conduct of others) or not a signatory to the Implementing Agreement, a legally flawed HCP and a flawed CEQA/NEPA document result. Indeed, the obligations of overseeing implementation of the BDCP fall on the permittees, which is precisely why federal agencies require that the permittees be capable of overseeing HCP implementation and have the authority to regulate the activities covered by the permit, including implementation of all restoration and mitigation measures. Here, none of the permittees has the authority to regulate many of the activities contemplated by the various conservation measures that make up the BDCP. Any reliance on voluntary efforts by third parties, or statements in the BDCP that required elements of the plan will simply happen in the future are insufficient to demonstrate that the various activities are reasonably certain to occur. HCPs have been invalidated for this precise reason. (*National Wildlife Federation v. National Marine Fisheries Service* (D. Or. 2003) 254 F.Supp.2d 1196, 1205.)

Here, there are no binding commitments from state and local agencies either to fund or to implement the responsibilities delegated to them by DWR. Without those binding commitments, NMFS cannot make a finding that any of those actions are "reasonably certain to occur" – a finding necessary to make a no-jeopardy determination. For example, CM-1 involves the construction and operation of conveyance facilities that will divert water from the Sacramento River and convey it through tunnels to the South Delta. (BDCP, pp. 3.4-12 – 3.4-13.) While it is questionable whether the massive new diversion facilities are a true "conservation" measure, it is clear that USBR must commit to utilize those new facilities in order for CM-1 to be "effective" and for it to be financially viable.[2] (BDCP, Section 3.4.1.4.)

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[2] The modeling undertaken as part of the BDCP includes changes in operation of federal CVP facilities, including Shasta and Folsom reservoirs, and Jones pumping plant in the South Delta. It is quite clear that, in order for CM-1 to be both financially and operationally viable, USBR must wheel CVP water through the new facilities. Moreover, the funding chapter, Chapter 8, discusses the funding contribution from CVP Contractors and how other "jointly developed facilities" are funded by both state and federal contractors. (BDCP, p. 8-70.) Indeed, Chapter 8 assumes federal water supplies will be moved through the new conveyance facilities – and clearly states that "[t]he financial support of the state and federal contractors is *essential in order to implement the plan*." (BDCP, p. 8-82.) The BDCP's lack of clarity on this issue only leads to confuse the public about the real nature of the BDCP.

However, USBR is not a permittee nor is it a party to the draft Implementing Agreement. USBR will therefore not be bound to undertake any actions to implement CM-1.

CM-14 similarly involves stated commitments to funding the Aeration Facility in the Stockton Deep Water Channel. The Aeration Facility is operated by the Port of Stockton, and there is no indication that the Port of Stockton is going to sign the Implementing Agreement binding it to any particular course of action. CM-17 anticipates funding to support more game wardens to enforce fish and game regulations in the Delta to reduce illegal harvest of species. The BDCP, however, does not appear to guarantee that CDFW will implement CM-17 as envisioned by the BDCP. Likewise, implementation of CM-21 *Nonproject Diversions* requires the execution of interagency agreements. (BDCP, p. 6-4.) With lack of commitments and the inability of the permittees to regulate the conduct of these third parties, it is not clear that these conservation measures will be implemented at all. Without those assurances, incidental take permits cannot issue.

E. The BDCP Implementation Plan Does Not Ensure that Timing of Conservation Measures Will Match Impacts and Defers Development of Key Information

Chapter 6, Plan Implementation, describes the timeline within which the various conservation measures will occur. Recognizing that certain [public] funds are not guaranteed, the BDCP recognizes that "the timing of funding available from public sources for actions that conserve species in the Plan Area [], may dictate the timing of some implementation actions." (BDCP, p. 6-2.) While the BDCP document argues that the timing of implementation actions will nonetheless meet the "rough proportionality" requirement, there is certainly no assurance that this will be the case. The BDCP fails for this additional reason.

As part of Plan implementation, the BDCP anticipates that an Annual Water Operations Plan will be developed. (BDCP, p. 6-23.) However, the first "version" of this plan will not be developed until year 9. (BDCP, p. 6-23.) According to the BDCP, DWR and USBR (non-permittee and non-signatory to the Implementing Agreement) retain final approval authority over the Annual Water Operations Plan. (BDCP, p. 6-23.) Without an appropriate operations plan proposed as part of the BDCP itself, the public is deprived of understanding the actual and potential impacts associated with CM-1. Moreover, it is not clear that the federal agencies can issue take authorization for a project when no one – not even the project proponents – knows how it will be operated.

F. The BDCP's Governance Structure Does Not Provide an Effective Voice for the City of Stockton and Other Affected Local Stakeholders

One of Sacramento County's most important concerns with the BDCP is to ensure that the proposed governance structure is transparent, fair, and offers the local Delta counties, including Sacramento County, a high-level decision making role in both the planning and implementation process. This is a long-standing point of concern that has been shared

numerous times in correspondence and in meetings with the Secretaries of both the California Natural Resources Agency and the United States Department of the Interior, the Governor, and Congressional representatives.

As expressed throughout these comments, uncertainties about critical details and outcomes of the Plan, including water operations, infrastructure and habitat restoration costs, and governance, are hugely problematic for a public infrastructure/habitat conservation plan of this scale. The proposed plan and preferred project (Alternative No. 4) has the potential to permanently damage the Delta as a whole, as well as result in irreversible and significant physical, environmental, and socioeconomic impacts to the portion of the Delta within unincorporated Sacramento County, including established legacy communities.

Despite nearly a decade of efforts to collaborate with the BCDP's lead state and federal agencies, including participating as a NEPA Cooperating Agency, Sacramento County has yet to receive a written commitment from these agencies to develop an implementation governance structure that guarantees the County a role in the process that affords it a true opportunity for substantive input and engagement. Currently, the County is relegated, with no less than 29 other representatives of special interest groups and local governmental entities, to the "Stakeholder Council" (Council), on which further, unspecified numbers of Authorized Entities and state and federal authorities will also sit (BDCP, p. 7-19). The broad and diverse spectrum of interests consigned to the Council will systemically and unacceptably dilute the County's voice in its unique and centric position as the focal point for much of the BDCP's implementation activities. Therefore, we continue to have grave concerns about the current governance proposal, which demotes irreversibly impacted local governments to this Council. In addition to being a very large, multi-agency body, the Council is only required to convene quarterly as an advisory body with the limited purpose of exchanging information and providing input and recommendations to the Program Manager for the BDCP. The Council has no actual decision-making authority or direct influence over the various phases of the BDCP.

In fact, the current proposal expects the Council to make reasonable efforts to provide input that reflects the general consensus of its large number of members. In contrast to the short, 14-day timeframes in the proposed dispute resolution process for decision-making entities within the Plan (i.e., the Authorized Entity Group or Permit Oversight Group), implementation plan disputes raised by the Council or its individual members are lengthened to an initial 60-day timeframe for internal Council resolution, then a 90-day review by the Authorized Entity Group, and finally an unspecified time period for review by whatever entity the Authorized Entity Group picks as having the 'locus of responsibility' for the disputed issue. These lengthy timelines for dispute resolution could consistently result in the disputed action occurring well before the Council or its members received true consideration of their objections to the action or issue. This dispute resolution process highlights the fabricated and disingenuous attempt by the Plan's proponents to give highly impacted local governments any meaningful participatory position and influence concerning the Plan and its implementation.

The County does note the BDCP now includes the following notation in Section 7.2.8 of Chapter 7:

> Note to reader: At the time of this Public Draft, the California Natural Resources Agency is working with representatives from Delta counties to identify an appropriate mechanism to involve Delta counties in Plan implementation. It is the intention of the agency to incorporate revisions to the implementation structure set forth in this chapter that address further Delta county participation in a final plan. (BDCP, p. 7-26)

Interestingly, this "Note to reader" is not located in the BDCP's section for "Role and Responsibilities of Entities Involved in the BDCP," but is instead placed within the section identifying how the BDCP Implementation Office and its Program Manager are required to coordinate with local governments and other Delta-centric public agencies. Unfortunately, the placement of this "Note to reader" suggests the BDCP's proponents view the Delta counties as entities for the Implementation Office and California Natural Resources Agency to appease, rather than entities deserving of a vote concerning any implementation of the plan. The County, individually and in its partnership with the Delta Counties Coalition (DCC), objects to its governance role being assigned to that of either "after the fact" communication and mitigation, or impotent information-sharing at a sideshow for a myriad of Delta interests.

To illustrate the importance of a fair and balanced governance structure, Sacramento County, again in partnership with the DCC, has helped developed an alternative governance proposal that includes (in summary) the following:

> Each Delta County should have a voting role on whatever decision-making body that is ultimately determined to have oversight, approval, and implementation authority of the BDCP's Conservation Measures (e.g., Authorized Entities Group, Executive Committee, or similar body). This decision making body should have a balanced membership, consisting of agencies that sell water and control water-related infrastructure (USBR and DWR), agencies that buy water (state and federal contractors), and local governments directly affected by the BDCP (each Delta County).

Two important distinctions to note in the DCC's governance alternative, which Sacramento County fully endorses, include:

1) Delta County participation in the BDCP process should be fully funded through all phases of the Plan. Unlike other agencies expected to participate in the lead BDCP governance entity, the Delta Counties have no reasonable way to recover their participation costs from customers or ratepayers. Nor does the County have any existing legal obligations (such as the Biological Opinions) that compel our participation. Instead, participation is a matter of fairness to the local governments with general legal responsibility under the California

Constitution for land within their boundaries and the health, safety, and welfare of affected residents.

2) Participation would not preclude Sacramento County from later pursing administrative appeals and/or litigation in connection with the BDCP. Similarly, the County's participation in BDCP governance should not be treated or presented as "support" for the BDCP.

As recently as April 25, 2014 and May 6, 2014 Sacramento County was a signatory on letters to Secretary John Laird (California Natural Resources Agency) requesting follow-up to the DCC's governance submittal. However, at the time these comments were prepared the County had not yet received an invitation to re-engage in the local governance discussion.

In sum, the placeholder language added to Section 7.2.8 (and cited above) is woefully inadequate as it provides no assurances to Sacramento County that the state and federal agencies are committed and agreeable to providing local governments with a substantive decision making role. Absent that commitment, Sacramento County vehemently opposes the BDCP governance/implementation structure currently described in Chapter 7 of the draft plan.

G. The BDCP Does Not Comply with Delta Reform Act Requirements

The Sacramento-San Joaquin Delta Reform Act of 2009 contained a specific mandate for the BDCP. (Wat. Code, § 85320.) Unless the BDCP met specified criteria, the BDCP would not be eligible for state funding. (Wat. Code, § 85320(b).) Among those criteria are the requirements that the BDCP include a comprehensive review and analysis of all of the following:

- A reasonable range of flow criteria, rates of diversion, and other operational criteria required to satisfy the criteria for approval of a natural community conservation plan as provided in subdivision (a) of Section 2820 of the Fish and Game Code, and other operational requirements and flows necessary for recovering the Delta ecosystem and restoring fisheries under a reasonable range of hydrologic conditions, which will identify the remaining water available for export and other beneficial uses.

- A reasonable range of Delta conveyance alternatives, including through-Delta, dual conveyance, and isolated conveyance alternatives and including further capacity and design options of a lined canal, an unlined canal, and pipelines.

- The potential effects of climate change, possible sea level rise up to 55 inches, and possible changes in total precipitation and runoff patterns on the conveyance alternatives and habitat restoration activities considered in the environmental impact report.

- The potential effects on migratory fish and aquatic resources.
- The potential effects on Sacramento River and San Joaquin River flood management.
- The resilience and recovery of Delta conveyance alternatives in the event of catastrophic loss caused by earthquake or flood or other natural disaster.

While the BDCP appears to remain in development, it appears clear that the BDCP will not include a comprehensive review and analysis of flows necessary for recovering the Delta ecosystem, one of the co-equal goals, and restoring fisheries. As discussed above, while the BDCP does mention alternatives that DWR considered, the BDCP does not include a *comprehensive review and analysis* of those alternatives, as required by the Delta Reform Act. The BDCP also fails to include an appropriate analysis of the impacts of climate change on the system. While the BDCP recognizes that climate change will occur, it fails to discuss the likely reaction (operational and regulatory) and fails to adequately discuss and analyze the impacts of climate change on restoration activities in the Delta. And while effects on migratory fish and aquatic resources are addressed, they are not addressed adequately, as demonstrated by the comments of the Delta Independent Science Review Panel in its review of the BDCP Effects Analysis. (*See* Delta Science Program Independent Review Panel Report, BDCP Effects Analysis Review, Phase 3, March 2014 ("Delta Science Program Report"), Exhibit B.)

H. The BDCP Fails to Account for and Describe Impacts of Integration of BDCP into the DSC's Delta Plan

Water Code section 85320 provides that if CDFW:

> approves the BDCP as a natural community conservation plan pursuant to Chapter 10 (commencing with Section 2800) of Division 3 of the Fish and Game Code and determines that the BDCP meets the requirements of this section, and the BDCP has been approved as a habitat conservation plan pursuant to the federal Endangered Species Act (16 U.S.C. Section 1531 et seq.), the council shall incorporate the BDCP into the Delta Plan.

While the BDCP recognizes it will be incorporated into the Delta Plan if it meets the standards of an NCCP, the BDCP fails to discuss the consequences of that incorporation. (BDCP, pp. 1-27 – 1-28.) Later in the document, however, there is a recognition that the BDCP may stand in the way of future projects. Indeed, the BDCP goes so far as to suggest future regulations might be prohibited if they are inconsistent with the BDCP. (*See* BDCP, p. 6-46 (future projects and regulations must evaluate effects on BDCP and be evaluated for consistency with the BDCP).) The BDCP suggests it will constrain future USFWS and NMFS consultations as well. (BDCP, p. 6-47.)

To the extent the BDCP will be a future measure of consistency, whether through the Delta Plan or otherwise, the BDCP and its accompanying DEIR/EIS must consider and evaluate the impacts of the BDCP on foreseeable future projects. The BDCP must, for example, analyze whether it will impact existing general plans in the Delta region, whether it will impact future transportation projects, recreational opportunities, and similar projects. Local agencies, like Sacramento County, should have a full understanding of how the BDCP might impact the County and its residents – not just through the construction of physical facilities – but also by any proscriptions on County activities that may follow as the BDCP acts as a prohibition on future activities. The omission of information explaining the consequences of incorporating the BDCP into the Delta Plan has deprived the public of information necessary to understand the project's impacts on local governments.

I. The BDCP Does Not Meet the Criteria for Issuance of a Clean Water Act Section 404 Permit

Construction of CM-1 and other CMs identified in the BDCP will require authorization from the U.S. Army Corps of Engineers (Corps) under Section 404 of the federal Clean Water Act because the project will result in the discharge of dredged or fill material in the Sacramento and other rivers, and in jurisdictional wetland areas. The basic premise of the Section 404 permit program is that no discharge of dredged or fill material may be permitted if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded. In applying for a 404 permit, the BDCP proponents will have to show that they have taken all reasonable steps to avoid impacts to rivers, wetlands, and other aquatic resources, that potential impacts have been minimized, and that compensation will be provided for all remaining unavoidable impacts. No permit will be granted if the proposed project is found to be contrary to the public interest.

The public interest review involves an analysis of the foreseeable impacts the proposed work would have on public interest factors, general environmental concerns, wetlands, economics, fish and wildlife values, land use, floodplain values, and the needs and welfare of the people. "The benefits and detriments to all public interest factors relevant to each case are carefully evaluated." (U.S. Army Corps of Engineers Permitting Process Information Fact Sheet, http://www.lrl.usace.army.mil/Portals/64/docs/regulatory/Permitting/PermittingProcessInformation.pdf (accessed May 13, 2014.)

During the review of a permit application, the Corps evaluates the following public interest review factors:

- Conservation
- Economics
- Aesthetics
- General environmental concerns

- Wetlands
- Historic properties
- Fish and wildlife values
- Flood hazards
- Floodplain values
- Land use
- Navigation
- Shore erosion and accretion
- Recreation
- Water supply and conservation
- Water quality
- Energy needs
- Safety
- Food and fiber production
- Mineral needs
- Considerations of property ownership
- The needs and welfare of the people (*Id.*)

The BDCP proponents do not make the required showing that CM-1 is in the public interest; further, CMs 2-22 are undefined as projects. The evidence presented to date shows the BDCP is certain to result in numerous detriments, while any benefits are merely theoretical because (1) the conservation measures on which they depend are not specifically defined; (2) they are unfunded; and (3) their promise of environmental benefit is not supported by evidence or science. As detailed throughout these comments, the BDCP will be highly damaging to the aquatic environment, and it is likely to significantly degrade the nation's waters. Expert evidence shows that not only will the north Delta intakes have significant impacts on protected fish species, through entrainment and increased predation, but BDCP-related changes in water quality have the potential to significantly degrade water quality, in perpetuity, through reduced dilution downstream of the intakes and the removal of sediment necessary to avoid detrimental downstream eutrophication. The DEIR/EIS demonstrates the BDCP will have significant adverse impacts to the economy of the Sacramento River Delta, aesthetics, historic properties, fish and wildlife values, land use, navigation, recreation, water supply, water quality, energy, safety (due to impacts to local law enforcement and emergency response times), food and fiber production (through the loss of thousands of acres of agricultural land), and the welfare of the residents of the Delta.

Because the BDCP is not the least environmentally damaging practicable alternative, and the evidence shows that there are more detriments than benefits to the public interest factors, the Corps may not issue the required 404 permit. Without such permits, the BDCP cannot be implemented consistent with the Clean Water Act. The BDCP proponents must go back to the drawing board and consider a reasonable alternative, or range thereto, like the suite of actions recommended by the County, that will survive the public interest test.

J. The BDCP Violates the Rivers and Harbors Act

The BDCP specifically addresses the fact that it will have to "conform to the requirements of various other state and federal laws and regulations not specifically addressed by the Plan." (BDCP, p. 1-16.) It goes on to explain that authorizations under Section 10 and Section 14 of the Rivers and Harbors Act of 1899 (RHA) will be required. (BDCP, pp. 1-17 – 1-18.) However, the BDCP does not acknowledge that authorization under Section 9 of the RHA, which requires authorization from Congress or the California state Legislature, in addition to that of the Corps, may also be required. It also is devoid of any discussion regarding the likelihood that these required authorizations can and will be given. While it is clear that RHA authorizations will be required before the BDCP can be implemented, serious unanswered questions remain as to whether these required authorizations actually can be obtained.

The BDCP admits that certain covered activities will require Section 10 and Section 14 permits from the Corps. Section 10 requires authorization from the Corps for the construction of any structure "in or over any navigable water of the United States or the construction of structures or alteration of capacity in any port, canal, navigable river, or other water of the United States." (BDCP, p. 1-17.) Section 14 authorizations will be required for those activities that affect federal project levees, weirs, and other "works" constructed by the United States. (33 U.S.C., § 408.)

The idea that authorization under Section 9 will be required is supported by case law. A California federal district court considering the application of Sections 9 and 10 to the Peripheral Canal in the late 1970's concluded that Section 9 and 10 authorizations for the Peripheral Canal were required before it could be constructed. (*Sierra Club v. Morton* (1975) 400 F.Supp. 610, 627, 632 (rev'd on other grounds).) The court's conclusions were based on the effect the Peripheral Canal would have on Delta waterways, as well as on evidence that the Peripheral Canal would lower water levels in the Sacramento River and decrease water velocities downstream of the intake facility. (*Id.* at pp. 626-627 and 632.) Similarly, CM-1 proposes the construction of facilities (intakes and tunnels) that will convey Sacramento River water "around" the Delta. The effects of these facilities on the Sacramento River and Delta waterways are similar to those identified with the Peripheral Canal. As a result, authorizations under RHA Sections 9 and 10 will be required.

The Corps' decision to issue or deny a permit under Sections 9, 10, and 14 of the RHA is also based on a "public interest review." (33 C.F.R. § 320.4(a).) This review involves an analysis of the foreseeable impacts the proposed project would have on various public interest factors, as well as an evaluation of the project's benefits against reasonably foreseeable detriments. A permit will not be granted if the Corps determines that it will be contrary to the public interest.

At the very least, based on the current analysis, CM-1 does not meet the criteria for issuance of the applicable RHA permits because it is contrary to the public interest. For

instance, while the BDCP's goal is to "restore and protect ecosystem health, water supply, and water quality..." the BDCP DEIR/EIS does not indicate that CM-1 will provide any significant benefits to these resources. Modeling of Alternative 4, the preferred alternative, demonstrates that operation of the water conveyance facilities would actually result in reductions in Delta exports and CVP/SWP deliveries compared with the No Action Alternative. Additionally, the DEIR/EIS identifies significant and permanent adverse impacts to water quality, Delta communities, agriculture, recreation, and navigation. For instance, operation of the water conveyance facilities envisioned under CM-1 would cause adverse in-Delta water quality effects by contributing to increased concentrations of bromide, chloride, and electrical conductivity. Changes in water quality and habitat conditions could expose fish to impingement, entrainment, and predation, rather than assist species survival and recovery. Further, construction of the facilities will disrupt access to Delta communities and result in the permanent conversion of thousands of acres of farmland, negatively effecting employment, income, and community character.

Additionally, there is a complete lack of evidence to support the notion that any benefits associated with CM-1 are worth the cost to build and operate the proposed facilities, let alone the costs that will be incurred from a resource impact perspective. In light of these impacts, as with the 404 permits needed by the BDCP, the Corps would be compelled to conclude that the BDCP is contrary to the public interest and therefore deny the issuance of any required RHA permits.

II. COMMENTS ON IMPLEMENTING AGREEMENT

The County has reviewed the draft Implementing Agreement (IA) and has a number of concerns about the adequacy of the IA and its ability to meet the requirements of the ESA and NCCPA. As a preliminary matter, the IA is incomplete and does not provide the public with a sufficiently complete picture of the obligations and assurances that will ultimately be included in a final Implementing Agreement. None of the exhibits to the IA were made available with the document on the BDCP website or elsewhere, to the County's knowledge.

An Implementing Agreement provides the permitting agencies with the requisite assurances that the project for which incidental take coverage is proposed has adequate funding, and that all appropriate mitigation and conservation measures will be implemented. The current IA fails to provide those assurances and is otherwise inappropriate.

A. Inadequate Representation for Local Governments

The County reiterates its objections to being relegated to the Stakeholder Council. The County, at least as part of the Delta Counties Coalition, wants a place in a decision-making body of the BDCP for implementation actions.

B. Lack of Participation by USBR

As explained in more detail above, in comments on the BDCP, it does not appear that USFWS/NMFS or CDFW can make all of the required findings to approve the BDCP, particularly because there are no assurances that the USBR will commit to any actions or provide any funding to support the BDCP. The USBR is identified as an Authorized Entity in the IA, yet the IA specifically provides that the IA establishes no obligations on behalf of the USBR. Given the integral nature of the USBR's participation in the BDCP, and the absolute necessity of the USBR's commitment to wheel water through the proposed facilities and to provide funding for the BDCP, the IA must describe the assurances that the USBR will do its part under the BDCP.

Moreover, it is unclear how the IA can provide adequate funding assurances without commitments from the USBR. For example, IA Section 13.1.1 obligates the Authorized Entities, which includes the USBR, to provide funding to implement the BDCP. Yet, and as explained above, the IA specifically provides that (1) the IA creates no obligations for the USBR, and (2) there is no commitment of federal funds for the BDCP. Except, the USBR will not be a signatory to this "contract." If there is insufficient funding because the USBR fails to provide its share of implementing costs, who will cover the shortfall? See also Section 13.2, wherein the IA represents that the USBR has committed substantial resources to ensure implementation of the BDCP. Without being a party to the IA, it is unclear how the IA can make this representation as to the USBR.

C. Inadequate Funding Assurances

As discussed in more detail, above, Section 10 of the ESA requires the USFWS to find that the applicant for an ITP ensure that sufficient funding will be available to implement an HCP. Not only does the IA fail to ensure sufficient funding to implement the BDCP, it expressly recognizes the current lack of federal funding commitments and the possibility that insufficient funds will be available to implement the BDCP. Notwithstanding the recognition that there could be a significant funding shortfall, the IA provides that the Authorized Entities will not be required to provide land, water, or monetary resources beyond their existing commitments. The IA lacks any semblance of funding commitments to implement the BDCP.

Moreover, the IA's continued inclusion of the USBR as an Authorized Entity in the context of commitments and assurances is improper, as the USBR cannot obtain regulatory assurances under Section 10 and, according to the IA, is not committing to the implementation of the BDCP in the means required by the ESA and NCCPA.

D. Improperly Restrains USFWS and NMFS Discretion

The IA repeatedly and improperly attempts to restrain future USFWS and NMFS jurisdiction regarding enforcement of the IA and in future review under NEPA and the ESA.

While Section 14.0 purports to recognize the ongoing authority of USFWS and NMFS, other language in the IA contradicts that recognition. For example, Section 13.2 provides that, even if sufficient funds are not available to implement the BDCP, the Authorized Entities will not be required to provide additional land, water, or monetary resources to support covered species. In addition, Section 20.1.9 eviscerates any subsequent NEPA review of Covered Activities by *requiring* USFWS and NMFS to assert that the BDCP conservation measures fully address any impacts to covered species, even if the science (and monitoring) proves to the contrary. This provision is inappropriate because it constrains the NEPA responsible agencies' judgment and discretion and compels a particular finding by them, even if there is substantial evidence to the contrary. This improper restraint on agency expertise and discretion deprives other federal agencies and the public who fund those agencies of the benefit of NMFS and USFWS expertise and guarantees that NEPA review will not be fully objective or lacking in bias. The consequence of this improper restraint on wildlife agency expertise means other agencies seeking objective input will have to go to outside experts to get an objective review and recommendations.

E. Insufficient Detail Regarding Decision Tree Process

The Delta Stewardship Council's Delta Science Program Independent Scientific Review Panel was highly critical of the Decision Tree process set forth in IA Section 10.2.1. The Draft IA fails to adequately address the concerns raised by the ISB.

F. Improper Exclusion of Compensatory Mitigation Critical Habitat

Section 20.1.6 provides that critical habitat will be excluded from the Plan area only if the BDCP adequately protects such habitat. If critical habitat is included in the plan area, then necessarily the BDCP does not adequately protect the habitat and species that depend on it. Thus in the event critical habitat *is* included, it is inconsistent with the ESA to say no compensatory mitigation or minimization measures will be required of the permittees. Due to the vast Plan area, this provision would allow the most significant factor affecting the success of listed species – water operations and diversions – to continue to harm them, in direct conflict with the ESA.

III. COMMENTS ON THE BDCP DEIR/EIS

A. The DEIR/EIS Fails to Provide an Accurate and Objective Assessment of the Project's Impacts and Is a Post-Hoc Rationalization for the Project Proponents' Decision to Divert Water in the North Delta

The purpose of an EIR is to "demonstrate to an apprehensive citizenry that the agency has . . . analyzed and considered the ecological implications of its action." (*No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 86.) As indicated throughout this letter, the DEIR/EIS fails in its fundamental purpose. As explained in detail in these comments, and those of independent experts, the DEIR/EIS, and the BDCP Effects Analysis that it

incorporates, are neither accurate nor objective. It is replete with critical errors and omissions and repeatedly overstates positive outcomes and downplays the BDCP's negative effects. The net result is a document that appears tainted by a pro-project bias and thus does nothing to demonstrate to an apprehensive public that the public agencies promoting the BDCP have objectively and meaningfully considered the project's environmental impacts. The DEIR/EIS's failure to provide adequate, balanced scientific analyses, and use of incorrect, biased data, which resulted in unfounded conclusions, has deprived the public and decisionmakers of significant information about the relative merits of the BDCP, and its potential environmental outcomes.

Any concerns that might arise from examination of the document are only exacerbated by the lead agencies' project advocacy before and during the environmental review process. As just one example, since before the DEIR/EIS was released, and months before any comments on the DEIR were due, the lead agencies have been blogging on a taypayer-funded public entity website about the purported project benefits, and dismissing any concerns about potential environmental impacts.[3]

Among the numerous pro-project statements on the lead agencies' blog were statements that

> The BDCP . . . represents the most comprehensive, science-based effort to date to restore the Delta ecosystem, protect threatened or endangered species, and plan for climate change and natural disasters. More information on the BDCP economic benefits can be found in the Draft Statewide Economic Impact Report. More information on the BDCP benefits to the Delta ecosystem can be found in BDCP Chapter 3: Conservation Strategy.

The very title of the blog "Correcting Stubborn Myths," its use of bold, underlined and all capital letters in lengthy defense of the DEIR/EIS, as well as definitive assertions about project impacts in advance of any public comment on the document (let alone the adoption of findings as required by CEQA), plainly indicates that the project decisionmakers have made up their minds about the BDCP's impacts and that approval is a foregone conclusion, making the CEQA process a post-hoc rationalization for project approval.

B. The Size and Structure of the DEIR/EIS Buries Essential Information and Violates CEQA and NEPA Requirements that It Actually Inform the Reader

CEQA requires that EIRs should be organized and written in a manner that makes them "meaningful and useful to decisionmakers and to the public." (Pub. Resources Code,

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[3] *See, e.g.*, http://baydeltaconservationplan.com/news/blog/14-01-10/Correcting_Stubborn_Myths_Part_II.aspx, accessed May 1, 2014; attached as Exhibit C.

§ 21003(b).) As stated by a leading treatise on CEQA, "The legal adequacy of an EIR depends on whether it addresses significant environmental issues and the quality of its analysis on those issues, not the quantity of information it provides." (CEB *Practice Under the California Environmental Quality Act*, 2nd Ed., §11.20, p. 545 (2/09.) Thus an EIR should be written in a way that readers are not forced "to sift through obscure minutiae or appendices" to find important components of the analysis. (*San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 659; *California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219, 1239.) "Documents that are confusing in their presentation are incomprehensible to the very people they are meant to inform." (*San Franciscans for Reasonable Growth v. City & County of San Francisco* (1987) 193 Cal.App.3d 1544, 1548.)

The National Environmental Policy Act (NEPA) incorporates a similar "readability" requirement. NEPA's implementing regulations require an EIS to "be written in plan language ... so that decisionmakers and the public can readily understand them." (40 C.F.R. § 1502.8.) This regulation requires that an EIS be "organized and written so as to be readily understandable by governmental decisionmakers and by interested non-professional laypersons likely to be affected by actions taken under the EIS." (*Oregon Envtl. Council v. Kuzman* (9th Cir. 1987) 817 F.2d 484, 494.) While technical material included in an appendix may be exempted from the "readability requirement," an agency may not avoid its obligation to provide a clear assessment of a project's environmental impacts simply by placing complicated information or analyses in an appendix. (*Id.* at p. 494.)

Paradoxically, the BDCP EIR/EIS is both overly long and complex and yet is lacking in substance or meaningful analysis and information on key issues of importance to affected entities and individuals. The BDCP EIR/EIS thus violates both NEPA's "readability" requirement and CEQA's mandate that an EIR clearly communicate meaningful information in a way that adequately informs decisionmakers and the general public.

An example of how unworkable the analysis is to the public and decisionmakers is the presentation of the project baseline. An accurate baseline is critical, as it is the foundation for the entire impact analysis. In order to understand several key assumptions underpinning the EIR/EIS baseline – what level of SWP and CVP exports were assumed to occur under "existing conditions" – the reader is required to scour the following documents:

- EIR/EIS Chapter 3: Discussion of Alternatives (237 pages);
- EIR/EIS Appendix 3D (Defining Existing Conditions, No Action Alternative, No Project Alternative and Cumulative Impact Conditions (112 pages);
- EIR/EIS Appendix and Biological Assessment on the Continued Long-Term Operations of the Central Valley Project and the State Water Project (August 2008) as modified by the June 2009 NMFS BiOp and the December 2008 USFWS BiOp;

- EIR/EIS Appendix 5A, BDCP EIR/EIS Modeling Technical Appendix;

- EIR/EIS Appendix 3A, Identification of Water Conveyance Alternatives, Conservation Measure 1. (*See* Appendix 3D at pp. 3D-2-3, describing location of assumptions regarding existing conditions).

Yet even after spending several hours reviewing these documents, County representatives were unable to determine what the precise assumptions were that the DEIR/EIS relied on. The County's specific concerns regarding the DEIR/EIS's assumptions and evidence supporting its baseline are explained in further detail in section II.E below. Additional comments demonstrating the many obscurities, internal inconsistencies and overall problems with the readability and understandability of the document are presented in our detailed comments in section III.M, below.

The County is not the only entity to identify significant problems with the readability and presentation of information in the BDCP and DEIR/EIS. The Delta Science Program Independent Scientific Review Panel (Science Panel), which is comprised of seven recognized experts in the areas of hydrodynamics and fisheries biology, reviewed the BDCP Effects Analysis, upon which the DEIR/EIS analysis is based, and found significant problems with the both the quality of data and conclusions and how that data was used (or more accurately, misrepresented), in the DEIR/EIS. (*See* Delta Science Program Report, Ex. B.) The entire report is attached, but just some of the problems noted by the Science Panel in its report to the Delta Science Program include: [t]he long, highly detailed document was difficult to review and comprehend." (Ex. B, Executive Summary at p. 5.) The analysis was "fragmented in its presentation and sometimes inconsistent with the technical appendices." (*Id.*) Moreover, the "inefficient organization and incomplete cross-referencing among sections within the Effects Analysis . . . as well as the larger BDCP planning documents make interpretation of anticipated net effects of BDCP implementation difficult at best." (*Id.*)

The Science Panel specifically criticized the fact that the effects analysis "does not represent a stand alone document and relies extensively on associated appendices and chapters for presentation of scientific information, with insufficient guidance for the reader." (*Id.*) Thus, "the [Science] Panel universally believes" that the BDCP effects analysis "inadequately conveys the fully integrated assessment that is needed to draw conclusions about the Plan, in part because of incomplete information on factors affecting covered species." (*Id.*) Overall, the Science Panel opined that "[t]he lack of accessibility to information within the [effects analysis] or clear reference to supporting detail inhibits rather than elucidates comprehension of the findings and thus conveys an unsatisfying 'trust us' message." (*Id.* at p. 6.) The Science Panel's comments demonstrate that the DEIR/EIS is not "organized and written so as to be readily understandable by" even highly specialized professionals, let alone the governmental decisionmakers and interested non-professional laypersons likely to be affected by actions taken under" the document." (*Oregon Envtl. Council v. Kuzman*, *supra*, 817 F.2d at p. 494.)

The Delta Independent Science Board concurred in the Science Panel's findings and issued its own highly critical report. (Delta Independent Science Board Review of the Draft BDCP EIR/EIS and Draft BDCP, May 15, 2014, (ISB Report) Exhibit D.) The Independent Science Board found the DEIR/EIS was "not organized in a way that can usefully inform the public and policy discussions." (ISB Report, p. 12.)

C. The Lack of a Complete Project Description Prevents Understanding of the Scope and Severity of Project Impacts

An EIR project description must include all relevant parts of a project, including activities that are reasonably foreseeable consequences of the project. An EIR cannot be adequate when its project description is not accurate, stable, and finite. The draft BDCP and DEIR/EIS do not meet this standard, as a few examples demonstrate.

Nearly every BDCP project element other than the Delta tunnels is subject to further development following later EIRs, more studies or uncertain adaptive management. Most notably, CMs 2-22 are lacking in any meaningful description of the range of possibilities or even approximate actions that might occur. The lack of any detail about these actions prevents the County from evaluating their effectiveness and their impacts, and especially the BDCP's claim that these measures would counterbalance any negative effects of CM-1, the north Delta diversions and isolated conveyance.

There also is no description of how SWP and CVP facilities upstream of the Delta would operate with the proposed tunnels. The "high outflow" scenario that is possible under the critical "decision tree" not only relies on undefined water transfers, but also assumes that the CVP would accrue undefined obligations to the SWP under the COA. (BDCP, p. 3.4-19.) The studies that would drive the decision tree's results "have not yet been determined." (BDCP, p. 3.4-32.)

The new bypass flow rules for the north Delta intakes are not completely spelled out in their entirety. Rather the BDCP only describes how they will operationally impact various species and operational aspects. "COA" does not have an identified acronym in the BDCP and is not identified as the Coordinated Operations Agreement until Appendix A.5. These rules have the potential to substantially affect operation of the Freeport Regional Water Authority (FRWA) intake, and adversely affect water quality and supply in the Delta. Without any details about the rules or analysis of their broader impact, the County is unable to determine whether and to what extent County resources may be affected.

Even the structure and operation of the proposed Implementation Office and related groups, councils and teams is unclear. (BDCP, Chapter 7.) The BDCP fails to clearly and concisely articulate where ultimate decisions are made and, while the BDCP acknowledges permit compliance will be the responsibility of the Permittees, Chapter 7 appears to create a confusing delegation of responsibilities that will make it difficult to track and ensure compliance. In addition, it is unclear what is intended by the discussion in Section 7.1.9,

regarding Support Entities. (BDCP, p. 7-18.) Does the BDCP anticipate any implementation actions by the County of Sacramento? If so, the BDCP should clearly identify how Sacramento County would be expected to engage in the BDCP. Section 7.2.8 Coordinating with Local Governments, Delta Protection Commission, and Other Public Agencies is also unclear. This section contemplates overlap in the BDCP with other local HCPs and suggests the potential for having local agencies assist the BDCP in the acquisition of conservation lands for the BDCP. Yet, there is no clear articulation of what the BDCP anticipates that local jurisdictions would be expected to do, and whether those local agencies would be willing to assist in the implementation of BDCP. Because of uncertainties like these, the draft BDCP and DEIR/EIS cannot give the County or the public an adequate understanding of the project or its possible effects.

D. The Incorporation of Mitigation Measures in the Project Description Violates CEQA

The DEIR/EIS improperly incorporates many necessary mitigation measures into its project description, characterizing them as "environmental commitments," and relies on this tactic to conclude potential project impacts would be less than significant or otherwise reduced. (DEIR/EIS, Appendix 3B, p. 3B-1.) However, characterizing the "environmental commitments" as part of the project violates CEQA. In fact, the "environmental commitments" are designed to reduce or eliminate numerous project impacts, including significant impacts to air quality, water quality, fish and aquatic resources, public health, and a host of other impact areas. There is hardly a resource area for which environmental commitments were not claimed to be factored into the impact analysis. (*See* DEIR/EIS, Table 3B-1, pp. 3B-2 – 3B-6.) Despite their critical role in reducing the BDCP's impacts, the "environmental commitments" are not even described in the DEIR/EIS itself or evaluated as part of the impact analyses but are relegated to one of the many appendices. (*See* DEIR.EIS, Appendix 3B, stating that environmental commitments "will not be restated in the impact analysis for each resource chapter but instead will be incorporated by reference." (*Id*).) Whether characterized as part of the project description or mitigation, burying the environmental commitments in an appendix subverts CEQA's informational mandate by denying the public the opportunity to review and understand them in the context of the DEIR/EIS analysis. Merely assuming their implementation will reduce impacts, without any analysis or evidence to support those assumptions, also prevents the public from understanding the full scope of the impact of the proposed actions or commenting on the effectiveness of the environmental commitments as mitigation.

The DEIR/EIS misleadingly tries to downplay the significance and uncertainty associated with these environmental commitments by characterizing them as "design features, construction methods, and other BMPs" that "tend to be relatively standardized and are often already compulsory. They represent sound and proven methods that can avoid or reduce the potential effects of an action, for example installation of a sedimentation barriers and other stormwater protections during grading – in contrast to mitigation measures that would be necessary to be included as part of project approval to offset the environmental effects of the

proposed action." (DEIR/EIS, p. 4-13, lines 4-12). However, examination of Table 3B-1, where the commitment titles are linked to generic issue areas, reveals that the environmental commitments are not limited to design features or construction methods or BMPs, and are not limited to "proven methods" to avoid or reduce environmental impacts. Indeed, the commitments are applied to some of the project's most serious impacts, including impacts to endangered species and human health.

For example, the environmental commitments include "Develop and Implement Fish Salvage and Rescue Plans," and "Develop and Implement a Barge Operations Plan" that will address sensitive resources, responsibilities, avoidance, performance, and contingency measures. (*Id.*) Because such plans are not developed, and involve the exercise of substantial discretion by the project proponents themselves during implementation, they are *not* similar to compliance with adopted standards such as building codes, which have been vetted through the code adoption or other regulatory processes. Further, characterizing these measures as "commitments" is inaccurate and misleading because not only are they not set forth in the project description but there is no firm commitment that they be implemented. (*See* Appendix 3B, stating "[t]he BDCP proponents will see to it that these measures will be implemented *as appropriate*, depending on the location of construction and surrounding land uses." (*Id.*).)

The project air quality impact analysis provides a particularly telling example of how the incorporation of the "environmental commitments" into the project description resulted in a failure to evaluate or disclose actual project impacts. With respect to construction emissions, a major concern to Sacramento County due to the number of massive facilities proposed to be built within County limits and adjacent to County residents, animals and farms, the DEIR/EIS states, "[e]missions estimates include implementation of environmental commitments (see Appendix 3B, *Environmental Commitments*)." (DEIR/EIS, p. 22-48, lines 13-15.)[4] Not only does the DEIR/EIS thus fail to disclose the total amount of hazardous pollutant emissions and greenhouse gases that would be released by the project, but it does not even provide for a reasonable comparison, should the reader choose to scour the appendices to try to unearth the estimated reductions from the environmental commitments, as they are provided in different units: "Although emissions are presented in different units (pounds and tons), the amounts of emissions are identical (i.e., 2,000 pounds is identical to 1 ton)." (DEIR/EIS, p. 22-48, lines 15-16.)

Moreover, the commitments themselves are inadequate as mitigation because they are fraught with uncertainties and off-ramps that would allow for no or undefined mitigation to occur, or have the potential to result in new significant effects that are not analyzed in the DEIR/EIS but subject to possible future environmental review. As but one example, the measure 3B.1.19 Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM) and

[4] *See also* "Construction Emissions Approach and Threshold": "Project-level GHG reduction measures (CO-1 and CO-2) included in the CAP have also been incorporated into the project design as environmental commitments (*See* Appendix 3B, *Environmental Commitments*)." (DEIR/EIS, p. 22-44, lines 18-10.)

Dredged Material (DEIR/EIS, Appendix 3B, pp. 3B-34-40) is proposed to occur somewhere over a *10 mile radius* of the construction sites (*See* DEIR/EIS, p. 3B-35, lines 10-11.) No detail is provided about the possible location of these disposal sites, but the DEIR/EIS acknowledges that disposal might occur in wetlands and vernal pool areas, which would be a significant impact. Nor is any information provided regarding the volume of RTM decant liquids that will need treating, the proposed method for treating them, or where they would be disposed of. Lacking any information about the specific sites that are likely to be available for spoils storage and disposal, or any information about the treatment of decant liquids, and what specific assumptions were used in applying this environmental commitment to the analysis of project impacts, it is impossible for the County to assess the scope of potential impacts to agricultural lands, wetlands, and other important resources.

Another example is the measure to "Develop and Implement a Barge Operations Plan." (DEIR/EIS, Appendix 3B, p. 3B-192.) This measure defers the development of all specific elements of the mitigation to the future and even acknowledges that impacts could occur. (*See, e.g.,* DEIR/EIS, pp. 3B-20, lines 38-39 - 3B-21 lines 1-2.) Moreover, no standards are set for mitigation for impacts that result if the "avoidance measures" called for are not successful. Section 3B.1.8.5 *Contingency Measures*, merely provides, "[i]n the event that the Performance Measures are not met, DWR will coordinate with NMFS, USFWS, DFG, and California Regional Water Quality Control Board (RWQCB) to determine appropriate rectification or compensation for impacts to aquatic resources as set forth above." (SB-22, lines 41-11.) "Coordinating" to "determine appropriate rectification or compensation for impacts" are merely vague platitudes that provide no evidence upon which the public can assess whether this measure will adequately mitigate for significant impacts to aquatic resources.

As another example, the description of the Fish Salvage Plan "commitment" states,

> In the event that the proposed methods are found to be insufficient to avoid the loss of an undue number of fish, the qualified biologist will revise the methods to minimize further losses and to offset those losses beyond the acceptable number. If fish rescue cannot be attempted (e.g., because of safety), a visual survey from the bank will be undertaken to document fish presence and the likely extent of effects. Binoculars will be used to identify fish; however, this method may not be feasible, if water clarity is low. (DEIR/EIS, Appendix 3B, p. 3B-18.)

This discussion reveals that the BDCP proponents do not know if the environmental commitment will be effective, or even the extent of its likely effects. Identification of the impact may not even be feasible. Further, the measure does not even define what is meant by "minimize" losses or quantify what would be considered an "undue number of fish" that might be lost. The lack of critical information about the scope of potential fish losses, the threshold that would constitute a significant impact (more specific than an "undue number"), and recognition that the measure may not actually work, make it unreasonable for the BDCP

to rely on this so-called commitment for any impact reduction. The DEIR/EIS must address these uncertainties.

The DEIR/EIS's reliance on the environmental commitments is complicated by the fact that, like so many other issues of concern in the BDCP, information about the commitments is so scattered throughout the DEIR/EIS and its appendices that it is not reasonably accessible to the reader. For example, the Fish Salvage and Rescue Plan is described generally in Appendix 3B, but there it is further noted that "[t]his commitment is related to AMM8, Fish Rescue and Salvage Plan, described in BDCP Appendix 3.C." (DEIR/EIS, p.3B-17, lines 29-30.) Forcing the reader to jump from appendix to appendix to review and try to piece together an understanding of a mitigation measure violates both NEPA's readability requirement and CEQA's goal of promoting informed decisionmaking.

The environmental commitments are plainly mitigation measures. CEQA requires that mitigation measures be separately identified and analyzed. This analytical procedure is necessary in order for the lead agency: (1) to make required findings regarding potentially significant project impacts; (2) to determine whether mitigation measures are required; (3) to adequately evaluate the range or efficacy of required mitigation measures or project modifications; and (4) to trigger the required adoption of an enforceable mitigation monitoring program. The DEIR/EIS's failure to discuss the significance of project impacts apart from these proposed mitigation measures is a fatal "structural deficiency in the EIR" which resulted in a failure to disclose the full scope of project impacts and to consider whether other possible mitigation measures would be more effective. (*Lotus v. Department of Transportation, et al.* (2014) 223 Cal.App.4th 645.) The same tactic, employed by Caltrans, was rejected by California Court of Appeal, which found it to be a "short-cutting of CEQA requirements" that subverted CEQA's purpose by omitting material necessary to informed decision-making and public participation; in short, it "preclude[d] both identification of potential environmental consequences arising from the project and also thoughtful analysis of the sufficiency of measures to mitigate those consequences." (*Id.*)

In order for the public to understand the full scope of the BDCP's impacts, the DEIR/EIS must be revised to clearly describe the environmental commitments in the context of the individual impact analyses, and explain exactly how and to what degree they are expected to reduce project impacts. Impacts must be measured and quantified without consideration of the environmental commitments, before any determination is made regarding their effect. This analysis and supporting evidence must be included in the body of the DEIR/EIS, and the document must be recirculated for public review and comment.

E. The EIR Uses an Inflated Baseline That Fails to Incorporate Relevant Existing Conditions

1. Inflating Existing Exports Minimizes Impacts

The DEIR/EIS is unclear what level of exports was used for the existing conditions simulation but it appears to have relied on full CVP and SWP contract deliveries. If this is the case, then the baseline likely has been inflated with respect to assumptions about the amount of water exports occurring under both existing conditions and the No Project Alternative, which has the effect of minimizing project impacts. With regard to SWP deliveries, it is well recognized that SWP contracts are written for far more supply than has ever been, or ever will be, delivered. (*Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715.) Moreover, SWP deliveries have declined significantly in recent years since various regulatory constraints were adopted, including the federal biological opinions.

Appendix 3D (p. 3D-6), Table 3D-1, *Summary of SWP and CVP Operations Included in Existing Conditions and No Action Alternative for the BDCP EIR/EIS*, states that the existing conditions with respect to SWP water demands are "[b]ased on full/variable Table A amounts including transfers through 2008," as well as other factors. It is not clear whether the existing conditions are based on an average of actual deliveries over a period of record (Inception of SWP through 2008? Some other period?), or a single year (2008?), or whether they were based on the full Table A amounts. If the existing conditions have been inflated over conditions representative of actual deliveries within the past five years, based on maximum exports, then project impacts necessarily will have been minimized.

What is the evidence supporting the amount of contract deliveries assumed in the existing conditions simulation? An accurate baseline would have relied on the lower exports allowed under the constraints of existing water quality and fisheries standards, including the fall X2 salinity standard and 2008 Delta Smelt Biological Opinion (see comments below).

2. Omission of the Fall X2 Salinity Standard Requires Revision and Recirculation of the DEIR Modeling and Analysis

The CEQA existing conditions did not assume full implementation of the fall X2 salinity standard contained in the 2008 Delta Smelt Biological Opinion because it had been ruled deficient by a trial court judge. (DEIR/EIS, Appendix 3D, p. 3D-2.) The fall X2 standard "in certain water year types, can require large upstream reservoir releases in fall months of wet and above normal years to maintain the location of the X2 at approximately 74 or 81 river kilometers inland from the Golden Gate Bridge." (DEIR/EIS, Appendix 3D, p. 3D-2.) The location of X2 directly affects how much water can be exported from the Delta. On March 13, 2014, the United States Court of Appeals for the Ninth Circuit upheld the USFWS's 2008 biological opinion, which concluded that the long-term operations plan for the CVP and SWP would jeopardize the continued existence of the Delta smelt and its habitat

in the Sacramento-San Joaquin Delta. (*San Luis & Delta-Mendota Water Authority v. Jewell*, 2014 U.S. App. LEXIS 4781 (9th Cir., Mar.13, 2014).) The practical impacts of this decision include potential decreased water exports and deliveries via the Projects to central and southern California. For the DEIR/EIS, the failure to include full implementation of the fall X2 salinity standard undermines the entire hydrologic and water quality modeling analyses. The reinstatement of the Delta Smelt Biological Opinion constitutes significant new information requiring revision and recirculation of the DEIR/EIS.

3. The DEIR/EIS's Use of a Future Baseline Results in a Failure to Evaluate Potentially Significant Impacts of Concern to the County

For hydrologic impacts, none of the alternatives was evaluated using an actual Existing Conditions model scenario. Unlike typical CEQA analysis, where alternatives are imposed on Existing Conditions, the alternatives were only evaluated against hypothetical future conditions representing river hydrology as it is projected to exist in 2060. These long-term baseline conditions incorporate assumptions about changing conditions that will not be felt for decades, including (for NEPA analysis) the impacts of climate change and future upstream water demands due to growth north of the Delta. By contrast, the BDCP water diversions will take effect in the near term, and the high level of new water exports from the north Delta have the potential to have a significant impact on river levels and water quality in and above the Delta. As noted in our specific comments on the Recreation analysis (*see* comments on DEIR/EIS Chapter 15 - Recreation, below), without an evaluation of impacts against current conditions, the County has no way to evaluate the nature and extent of potential impacts to recreation, as well as other impacts to County resources, such as agricultural water supply. In this respect the use of an exclusive future baseline omits key information necessary to informed decisionmaking and renders the EIR inadequate.

F. The Project Will Significantly Increase the Risk of Bird Strikes to Airplanes, Resulting in Significant and Unavoidable, and Thus Unacceptable, Impacts to Human Health and Safety

Both through the construction of CM-1 and the creation of new habitat in CM-2 and other CMs, the BDCP will substantially increase the risk to human health and safety from collisions between birds and aircraft ("bird strikes"). The Sacramento County Department of Airports (Airports) has prepared detailed comments on the DEIR/EIS, which are attached to this letter. (February 11, 2014 Letter from J. Glen Rickelton, Sacramento County Department of Airports, to Don Thomas, Sacramento County Department of Water Resources (Airport Comments), attached as Exhibit E.) Airports is subject to regulations and policies promulgated by the Federal Aviation Administration (FAA) for the safe operation of public use airports. The FAA requires review of all proposed land use practices within a five-mile radius of an airport's Air Operations Area for the potential to increase wildlife hazards. This provision applies to commercial service airports such as Sacramento International Airport, as well as any airport that has received federal grant-in-aid funding for infrastructure improvements. The DEIR/EIS Plan Area is within a five-mile radius of three airports

operated by Airports: Sacramento International, Sacramento Executive, and Franklin Field airports.

One of the conditions of most concern to the FAA is the potentially synergistic effect of two or more different land uses that would not, by themselves, be considered hazardous wildlife attractants or that are located outside specified separation distances, when attractants are aligned in such a way as to induce wildlife movement through the airport and/or surrounding airspace. An example would be a large foraging area such as agriculture on one side of an airport and a lake or wetland on the opposite side of the airport. Many aspects of the BDCP have the potential for increasing synergistic wildlife impacts on the County's airports. The BDCP thus has potential for a significantly greater number of bird strikes due to the anticipated increase in wildlife habitat near County-operated airports. As fully outlined in Airports' comment letter, the DEIR/EIS fails to evaluate the full scope of potential impacts from bird strikes and thus minimizes the significant and unavoidable impacts to human health and safety that will occur as a result of the BDCP as well as the potential impacts to existing wildlife.

G. The DEIR/EIS Fails to Provide an Accurate and Objective Assessment of the Project's Impact on Listed Fish Species

A key purpose of the BDCP is to maintain or increase water exports from the Delta. Improbably, it proposes to do this while mitigating for the decades of significant adverse impacts to fisheries caused by such exports, which have led to multiple species being listed under the federal ESA as endangered or threatened. It is not surprising, then, that both in the selection and characterization of data and impact determinations, the DEIR/EIS reflects significant bias in favor of the BDCP. In many cases the bias is undetectable to the average reader or decisionmaker because the inconsistencies and mischaracterizations are buried in reams of data and thousands of pages of highly detailed technical appendices. Nevertheless, the state's own experts, who have been charged with review of the document, have identified significant problems with the DEIR/EIS that undermine the analysis and impact determinations and the integrity of the document.

The Science Panel has severely criticized the accuracy and integrity of the BDCP Effects Analysis, which provides the basis for the DEIR/EIS's determinations about the project's impacts on fish. In its most recent critique of the Effects Analysis the Science Panel stated that it "universally believes" that the BDCP effects analysis "inadequately conveys the fully integrated assessment that is needed to draw conclusions about the Plan, in part because of incomplete information on factors affecting covered species." (Delta Science Program Report, Ex. B, Executive Summary at p. 8.) Its conclusion was that "the effects analysis is poorly substantiated" and "many of the critical assumptions in modeling effects and justifications behind the supposed benefits of the conservation measures are highly uncertain." (*Id.* at p. 6.)

The Science Panel also objected to the "disconnect between the assessments of the level of scientific uncertainty" presented in the Effects Analysis compared to the characterizations of the technical appendices." (Ex. B, Executive Summary at p. 8.) "In many cases," the Science Panel felt the Effects Analysis "did not sufficiently acknowledge or articulate" the reality of the "high uncertainty" associated with the BDCP's claims that it would result in beneficial effects. (*Id.* at p. 5.) Notably, the Science Panel found that the "net effects analysis tends to overreach conclusions of positive benefits for covered fish species." (*Id.* at p. 7.) The report thus noted a "broad consensus" among the Science Panel that the effects analysis "does not adequately acknowledge the extensive uncertainty associated with the BDCP's assumptions and predictions. In its current form . . . in the conclusions the level of uncertainty is often downplayed." (*Id.* at p. 8.) In situations in which an array of outcomes may be possible, only the more beneficial outcomes are used in conclusions about the BDCP." (*Id.*)

H. The Inadequate Fish Screen Design Will Fail to Protect Fish

A major problem of concern to the County, identified by an expert in fish screen design and anadramous fishes, is that the proposed fish screen design and placement, flush to the banks on a relatively straight section of the river, is not adequate to protect juvenile salmon and could cause high levels of entrainment and impingement. The expert provides evidence and analysis to explain why, to provide adequate protection for migrating juvenile salmonids, and accommodate high levels of sediment in the diversion water, the diversion structures and associated sedimentation basins will need to be relocated to the outside edge of a sharper river bend, or angled out into the river. Moving the intake structures to a sharper bend in the river, increasing their size and/or changing their design by angling them farther out into the river, would all be substantial changes to the project that have the possibility of resulting in new or substantially more severe significant impacts than were considered in the DEIR/EIS. Any of these changes could have significant impacts to biological resources, transportation, aesthetics, agriculture, historic resources, navigation, recreation, and flood control, just to name a few.

The expert also explains why the new north Delta intakes are likely to be a predation hotspot and will simply shift existing impacts from the south Delta to the north and increase them, due to changes in fish screen operation (changes in seasonality, involving greater diversions at the season when greater numbers of protected fish species are present) and the increased volume of exports. The expert's analysis of the proposed intakes' inability to perform as intended (with regard to protection of fish species), constitutes significant new information revealing substantially more severe significant impacts of the project. CEQA requires that the DEIR/EIS be revised and recirculated to address this new information.

I. The BDCP Improperly Relies on Insufficiently Defined Conservation Measures to Mitigate Adverse Effects of Water Exports

The BDCP's numerous significant impacts require extensive mitigation, both in the form of CMs 2-22 and additional mitigation for impacts identified in the DEIR/EIS. Mitigation measures must be clearly effective in reducing impacts to a less than significant level. (*Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1115.) Mitigation measures that require development of a mitigation plan based on future studies are legally inadequate if they do not describe the anticipated management actions and do not include management guidelines or performance standards. (*Preserve Wild Santee v. City of Santee* (2012) 210 Cal.App.4th 260 [plan for active habitat management failed to describe anticipated management actions or include standards or guidelines for actions that might be taken].)

A recurring criticism of the BDCP is its reliance on the untested or unproven assumption that habitat restoration can substitute for flow. The California Advisory Committee on Salmon and Steelhead has stated that findings approving the BDCP as an NCCP cannot be made because "[t]he concept of habitat restoration measures to offset impacts from increased water withdrawals from the Delta (increased "reliability") is not supported by science. . . ." (Helliwell Letter, Ex. A, *supra*, at p. 4.) The Science Panel criticized the effects analysis, which is the foundation for the DEIR/EIS impact determinations as to fish species, for not sufficiently acknowledging or articulating the "reality" that there are critical uncertainties associated with presumed beneficial effects of tidal wetland restoration." (Delta Science Program Report, *supra*, Ex. B at p. 5.) Thus the Science Panel found: "Much of the conservation measures center around restoration activities and management actions to improve current conditions. Our impression, therefore, is that the foundation of the BDCP is weak in many respects . . . ." (*Id.*)

In addition to actually reducing significant environmental impacts, mitigation measures must be financially feasible. As discussed in our comments on the BDCP itself, above, no funding plan has been identified, or costs estimated, for the extensive mitigation required for the BDCP. Lacking evidence to support the assumptions that the proposed mitigation, including the conservation measures themselves, will be effective or actually can implemented, there is no basis for concluding that many diversion-related project impacts can be mitigated below a level of significance. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 [rejecting mitigation measure that required project applicant to develop a plan for reducing greenhouse gas emissions and to consider a set of undefined and untested measures of unknown efficacy]; *Anderson First Coalition v. City of Anderson* (2005) 130 Cal.App.4th 1173, 1187 [rejecting mitigation due to uncertain funding].)

J. The DEIR/EIS Fails to Examine a Reasonable Range of Alternatives

The alternatives selected do not represent a reasonable range because all the alternatives are designed to further the BDCP proponents' goal of maximizing water supply reliability, and no alternatives are designed to meet the coequal goal of recovery of species.

Moreover, despite the fact that many of the conservation measures will have significant impacts, the DEIR/EIS evaluates no alternatives to any of the conservation measures other than CM-1.

The DSC in its July 11, 2013 comments on the second administrative draft EIR/EIS suggested the EIR evaluate an alternative conservation measure that would provide a more natural Delta flow regime, as a means of lessening the BDCP's impacts on in-Delta water quality. (*See* July 11, 2013 Letter to Russell Stein from Dan Ray) (DSC Letter), attached as Exhibit F.) Other experts have emphasized that enhanced flow and flow modifications to mimic the natural hydrograph are the single most important action that can be taken to improve water quality and fisheries habitat in the Delta. Such an alternative could be achieved not only through reduced Delta exports, but by water transfers or releases from new surface storage projects.

The DEIR/EIS also fails to consider any alternative that would reduce the BDCP's significant effect on agricultural land. As suggested by the DSC, the DEIR/EIS should consider an alternative designed to minimize agricultural land losses, such as emphasizing restoration of tidal marsh at Suisun Marsh. This alternative has the potential to mitigate both loss of agricultural land as well as the BDCP's adverse water quality effects by dampening saltwater intrusion into the Delta.

The failure to evaluate alternatives that would avoid or substantially lessen the significant impacts of any conservation measures other than CM-1, or one that would reduce the BDCP's significant effect on agricultural lands, violates CEQA's mandate that an EIR evaluate a reasonable range of alternatives to the project or to its location that would feasibly attain most of the project's basic objectives while reducing or avoiding any of its significant effects.

K. The BDCP Abuses the Program EIR Process

The BDCP abuses the intent of CEQA's program EIR process. The decision to perform a project-level analysis of CM-1 but only a program level analysis of CMs 2-22 appears designed to avoid meaningful environmental review and evaluation of the feasibility and secondary impacts associated with what is essentially mitigation for the new diversion and conveyance project impacts. By purporting to evaluate the impacts of CMs 2-22, the substance of which is undefined but critical to understanding of project impacts, the EIR arbitrarily concludes that many impacts of CMs 2-22 could be significant and unavoidable. This determination effectively insulates these CMs from meaningful future environmental review because the BDCP proponents may find that impacts of the CMs once refined are "within the scope" of the BDCP program EIR.

The decision whether supplemental environmental review will occur, and at what level, is left to the BDCP proponents. This is akin to the fox guarding the hen house as there is no clear process by which the public can review and comment on future decisions regarding

the need for additional environmental review. The process for review of future decisions is set forth in Appendix 31A. Nowhere in Appendix 31A is there any guarantee for public review of, or comment on, environmental determinations regarding future changes or additions to the BDCP. As noted throughout the County's comments and by many other commenters, the BDCP and BDCP DEIR/EIS do not contain information sufficient, or in a sufficient format, to adequately inform decision-making about project impacts. Due to the lack of meaningful information about the substance of about CMs 2-22 in this EIR, or analysis of their impacts, future actions related to these "conservation measures" should be treated as new CEQA projects, subject to all the requirements for public review and notice that would apply to a new project, and not as modifications to the BDCP as vaguely identified in this DEIR/EIS.

L. The Mitigation Monitoring and Reporting Program Should Be Circulated for Public Review and Comment

The DEIR/EIS generally discussed responsibility for the various CMs. CM-1 is to be managed by DWR; CM-2 will be managed by DWR and USBR, while CM 3-22 will be managed by a larger group of agencies with the specific responsibilities to be described in the Mitigation Monitoring and Reporting Program (MMRP) that has yet to be issued. For the public to understand how the proposed mitigation will be accomplished, it is important to know who will be responsible for implementing it and how. This is especially critical given the nature of the project – authorization for 50 years of take of endangered species. The USBR is not a party to the draft Implementing Agreement, which casts doubt on its role in managing any of the CMs. The DEIR/EIS should explain whether and how DWR alone could manage CM-2 without USBR. Ultimately, the MMRP should be circulated for public review and comment prior to its adoption.

M. Comments on Specific Chapters of the DEIR/EIS

Due to the vast length of the DEIR/EIS and number of related documents (including appendices and ancillary studies) which it states constitute the DEIR/EIS, it was not feasible for County staff to conduct a detailed review of the analysis of all alternatives in the time provided for public review and comment. Therefore the County's comments focus largely on the analysis and impacts of the preferred project, Alternative 4. To the extent other alternatives are the same or substantially similar to Alternative 4, the County's comments on the DEIR/EIS and/or its objections to Alternative 4 apply equally to those other analyses and alternatives. Similarly, the County's discussion of proposed mitigation measures focuses on language used in mitigation as presented to mitigate impacts of Alternative 4. To the extent that the same or substantially similar mitigation measures are proposed for other alternatives, these comments apply equally to that mitigation.

Chapter 2: Project Description

Project Objectives

The DEIR/EIS states that DWR's "fundamental purpose" in adopting the BDCP is to make physical and operational improvements to the SWP system. (DEIR/EIS, p. 2-2, lines 30-31.) Given that the BDCP is intended to be an HCP and NCCP, defining its fundamental purpose in a way that does not specifically include contributing to the recovery of endangered and threatened species, is inconsistent with the purpose of an HCP.

The DEIR/EIS further states there is a need for state agencies to "strike a reasonable balance" between "competing public policy objectives" of addressing the conflict between at-risk Delta species and the need for water supply for people and communities. (DEIR/EIS, p. 2-1, line 19.) The federal ESA does not allow for this type of balancing when it comes to the protection of endangered species, which Congress intended to afford "the highest of priorities." (*Tennessee Valley Auth. v. Hill* (1978) 437 U.S. 153, 174.) When an action constitutes "an actual present negative impact on the [species'] population that threatens the continued existence and recovery of the species . . . , the Endangered Species Act leaves no room for balancing policy considerations" and the action threatening the species must yield to the ESA's higher purpose. (*Palila v. Hawaii Dep't of Land & Natural Resources* (D. Haw. 1986) 649 F. Supp. 1070, 1082, *aff'd*, 852 F.2d 1106 (9th Cir. 1988).) In any event, as discussed in detail in our comments in sections II.G and H, above, the BDCP fails to meet even its own dubious objectives because DEIR/EIS evidence and comments of experts suggests that the BDCP will not meaningfully contribute to the recovery of endangered and threatened species and, in fact, likely will harm the very species it purports to protect.

The DEIR/EIS further states that a project objective is to "restore and protect the ability of the SWP and CVP to deliver full contract amounts of water." In what years have the SWP and CVP delivered full contract amounts of water? With the project, in how many years will the SWP and CVP be able to deliver full contract amounts of water? Where is this spelled out in the EIR? To the extent that contracts provide for far more water than has ever been, or ever can be, delivered, in light of hydrologic and other (biological) constraints, this objective is arbitrary and capricious and appears designed to bias the analysis and selection of alternatives towards those that would favor water exports over environmental protection.

Page 2-3:36-38: What is meant by "develop projects that reduce stressors (etc.) in a manner that creates a stable regulatory framework under the ESA."? Is this the no surprises rule?

Chapter 5: Water Supply

The County has significant concerns about the potential impacts of the BDPC on its water supply. Detailed comments on the BDCP, BDCP DEIR/EIS and the BDCP's potential effects to upstream water rights holders and water users, including Sacramento County, have

been developed by the North State Water Alliance (NSWA), of which Sacramento County is a member. The County adopts the comments of the NSWA and incorporates them by reference in these comments. In addition, the County offers the following comments related to the DEIR/EIS.

There is general recognition that increasing water flowing through the Delta will promote a healthier Delta. As a by-product of the increased flows to promote Delta health, there will now be additional water available for cross-delta transfers – at a new intake north of the current diversion location. Maintaining the required Delta outflow is left up to the SWP and CVP and it seems that the water supply necessary to maintain Delta outflows and allow Delta exports will come at the expense of users north of the Delta. Users north of the Delta may have water supply contracts in excess of their current demand that are allocated toward future growth. However, the future use of this water could be subject to a review as a "covered action" within the scope of the Delta Plan, to see if it is consistent with the BDCP. This could produce a scenario where Delta exports will still be allowed, while a north of Delta user's water supply uses are restricted in order to maintain the regulatory required Delta outflow (i.e., changes in reservoir operation and/or water supply availability). The operational changes to upstream reservoirs, and impacts to upstream water supply, are not adequately addressed in the DEIR/EIS and are unclear at this point.

Section 5.3 Environmental Consequences

In the DEIR/EIS's assessment of the continued long-term operation of the CVP and SWP, the modeling analysis assumes that the SWP and CVP are solely responsible for providing any needed water for the BDCP's implementation. The primary factors for analysis are considered to be Delta outflow requirements and SWP/CVP reservoir storage, along with conveyance and regulatory export requirements. Furthermore, the section implies that under excess conditions (Delta outflow standards met), any transferred water released to the Delta should not be counted as transfer water. The discussion in Section 5.3 of water transfers is too simplistic and does not provide the public with the information necessary to be informed of the impact of the BDCP. There may be times when the Delta is in excess conditions and transfers could still occur. If so, this discussion in the EIR is incorrect and misleads the public.

The primary factors used for analysis are considered to be Delta outflow requirement and SWP/CVP reservoir storage along with conveyance and regulatory export requirements. The plan does not take into account future water uses (future demands) for users north of the Delta (a right may exist, but the ultimate demand has not been realized). The DEIR/EIS should contain a detailed evaluation of the BDCP's effect on future water supply for upstream entities, including the Sacramento County Water Agency (SCWA) and the reliability of water supply for those entities.

The BDCP would increase conveyance capacity and lead to increased Delta exports. While the BDCP will decrease the number of years in which there is a demand for cross Delta

water transfers, it will increase the average annual quantity of transfer water conveyed compared to existing conditions. However, the analysis of any potential upstream impacts from increased transfer volumes is not included as part of this DEIR/EIS. This approach improperly defers the analysis of these indirect project impacts and thus deprives the public and decisionmakers of the opportunity to comment on a potentially substantial adverse effect of the BDCP.

The DEIR/EIS states that post-September storage in Folsom Lake will increase, to support increased releases from Folsom to meet the required Delta outflow. The analysis also implies that increased releases from Folsom will be required in the future under the No Action Alternative, due to the rise in sea levels, climate change, and increased north of Delta demands. Given the minimum flow requirements in the American River and projections of consecutive dry years, increased releases from Folsom to provide increased Delta outflows related to the BDCP places American River water users at greater risk of substantial impacts to water supply.

Chapter 6: Surface Water

Effects on Sacramento River Flows

The analysis appears to consider change in flows only with respect to the BDCP's potential to increase flows and cause flooding. A major concern to Sacramento County is the project's potential to reduce flows, especially at times of year key recreation facilities are in use, and/or cause changes in water levels that adversely affect recreational uses. (DEIR/EIS, pp. 6-44 – 6-45.)

Flow effects were evaluated for wet years and an average of all years. (Figures 6-10 and 6-11.) However, because recreation effects are caused by lowered river levels, they are most likely to be experienced in normal or dry years, when any lowering of river levels may adversely affect operation of marinas. Contrary to the statement in Chapter 15, Recreation that the BDCP will not affect flows (DEIR, p. 15-64, lines 1-2.), Figure 6-10 indicates that under all four operating scenarios, Alternative 4 will decrease monthly average flows compared to existing conditions, as well as the No Action Alternative, in the months most critical to recreation uses – April through September. Figure 6-10 suggests the potential for the BDCP to lower river levels, but more information is needed for Sacramento County to understand the BDCP's potential effects on recreation.

Specifically, what will be the monthly changes in river levels at Freeport and Hood, and what is the modeled maximum daily increase and decrease in river levels at those locations? This information should be presented by month as well as daily, as the potential for an adverse effect to recreation depends on the precise effect on any given day. If river levels are lowered significantly on weekdays, the effects on recreation may be less than if levels are lower on weekends. Operational criteria should be written to avoid any substantial lowering of river levels.

BDCP-related changes in Sacramento River flows and water levels may have a substantial adverse effect on recreational facilities. Launch ramps, marinas, and fishing access areas are designed to meet current flows in the Delta. The modeling in Exhibit 5A addresses the average flow, but the analysis provided in Chapter 6 only addresses impacts with peak flows. A change in sustained flows could adversely impact recreation and must be analyzed. The affected marinas and recreation all depend on the operation of the proposed diversion pumps and the resulting river flows. Without an operating plan, the County is unable to identify which marinas or other recreation amenities will be impacted, and to what degree. Supplemental environmental review is needed when an operating plan is identified, and before the BDCP is approved, so the precise effects on flows and water levels can be evaluated.

Moreover, as discussed in section II.E.3, above, regarding the DEIR/EIS baseline, in order for the County to understand the impacts that will occur from changes in flows, the DEIR/EIS needs to provide an analysis of BDCP effects at various points in time, not 60 years out, to see effects that will occur in the interim. North Delta diversions will increase over time, as will predicted effects of climate change, whereas Project effects from increased diversions will occur immediately and for decades before other changes take full effect. By showing only long term changes, the Project's shorter and nearer term impacts are hidden.

Effect on American River Flows

The DEIR/EIS identifies changes in Folsom Lake levels as a result of the Project but not American River flows. The DEIR/EIS seems to attribute downstream reductions to climate change and increased north Delta diversions that are not project-related. The DEIR/EIS needs to explain whether and how the BDCP will affect flows in the American River. If no change is expected, the evidence and analysis supporting that determination must be provided.

Accuracy of Flood Mapping Information

The County administers FEMA within the BDCP project area. Some of the information used in the analysis of Delta Flood Risks (DEIR/EIS, Section 6.1.5, pp. 6-18 – 6-23) is dated. For example, Figure 6-7 depicts the floodplain as being mapped in 2009. It would be more informative/appropriate if the DEIR/EIS cited the Sacramento County DFIRM map, dated August 16, 2012. Further, this reference would necessitate revisions to the text found in Section 6.1.5.1 (FEMA Analyses). For example, Reclamation District (RD) 744, 755, 551 are now in the Special Flood Hazard Area Zone AE, and RD 554 is currently mapped as protected by provisionally accredited levees.

Section 6.1.5.2 (FEMA Flood Areas): The DEIR/EIS should be revised to clarify that Courtland, Locke, and Walnut Grove are subject to the Flood Insurance Rate Map, dated

August 16, 2012. These Delta legacy communities, as mapped, are not protected from the one percent annual chance flood due to levee de-accreditation.

Also, Walnut Grove is not in the northern part of Tyler Island (RD 563) as described on page 6-22. It is more accurate to describe East Walnut Grove and RD 554 as protected by provisionally accredited levees, and West Walnut Grove on Grand Island RD 3, where levees were de-accredited resulting in Zone AE on the effective FIRM. Further, this section omits any mention of Hood and Ryde.

Chapter 7: Groundwater

Water Supply Impacts to Delta Communities

The BDCP is likely to substantially deplete municipal and agricultural water supplies within the Delta construction area, from construction area dewatering as well as construction-induced liquefaction and settlement (such as from pile driving, tunnel boring and operation of other heavy equipment), which could adversely affect groundwater levels, and operation and integrity of wells. The DEIR/EIS glosses over these serious effects by characterizing them as "temporary," even though construction will take place for 10 years or more. (*See* discussion of Impact GW-1, DEIR/EIS, pp. 7-46 – 7-48.)

The DEIR/EIS makes no effort to estimate the quantity of water that the BDCP would make unavailable for existing uses. As mitigation, the DEIR/EIS proposes to offset domestic losses attributable to dewatering (but not losses or adverse effects attributable to diminished groundwater quality, or from losses caused by construction-induced liquefaction and settlement). Measures proposed to achieve this objective include installing sheet piles to depths below groundwater elevations, deepening or modifying wells used for domestic purposes to maintain water supplies at preconstruction levels, or securing potable water supplies from offsite sources. (Mitigation Measure GW-1, DEIR/EIS, pp. 7-47 – 7-48.). No analysis or evidence is provided to quantify the extent of the potential impact (including the amount of water supply that could be lost due to construction) or to demonstrate that such mitigation measures are capable of avoiding significant effects to groundwater levels, wells, and water supply. Further, it is not clear whether the DEIR/EIS evaluated the secondary impacts associated with well deepening, including increased energy use and air quality impacts from the additional pumping that will be required to obtain water from deeper wells. Moreover, these mitigation measures are inadequate because they require Delta water users to agree to physical alterations of their property (which are not likely to be given to facilitate construction of the intake and tunnel facilities) and/or to accept a substitute water supply, of unknown quantity and quality. This type of mitigation has been held to be illegal under CEQA. (*Gray v. County of Madera* (2008) 167 Cal.App.4th 1099.)

Even if provision of a substitute supply were legal, particularly with respect to agricultural water supply losses, the practical feasibility of securing "a temporary alternative water supply" is dubious at best. How much water will be needed to compensate for BDCP-

related losses, and where and how would the replacement water be obtained? What evidence is available that an alternative water supply of adequate quantity and quality to sustain agricultural uses is available, and what would be the impacts and costs of securing and delivering this alternate supply? Mitigation measures that are so undefined that it is impossible to assess their effectiveness are legally inadequate. (*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 727 [mitigation calling for purchases of replacement groundwater supplies without identifying whether water was in fact available was inadequate to mitigate project effects on groundwater supplies]; *Preserve Wild Santee v. City of Santee* (2012) 210 Cal.App.4th 260 [plan for active habitat management failed to describe anticipated management actions or include standards or guidelines for actions that might be taken].)

Compensating farmers for production losses attributable to a reduction in available groundwater supplies, as proposed by the mitigation measure, is inadequate because it does not "maintain water supplies" and thus fails to meet the performance criteria set forth in the mitigation measure. Moreover, the affected area includes many permanent crops, including fruit trees. These crops are an essential part of the Delta economy, as well as a defining aspect of its visual and historic character. If agricultural water supply and groundwater levels are significantly affected for up to 10 years of construction, plus an unknown period of time following construction for supplies to recharge and recover, it is reasonable to assume that these permanent crops will be lost, which will have secondary impacts to agriculture, wildlife, and the aesthetics, economy and essential character of the Delta communities. The DEIR/EIS must be revised to include actual analysis of the extent of impacts to local water supply, including evidence and analysis relating to the availability, adequacy and means of providing any "temporary alternative water supply" to both municipal and agricultural uses, as well as the attendant secondary impacts that will result if water supply is significantly depleted for an extended period of time.

Effects on Sacramento Valley CVP Water Users

The DEIR/EIS discusses the potential for the BDPC to result in "minor decreases in water supply availability to CVP water users in the Sacramento Valley . . . " (*See Analysis of Groundwater Conditions in Areas that Use SWP/CVP Water Supplies*, DEIR-EIS, p.7-32, lines 30-40.) The estimated decrease in supply is 50,000 AFY. The section concludes, "[a] 2% increase in groundwater use in the Sacramento Valley to make up for any shortfalls in surface water supply is not anticipated to substantially impact the groundwater resources as long as the additional pumping is not concentrated in a particular area of the valley." This claim requires additional analysis. Who exactly are the Sacramento Valley CVP contractors that are being referenced? What is their distribution through the valley? What is the respective decrease in surface water for each? Overall the analysis of these impacts appears to focus on San Joaquin and Tulare Lake basins as well as on agricultural users, as opposed to municipal users.

As noted above, a primary concern for the County is how growth that is already planned (whether in the Delta or north of the Delta) will be impacted by the BDCP. The DEIR/EIS indicates the BDCP will have a negative impact on certain unidentified groundwater supplies. The ability to accommodate projected and planned growth within the area of SCWA Zone 40 relies on the availability of specific groundwater and surface water supplies. SCWA has a defined plan for providing water to its Zone 40 service area. This plan is a conjunctive use plan that includes both surface water and groundwater. Other purveyors who use the same groundwater basin also employ a conjunctive use program. These plans have a defined amount of the resource that is or will be used to meet current and future customer needs. In considering the 2% proposal one must assume that the increase is not applied uniformly over the entire Sacramento Valley. No information is provided as to where additional pumping will take place, whether it will it interfere with existing conjunctive use programs, or whether it will exacerbate existing groundwater overdraft or cause groundwater overdraft in locations where that condition does not presently exist.

The DEIR/EIS states that additional pumping will not be concentrated in a particular area of the valley, but doesn't describe the criteria that will be used to make that decision or how that decision may impact current and future users of the groundwater basin. How can individual purveyors and water users who participate in an existing or future groundwater management program be assured that they will not be negatively impacted by a proposal to increase groundwater pumping so that additional surface water can be redirected to the Delta or the south state? The DEIR/EIS does not provide enough information for the County to assess whether BDCP implementation will jeopardize planned Zone 40 water supplies.

Other Comments Related to Groundwater

Page 7-28, Table 7-4 Delta Region Groundwater Management Plans: The reference to *Sacramento County Water Agency GWMP* should be deleted as that document has been superseded by the groundwater management plan for the Sacramento Central Groundwater Authority.

The reference to *Sacramento County Water Agency Central Sacramento County GWMP* should be edited to read:

Entity/Entities: Sacramento Central Groundwater Authority
Document Title: Central Sacramento County GWMP
Adoption Date: 11/8/2006

Chapter 8: Water Quality

Insufficient Evaluation of Water Quality Impacts Upstream and Immediately Downstream of Intakes

Sacramento County is a co-permittee along with the incorporated municipalities within the County in the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System permit (NPDES No. CAS082597, Order No. R5-2008-0142). The co-permittees comprise the Sacramento Stormwater Quality Partnership (Partnership). The County and the Partnership, have strong concerns about proposed CM-19 (urban stormwater treatment) and its effect on our municipal stormwater program. The Partnership has identified a number of significant problems with CM-19 and the DEIR/EIS's evaluation of stormwater and water quality-related issues, including, but not limited to, a lack of justification for CM-19; insufficient commitments to adaptive management and monitoring programs to protect upstream and Delta water quality; insufficient evaluation of water quality impacts upstream and immediately downstream of the proposed intakes; inconsistency with the Antidegradation Policy and water quality regulations; and critical technical errors and omissions. The County and Partnership's specific concerns with the BDCP and DEIR/EIS are detailed in their comments on the BDCP and DEIR/EIS, which the County incorporates by reference into these comments.

Effects of Sediment Entrainment at the North Delta Intakes and Sediment Removal Under CM-2 on Eutrophication in the Delta and San Francisco Bay

The DEIR/EIS fails to evaluate the project-specific and cumulative effects of sediment entrainment at the north Delta intakes as well as sediment removal under CM-2, which will result in excavation of a minimum of one million cubic yards (MCY) of sediment from channels and drains every other year plus removal of another 1 MCY within one mile of the Fremont Weir every five years,[5] on eutrophication in the Delta and San Francisco Bay. The proposed north Delta intakes will remove massive amounts of sediment from the Sacramento River annually through entrainment, and CM-2 will remove sediment upstream that will reduce overall sediment loads in the Delta. The removal of this sediment has the potential to have significant adverse effects on water quality by reducing turbidity downstream in the Delta and San Francisco Bay. Reduced turbidity has been invoked as a possible mechanism making San Francisco Bay more prone to eutrophication than in decades past. Specifically, the concern is that phytoplankton are increasingly less constrained by light and are able to convert more of the available nutrient supply into biomass.[6] The same argument can be

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[5] DEIR/EIS, p. 11-199, lines 2-9; BDCP, p. 67, lines 11-17.

[6] Cloern, J.E., Jassby, A.D. (2012). *Drivers of change in estuarine - coastal ecosystems: Discoveries from four decades of study in San Francisco Bay.* Rev. Geophys., 50, RG4001, doi:10.1029/2012RG000397; http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/amendments/estuarineNNE/Nutrient_Strategy%20November%202012.pdf, SFEI, San Francisco Bay Nutrient Management Strategy,

FOOTNOTE CONTINUED ON FOLLOWING PAGE.

applied to the Delta, where it is believed that turbidity is a constraint on primary productivity. The BDCP proponents have been vocal in their concern about the potential adverse effect on their water supplies from increased eutrophication in the Delta.

Effects on Mercury Concentrations from Implementation of CMs 2-22

The DEIR/EIS acknowledges the potential for restoration activities to increase the generation of methylmercury within the Delta. (Impact WQ-14, DEIR/EIS, p. 8-446.) CM-12 (Methylmercury Management) is identified both in the text of this section and within the BDCP as the conservation measure that will address methylmercury by developing project-specific control measures to minimize the impact of restoration on methylization. However, the implementation language found in CM-12 indicates that this conservation measure only applies to tidal wetlands restoration (CM-4). Section 3.4.12.2.1 of the BDCP explains:

> 3.4.12.2.1 Project-Specific Mercury Management Plans:
>
> For each restoration project under *CM4 Tidal Natural Communities Restoration*, a project-specific methylmercury management plan will be developed and will incorporate all of the methylmercury management measures discussed below or will include an explanation of why a particular measure should not or cannot be incorporated. Each project-specific plan will include the following components. (BDCP, p. 3.4-259.)

The DEIR/EIS should be expanded to include an analysis of methylmercury-related impacts and their link to all proposed habitat restoration-related conservation measures, not just CM-4. Moreover, if the DEIR/EIS is relying on CM-12 to mitigate methylmercury impacts, it should be revised to clearly apply to all CMs with the potential to result in methylmercury impacts, consistent with the DEIR/EIS's analysis that finds significant impacts from CMs 2-22, not just CM-4.

Chapter 9: Geology and Seismicity

The BDCP is likely to have significant adverse impacts to County residents, homes, and water supply wells from construction-related vibration and excavation. The accuracy and adequacy of data supporting the analysis of these impacts is essential. It appears that the DEIR/EIS lacks relevant data in several areas to support an adequate impact analysis. Data issues aside, the entire section is inadequate because the data that is available is not presented in a manner reasonably calculated to inform the public and decisionmakers of the BDCP's potentially significant effects.

Adequacy of Seismic Boring Data

With regard to data, the seismic boring data is insufficient to support a project-level analysis because at least one of the bores is not deep enough, nor close enough to the affected area, to accurately reflect actual conditions. Specifically, the analysis relies on data from five test bores, shown in Figure 9-4. The only bore (B4) near the intake structure of the project, which is near Hood, is located near Locke. Bore B4 is only 106 feet deep, compared to the 300-foot depth of the other four bores. Bore B4 does not even reach the proposed top of the conveyance tunnels. Additional bores near Hood to at least 300 feet would seem warranted to determine the impacts of the seismic-like impacts from project construction (pile driving and other severe construction techniques).

Figure 9-6 shows general geology of the project area and levels of possible liquefaction hazard levels. This map omits the geology of the area near Hood/Courtland. This should be detailed (similar to Figure 9-3) since this area will experience substantial project-related geological disturbance and has existing development that could be significantly impacted.

Failure to Present Data and Analysis in a Manner Reasonably Calculated to Inform the Reader

The omission of data is hardly the most notable failing of the Geology and Seismicity chapter. With regard to the overall analysis, the discussion of seismic hazard risk is illustrative of the DEIR/EIS's deficiency as an informational document. On page 9-28 (line 4) the DEIR/EIS discusses seismic hazard maps and the limited area and number that are available. It further states the BDCP construction area is not mapped and, "the Seismic Hazards Mapping Act requirements will not affect the project unless and until the area is mapped." One question that arises from this statement is: with a project this large and the potential effects so high, should the requirements apply? The answer to that question would seem to depend on whether the project area is subject to significant earthquake risk. The DEIR/EIS discussion of the environmental setting would be the logical place the reader would expect to find that information. However, the discussion of existing geologic hazards is so technical and full of jargon it is incomprehensible to the average reader.

A prime example of this problem is found in Section 9.1.1.4.2 Earthquake Ground Shaking, which reads, in part:

> 9.1.1.4.2 Earthquake Ground Shaking
>
> The potential of earthquake ground shaking in the Delta was evaluated in the seismic study using the 18 Probabilistic Seismic Hazard Analysis (PSHA) method (California Department of Water Resources 19 2007a). This method permits the explicit treatment of uncertainties in source geometry and 20 parameters, as well as ground motion estimation. In a PSHA, the probabilities

> of exceeding various levels of ground motion at a site are calculated by considering seismic source locations and geometry, rates of various earthquake magnitudes, and ground motion attenuation from the energy source to the site. The uncertainties associated with source parameters and ground motion estimation are incorporated in the analysis using a logic tree approach that uses multiple parameter values.
>
> The standard PSHA assumes a Poissonian process for earthquake occurrences or a time-independent earthquake recurrence model. In the seismic study, however, a time-dependent recurrence model was used to calculate the earthquake potential (California Department of Water Resources 2007a). The time-independent PSHA analysis was also performed for comparison purposes.
>
> In a time-dependent model, the time of the last earthquake is used to estimate earthquake recurrence interval or frequency (a non-Poissonian process). Because many of the San Francisco Bay region seismic sources do not have sufficient information on the times of last earthquakes, only seven of the major faults were characterized using the time-dependent model: the San Andreas, Hayward–Rodgers Creek, Calaveras, Concord–Green Valley, San Gregorio, Greenville, and Mt. Diablo Thrust. Therefore, the overall model used in the seismic study is not a pure time-dependent model. (DEIR/EIS, pp. 9-17 – 9-18.)

This one subsection goes on to present six more pages of highly technical information and data without any intelligible summary or conclusion about the relative earthquake risk in the project area, an issue of major concern to Sacramento County and its residents due to the significant risks to safety and property should the BDCP intake and transmission facilities be damaged by an earthquake. Here, as in many other areas, the DEIR/EIS's presentation of information essential to understanding the BDCP's impacts fails to comply with NEPA's readability requirement as well as CEQA's requirement that EIRs be written in plain language, with technical information translated in a manner that will actually inform the reader and decisionmakers. (CEQA Guidelines, § 15140.)

Failure to Evaluate Project-Related Geologic Impacts to Local Water Supply

Discussions of construction-induced geologic impacts indicate the potential for significant impacts from dewatering, construction-induced liquefaction, and settlement (such as from pile driving, tunnel boring and operation of other heavy equipment). (*See, e.g.,* discussions for Alternative 4 in impacts GEO-2, GEO-3, GEO-5.) These discussions are very general and fail to recognize the significant risk to wells and water supply intakes within the project area, as well as the risk of loss of water supply or diminished water quality. The area that the BDCP covers has a high level of reliance on groundwater, and the DEIR/EIS should explicitly evaluate possible water quality changes or reduced yield from aquifers, especially given the depth that the tunnels are being constructed.

Moreover, discussion of operations-related geologic impacts, such as liquefaction damage (GEO-8), focuses on damage to the BDCP's infrastructure but does not address the potential impacts to the many agricultural wells in the area nor M&I water system damage. The DEIR/EIS should be revised to specifically address impacts to construction and operations-induced geologic impacts to local water supply and water quality. Concrete mitigation measures that will avoid adverse effects to local water supply must be included with the analysis, and the entire discussion must be recirculated for public review and comment.

Chapter 11: Fish and Aquatic Resources

Effect of Loss of Sacramento River Sediment on Fish and Downstream Habitat

The proposed north Delta intakes will remove massive amounts of sediment from the Sacramento River annually through entrainment. The removal of this sediment has the potential to have significant adverse effects on fish species by reducing turbidity. Reduction in turbidity is associated with increased predation losses of small fish and increased concerns for eutrophication in San Francisco Bay. Species such as salmonids rely on turbidity for cover, and smelt require it for proper feeding behavior. Smelts' need for sediment is especially related to their ability to detect copepods for feeding. For reasons not entirely understood, copepod capture rates are higher in turbid water. They may also benefit from being less viable to their own predators. The DEIR/EIS fails to consider the effect of loss of Sacramento River sediment on these fish species.

Nor did the DEIR/EIS consider the effect of reduced Sacramento River sediment loads on existing and proposed downstream habitat, including the value of the BDCP's own proposed habitat restoration projects. Specifically, the DEIR/EIS did not evaluate whether decreases in sediment supply (from reduced downstream transport of Sacramento River sediment from project entrainment) will interfere with creation of new intertidal habitat in the west Delta and whether habitat restoration in the Delta by the BDCP will utilize sediment that is required to maintain intertidal marshes further downstream in San Francisco Bay. The Science Panel specifically took the BDCP to task on this point, noting that the BDCP "ignores crucial data [regarding sediment supply] that should have been incorporated into trajectories concerning the restoration of wetland and associated aquatic habitat." (Delta Science Program Report, Ex. B at p. 58.) The Science Panel's report noted that the BDCP assumes a constant sedimentation concentration for the time period of the plan, yet it indicates that sediment concentration has been declining over the past 50 years and that the BDCP conservation measure will further reduce the sediment supply by an additional 8-9%." (*Id.* at p. 13.)

Moreover, in addition to the issue of direct entrainment of sediment by the intakes, the habitat suitability indices (HSIs) used to evaluate the value of restored habitat did not take future decreases in upstream sediment supply into account. (*See* Appendix 5.E., Section

5.E.4.4.1.1. Habitat Suitability Analysis.) As a result of this omission, HSIs for future periods are inflated for Delta and longfin smelt, which require turbid water for successful feeding behavior. The BDCP further states, "it was assumed that turbidity would remain constant between scenarios. However, there is reason to believe that turbidity may decrease in the future because of changes in sediment input and retention in the Delta (unrelated to the BDCP) (Schoellhamer 2011), which would decrease the HSI values derived in this analysis." (BDCP, p. 5E-15, line 8.)

Despite acknowledging that declining sediment supply and the impact of CM-1 will mean a much lower sediment supply, these facts are not incorporated into the analysis and the DEIR/EIS does not address the issue at all. Rather, as noted by the Science Panel, "the loss of sediment supply creates great uncertainties in the rate and potential for restoration of these habitats, while only the most optimal circumstances are modeled or estimated." (Delta Science Program Report, Ex. B, at p. 58.) The failure to account for project-related and cumulative decreases in turbidity in the HSIs used to evaluate the value of restored habitat undermines the BDCP's and DEIR/EIS's assumptions about the beneficial effects of proposed habitat restoration activities.

Use of Fish Models for the BDCP Analyses

The BDCP used a variety of models to evaluate the project's potential effects on salmon. As described in detail in the report by anadramous fisheries expert Dave Vogel (prepared for the Sacramento Valley Water Users/North State Water Alliance) (*Comments on the Public Draft Bay-Delta Conservation Plan (BDCP) and Draft BDCP Environmental Impact Report/Environmental Impact Statement*, Dave Vogel, June 6, 2014 (Vogel Report)), the models used for the BDCP were particularly constrained because of a lack of empirical data, incorrect data, and very low reliability and confidence in the models' outputs. Some of the fish models related to salmon survival and behavior are based on faulty data rendering model run outputs invalid and incapable of comparing BDCP alternatives. In many instances, inputs to the models were based on inflated and biased fish survival estimates that would not provide valid comparisons of the BDCP scenarios. Although the BDCP claims that "[t]he methods used reflect the best available tools and data regarding fish abundance, movement, and behavior" (BDCP, p. 5.B-i.), the Vogel Report explains why that assertion is not correct.

As noted by the Science Panel and the Vogel Report, when the models suggested unfavorable results (i.e., adverse impacts on salmonids), they were downplayed or not used. Conversely, when the models suggested favorable results (i.e., beneficial impacts on salmonids), they were overplayed and used. Because there was such heavy reliance on models for the BDCP analyses and impact determinations, it is important to understand the very serious limitations of those models. The documentation for various models describes some of the limitations, but those discussions are fragmented and buried in the voluminous appendices and are commonly not carried forward into the main body of the BDCP document. Nor are the limitations clearly disclosed in the DEIR/EIS. Problems with the models themselves, the DEIR/EIS's failure to plainly disclose the limitations in the models, and the

selective use of data and results favorable to the BDCP, deprive the public of meaningful information necessary to informed decisionmaking and cast serious doubt on the integrity and validity of the DEIR/EIS's determinations as to the BDPC's impacts on fish.

Also see Airport Comments, Ex. E hereto.

Chapter 12: Terrestrial Biological Resources

See Airport Comments, Ex. E hereto.

Chapter 13: Land Use

Impact on Delta Communities

The DEIR/EIS's conclusion that the action proposed under CM-1 (conveyance) will have a significant and unavoidable impact associated with the "creation of physical structures adjacent to and through a portion of an existing community" (LU-3) does not convey the full scope of the BDCP's impact on Delta communities. The scale of both the proposed water conveyance (operations and diversion infrastructure) and the 21 habitat restoration measures are massive, making the resulting short- and long-term impacts difficult to comprehend/grasp. When evaluated in its entirety, in concert with the numerous identified construction-related impacts of the conveyance facility, occurring over a 10-12 year period, and restoration actions, occurring over a 50-year period, it is unfathomable to conclude that the proposed habitat conservation plan will not just "create physical structures" in and around existing communities but will permanently and adversely alter the very much valued and generation-old agricultural land use pattern for which the Delta is known.

Implementation of the BDCP will result in a lengthy list of significant and unavoidable impacts (at least 48 of them). Sacramento County is particularly hard hit. Specifically, the proposed water export facility construction and operations will cause long-term and irreversible land use compatibility impacts, along with significant disruption (and likely permanent destruction) of the existing rural and agricultural land use pattern, along with future land uses contemplated under Sacramento County's 2030 General Plan.

According to the DEIR/EIS, permanent surface features associated with the water conveyance facility that would fall within Sacramento County include three water intakes (with associated pumping plants and other features), an intermediate forebay, a borrow/spoil area, shaft locations, tunnel muck storage areas, and transmission lines. (DEIR/EIS, p. 13-109.) These industrial uses would be sited on land designated as Agricultural Cropland, Agricultural-Residential, Low Density Residential, Medium Density Residential, Natural Preserve, and Recreation. (*Id.*) Alternative 4 would require the removal of at least 81 permanent structures within Sacramento County, including 19 homes and 8 recreational facilities (DEIR/EiS, Table 13-12, p. 13-112.) and be incompatible with existing land uses on covering at least 2,112 acres. (DEIR/EIS, Table 13-11, p. 13-108.)

Incompatibility with Delta Plan Policy DP-2

Delta Plan Policy DP-2 requires that the BDCP "Respect Local Land Use When Siting Water or Flood Facilities or Restoring Habitats." The DEIR/EIS illogically concludes that "avoidance of all incompatibilities is likely to be considered infeasible; thus, activities associated with CM-1 would be compatible with Policy DP P2." (DEIR/EIS, p. 13-107, line 41.) The Sacramento County community of Hood would be hardest hit. The DEIR/EIS acknowledges that this small historic community would experience substantial and permanent adverse changes to the community and character as a result of the significant construction impacts and the addition of permanent project structures that would irretrievably alter community character. The impacts to Hood are plainly incompatible with Delta Plan Policy DP-2, and it is disingenuous for the DEIR/EIS to conclude otherwise. There is no evidence that an alternative that does not include facility construction in Hood or other Sacramento County Delta communities is infeasible. In fact, the cost of repairing levees (an element of Alternative 9) has been estimated to be only $4 billion, compared to the $25 billion or greater cost to construct Alternative 4. (Economic Sustainability Plan for the Sacramento-San Joaquin River Delta, Delta Protection Commission, January 19, 2012, Executive Summary at p. 11, attached as Exhibit G.)[7]

Also see Airport Comments, Ex. E hereto.

Chapter 14: Agricultural Resources

Lost Agricultural Production

Temporary and short-term construction of facilities would convert approximately 1,315 acres of Important Farmland and 837 acres of land subject to Williamson Act contracts or in 38 Farmland Security Zones to other uses. Physical structures would also permanently convert approximately 4,975 acres of Important Farmland, including 4,281 acres of Prime Farmland, 158 acres of Farmland of Statewide Importance, 339 acres of Unique Farmland, and 197 acres of Farmland of Local Importance and 3,080 acres of land subject to Williamson Act contracts or in Farmland Security Zones to other uses. (DEIR/EIS, pp.14-109, 14-111.)

According to the DEIR/EIS, construction of the water diversion and conveyance facility (CM-1) will result in significant impacts to agriculture in the Delta for a minimum of 10 years. However, the DEIR/EIS terms this decade-long period as "temporary." Subjecting growers, who make their living from the affected agriculture, to a decade of significant and unavoidable impacts will bring the primary economic driver in the Delta to a grinding halt. The proposed mitigation measures included in the DEIR/EIS fail to adequately address the

[7] The entire Economic Sustainability Plan can be found at http://www.delta.ca.gov/res/docs/ESP/ESP_P2_FINAL.pdf.

issue of lost agricultural production on prime farmland and how/if growers will be fairly compensated for lost revenues while the land is out of production.

In addition, the DEIR/EIS fails to analyze and disclose whether agricultural operations in the Delta will remain viable once the activities contemplated by the BDCP are complete. The BDCP will result in the permanent removal of a significant amount of prime farmland from production, construction activities will "temporarily" remove a significant additional amount of prime farmland from production, and direct and indirect impacts from construction-related activities will adversely affect even more prime farmland. Drainage patterns will likely change, water quality will likely change, and growers could be faced with buyers finding alternate sources of supply with land out of production for extended periods of time. In addition, the BDCP's proposed restoration of some Delta islands could put other islands at risk of flooding, further threatening local agriculture. With a significant amount of farmland removed from production or production otherwise adversely affected, the DEIR/EIS must analyze and disclose whether the prolonged adverse affects on agriculture in the Delta will result in any permanent loss of agriculture in the region.

Air Quality Impacts to Crops

The DEIR/EIS also fails to address the potential adverse effects to crops from project-related air emissions. Fugitive dust can substantially reduce crop yield, and significant dust-generating activities are proposed to occur in and adjacent to agricultural areas. Impact AG-2 – *Other Effects on Agriculture as a Result of Constructing and Operating the Proposed Water Conveyance Facility*, should be revised to include an analysis of effects on agriculture as a result of BDCP-related air emissions, including but not limited to particulate matter.

Salinity Impacts to Crops

Impact AG-2 discusses effects on agriculture as a result of change in salinity (as Electrical Conductivity [EC]), but there is no discussion of EC increases other than at Emmaton and the San Joaquin River. Did the DEIR/EIS evaluate EC increases in the Sacramento County Delta community areas, and is there an adverse effect to agricultural intakes near the BDCP intakes? (*See* DEIR/EIS, p. 14-122.)

The discussion of impacts also appears to be internally inconsistent. The discussion at page 14-122 first describes the increase in frequency with which EC objectives will be exceeded (lines 1-35), but then says that following implementation of Scenarios H1-H-4, there would be a decrease in the number of days in which the EC objective is exceeded. This apparent inconsistency should be explained.

Note too that the analysis is based on a comparison with the No Project Alternative, which relies on future baseline water quality conditions. Impacts to EC levels, and potential adverse crop effects, will occur immediately upon operation of the new intake structures, and the project has the potential to result in significant adverse impacts to agricultural water

salinity levels in the short and near term. In order to understand potential adverse impacts to agricultural water supplies, an analysis must be provided that compares BDCP-related water quality changes to the existing conditions in the Delta and Sacramento River, considering current hydrology. Basing an analysis solely on a future baseline that includes changes due to climate change and upstream diversions that will not occur in full for decades results in a failure to evaluate potentially significant adverse changes that will occur in the intervening decades.

Agricultural Land Mitigation

Mitigation Measure AG-1 calls for the purchase of agricultural conservation property interests as mitigation for the BDCP's significant impacts to agricultural lands. What evidence is there that sufficient agricultural land of comparable quality to the land being destroyed in Sacramento County is or will be available for mitigation purposes, within the affected project area? What are the estimated costs of this mitigation land, and how will acquisition of the interests be funded? Will purchase of the property interests be required to occur prior to destruction of existing agricultural land and operations by construction of the BDCP facilities?

If land that is acquired for agricultural mitigation is allowed to be "double counted" as satisfying biological mitigation objectives, how will the lead agencies ensure that the total mitigation acreage is equal to the total land lost by the BDCP? Depending on the lands selected, allowing mitigation land to be counted as mitigating multiple impacts could result in a net loss of total resources if the BDCP results in a loss of land with biological resource value (e.g., Swainson's hawk foraging land) that is not also Important Farmland, and mitigation credit for the Swainson's hawk habitat loss is allowed to occur on land that is being protected to satisfy farmland mitigation requirements for loss of other farmland that did not qualify as Swainson's hawk foraging habitat.

Chapter 15: Recreation

A key question of importance to Sacramento County is the BDCP's effects on river flows and river levels, as changes in river levels have the potential to have a significant impact on river-dependent recreational uses, including marinas and riverside parks. The Recreation section contains no analysis of BDCP effects on river levels and the resulting effect on river-dependent recreational uses. The reader has to comb through the section to find any discussion of this issue. Buried between a summary of noise impacts and a list of reservoirs that are not being evaluated is the following statement: "CALSIM modeling results indicate that effects, if any, to river flows are so minor as to have no effect and are not discussed further." (DEIR/EIS, p. 15-64, lines 1-2.) This statement is not supported by any analysis or evidence demonstrating that flow effects on river levels will not adversely affect recreational uses. Other evidence in the record shows that the BDCP will affect flows in the Sacramento River and possibly American River as well. (*See* Figures 6-10 and 6-11.)

Changes in flows, and river levels, may have a significant adverse effect on recreational uses along both these rivers, including rivers and parks. Impacts to marinas and recreation depend on how the diversion pumps are operated. Without an operating plan, the County is unable to identify the marinas or other recreation amenities that may be adversely affected by the BDCP. The lack of detailed information about BDCP operations, and information about changes in flows and water levels in the vicinity of specific recreational areas that may be adversely affected, makes it impossible for the County to know what the BDCP's impacts on this resource will be.

Methods for Analysis

The determination of effects (DEIR/EIS, Section, 15.3.2, p. 15-62, line 21) attempts to identify a "substantial impact" by using 82 years of simulations (Section C of the modeling results). The DEIR/EIS establishes a significance threshold of a 10 percent or greater reduction in the frequency of recreation facility availability, based on reservoir levels. The remainder of the DEIR/EIS analysis is based on a 50-year operation period. Using 82 years of simulations to establish a 10 percent substantial impact appears to understate the impacts that would occur in a 50-year operating permit. Using 82 years of simulations minimizes the peak and low flow impacts by spreading them out over a period that is more than 50 percent longer than the BDCP life. Because the operating permit is only 50 years, impacts should be measured against a 50-year benchmark. If the appropriate baseline were used, recreation impacts likely would be substantial. Moreover, to the extent the analysis focuses on reservoir levels, it fails to consider flow-related recreational impacts, including impacts to marinas and recreational areas along the Sacramento and American Rivers.

In assessing overall recreation impacts, the DEIR/EIS emphasizes the comparison of project effects with the No Action Alternative as opposed to the existing conditions. (*See* Impact REC-6 – *Cause a Change in Reservoir or Lake Elevations Resulting in Substantial Reductions in Water-Based Recreation Opportunities and Experiences at North- and South-of-Delta Reservoirs* and discussion at p. 16-87.) The DEIR/EIS assumes sea level rise at a specific rate over 50 years and builds sea level rise into the No Action Alternative. Using the future baseline conditions of the No Action Alternative as the yardstick for measuring project impacts minimizes the BDCP's actual recreation impacts on reservoirs and rivers. Impacts to the river will occur immediately when BDCP diversions commence, whereas the modeled No Action baseline conditions will not occur for decades into the future. By comparing impacts against the No Action Alternative, instead of existing conditions, the DEIR/EIS fails to evaluate and disclose significant impacts to recreation uses that are likely to occur in the years immediately following commencement of operations and into the future unless and until the predicted future climatic influences actually occur.

For example in the DEIR/EIS's 82-year simulation period, the loss of recreation access under existing conditions is 22 years out of 82; under the No Action Alternative it is 50 years out of 82; and under Alternative 4 it is 41 years out of 82. The DEIR/EIS thus concludes Alternative 4 would be an improvement as compared to the No Action Alternative.

(*See* DEIR/EIS, pp. 15-87 – 15-88). By failing to evaluate the BDCP's impacts against existing conditions, the DEIR/EIS fails to disclose that the BDCP will substantially decrease access to recreation (by a factor of almost 2). Using the threshold of significance set forth for impacts to reservoirs (10 percent or greater reduction in frequency of recreation facility availability), it would appear that the BDCP would have a significant impact when compared to existing conditions, because it reduces frequency of availability 50 percent of the time, compared to just 26 percent of the time under existing conditions, a 24 percent reduction in availability.

Construction Impacts to Cosumnes River Preserve

Although it concludes that impacts to recreation from construction will be significant and unavoidable, the DEIR/EIS (Impact REC-2 – *Result in Long-Term Reduction of Recreation Opportunities and Experiences as a Result of Constructing the Proposed Water Conveyance Facilities*, DEIR/EIS, p. 15-70.) improperly minimizes the severity and extent of significant and unavoidable impacts to the Cosumnes River Preserve recreation area and recreation experience that will occur for five years or more as a result of BDCP construction by discussing purported beneficial effects of proposed conservation measures that are uncertain to occur because they are unfunded and have not been subject to project-specific environmental review. Rather than focusing on impacts that will occur during construction, the extensive discussion of purported long-term benefits and attempt to rely on them to minimize and justify construction impacts that will occur for over eight years is improper and biased. This sort of balancing might be appropriate in a Statement of Overriding Considerations; it has no place within the body of the EIR. It is disingenuous to imply, as the DEIR/EIS does, that construction of CM-1 will result in anything other than significant and unavoidable impacts to the Cosumnes River Preserve.

Impacts to American River Parkway Upstream of Discovery Park

The DEIR/EIS refers to goals and policies of the American River Parkway Plan, including policies specific to the Discovery Park Land Use area. (DEIR/EIS, p. 15-47.) The DEIR/EIS recognizes impacts to Discovery Park but fails to look at the 23 miles of river upstream from Discovery Park on the American River and how BDCP-related flows will impact recreation on the river. A change in flow standards will impact access to recreation on the river, parking, and trails and may cause scouring of river banks, trails, and access areas near the American River. The DEIR/EIS should be revised to evaluate the BDCP's effect on American River flows upstream of Discovery Park and attendant recreation impacts. The revised analysis should address the additional American River Parkway Plan land use policies for the following potentially impacted land use areas: Woodlake Area, Cal Expo Area, Paradise Beach Area, Campus Commons Area, Howe Avenue Area, Watt Avenue Area, Sara Park Area, Arden Bar Area, River Bend Park Area, Sarah Court Access, Ancil Hoffman County Park, Rossmoor Bar Area, San Juan Bluffs, Sacramento Bar Area, Sunrise Recreation Area, Sunrise Bluffs, and Sailor Bar Area.

Impacts to Staten Island

In addition to tunneling through the Staten Island nature preserve, the BDPC would build a tunnel shaft, a launch shaft, a vent shaft, two reusable tunnel material (RTM) areas and a conveyor facility, two temporary access roads, a permanent access road, temporary work areas, and a temporary barge unloading facility on the island (DEIR/EIS, Table 15-15 and Mapbook Figure 15-4, p. 15-254.) The DEIR/EIS downplays the significant adverse effect this construction will have on recreational opportunities and the visitor experience at Staten Island.

Staten Island receives significant amounts of visitors – over 3,000 per year according to staff at the Nature Conservancy, which manages conservation easements on the island. Not only would recreation use be substantially diminished during the years of construction, but the placement of RTM areas, shaft locations, and a permanent access road would cause permanent surface impacts and would permanently displace portions of the preserve that are used by recreationists. The BDCP would result in the permanent loss of a substantial portion of the preserve. The fact that the preserve as a whole would not be permanently lost or closed does not mean the significant diminishment of the quality of the island as a nature preserve, and diminishment of the visitor experience due to the intrusion of these industrial elements, would not be a significant adverse impact on a recreation facility.

Other Comments on Recreation

Page 15-29, Line 10: The DEIR/EIS incorrectly identifies a softball field and playground as recreation elements in Discovery Park.

Page 15-46: Under the heading "Sacramento County General Plan" all citations for references are linked to the City of Sacramento's 2030 General Plan. The DEIR/EIS fails to address Sacramento County's General Plan in this section and substituted goals and policies for the City's General Plan. The DEIR/EIS must be revised to evaluate the County General Plan.

Chapter 16: Socioeconomics

This section addresses effects on regional economics in the Delta. (*See* DEIR/EIS, Impact ECON-1, p. 16-54.) However, the analysis in this chapter does not use the best available evidence to evaluate BDCP impacts, and displays bias by quantifying and emphasizing favorable effects while relegating large unfavorable effects to short, qualitative discussions (*See Comments on the BDCP EIR/EIS Socioeconomic Analysis prepared for Sacramento County* by Dr. Jeffrey Michael, May 16, 2014 (Michael Report), attached as Exhibit H). For example, this chapter does not use nor differentiate the praised and peer-reviewed Economic Sustainability Plan (ESP) generated by the Delta Protection Commission for any of its data or project impact analysis. The ESP is merely referenced and summarily dismissed even though in some areas, like agricultural productivity data, the ESP is more

current and accurate than that used in the DEIR/EIS. Similarly, the DEIR/EIS fails to quantify the economic impacts on agriculture of Conservation Measures 2-22, stating the lack of quantification is "because the information required as input to the IMPLAN model was not available" even though other assessments – including the BDCP August 2013 Statewide Economic Impact Report – found data to quantify and estimate extremely large negative impacts of implementing the BDCP CMs 2-22 on agriculture production in the Delta.

Further, in several important areas the impact analysis is incorrect or omits important evidence that the BDCP will have more severe adverse socioeconomic effects. Significantly omitted from the chapter's discussion is the BDCP's potential effect on the agricultural economy through reduced crop yield as a result of project particulate emissions. (*See* comments under Air Quality, above.) Likewise, the DEIR/EIS omits, or uses inadequate evidence, to establish the baseline for impact analysis on issues of locally vital socioeconomic concerns to the Delta. Specifically, the DEIR/EIS does not provide adequate evidence relating to recreation spending, total Delta agricultural revenue, temporary and permanent loss of Delta agricultural production during construction, then operation and maintenance of the isolated conveyance facility, long-term loss to the recreation economy from the construction and operation of the isolated conveyance facility, and the negative impact of the BDCP on community character in the Delta. (*See* Michael Report, attached as Ex. H.) This has the effect of distorting the analysis to minimize the BDCP's true impacts. The biased and underestimated impacts of the analysis chapter do not provide the public with true information required for CEQA/NEPA compliance, and are not the basis on which any informed plan and project decision can be made.

Chapter 17: Aesthetics and Visual Resources

The DEIR/EIS (pp. ES-118 – ES-119.) identifies seven significant aesthetic impacts of the BDCP. The identified degradation of the visual values and resources is directly attributable to a menu of activities and physical features including, but not limited to, the construction of physical structures, new transmission line corridors, and fugitive light emitting from the various water operation locations (i.e., intakes). Despite its conclusion that five of the seven impacts will remain adverse and significantly unavoidable even after the implementation of proposed mitigation measures, the DEIR/EIS downplays their real world effect. For example, the DEIR/EIS concludes that construction that would "last up to 9 years and would change the existing visual character in the vicinity of project elements from those of agricultural, rural residential, or riparian and riverine settings to areas involving heavy construction equipment, temporary construction structures, work crews, other support vehicles and other activities that would modify and disrupt short- and long- range views" would merely "be *disruptive to some* viewers." (DEIR/EIS, p. 17-60, emphasis added.)

Far from being just "disruptive" to "some," the construction and operation of the large-scale physical features of the proposed conveyance and water operations facility, in concert with the addition of significant levels of artificial light/glare to the night sky of this

rural portion of County, will result in a substantial adverse permanent change in the scenic quality and natural beauty of the Delta.

As stated in the County's comments on the Land Use chapter, the size and scale of the proposed conveyance and water operation facility (i.e., CM-1), including the intakes, forebay, pumping plants, surge towers, and transmission line corridors, are massive and will alter the physical landscape of the Delta, substantially degrading its unique scenic qualities and values in perpetuity. Invasive impacts also will occur from the extensive lighting required during both construction and operation of the completed conveyance facility. Dewatering near the intakes and pumping plants, and certain pipeline and intermediate forebay construction would take place seven days per week and 24 hours per day, while other construction activities would occur five days per week (Monday through Friday) up to 24 hours per day. (DEIR/EIS, p. 3-83.) Further, construction of each intake structure would take up to four years to complete and would occur Monday through Friday for up to 24 hours per day. To facilitate nighttime construction large-scale lighting systems will be needed. The DEIR/EIS acknowledges that evening and nighttime construction activities will require the use of "extremely bright lights" which would negatively affect nighttime views of and from the work area. (DEIR/EIS, p. 17-75.) Nighttime construction could also result in headlights flashing into nearby homes when construction vehicles are turning onto or off of construction access routes. In addition, significant artificial light and/or glare occurring during construction and post-construction of BDCP infrastructure could have an indirect effect on wildlife in the vicinity of the BDCP facilities. It is also possible that this newly introduced artificial light source could reduce the productivity of local livestock.

Impacts related to the proposed surge towers (at each intake location) would be two-fold, causing both permanent daytime and nighttime impacts. For example, under Alternative 4 (intakes 2, 3 and 5), the surge towers will be range from 70 to 105 feet in height. (DEIR/EIS, p. 3-87, lines 7-9.) Given the limited elevation change in the Delta, these towers will introduce a series of imposing physical structures on the rural landscape. In addition, due to their height, the surge towers will require the use of safety lights that would alert low-flying aircraft to the presence of these structures (DEIR/EIS, p. 17-75, lines 9 and 10.), thereby causing a new source of permanent fugitive light/glare for residents living in and around the communities of Freeport, Hood, and Courtland. These impacts will not only change the Delta's visual character but also permanently diminish the quality of life for Delta residents.

While mitigation is proposed to help reduce the severity of these impacts, inconsistences and vagueness in the description of mitigation proposed to address various aesthetic impacts prevent the County from assessing its effectiveness. Moreover, rather than substantially lessening the BDCP's impacts, as required by CEQA, much of the aesthetic impact mitigation appears likely to create its own visual blight, trading one set of adverse impacts for another.

Mitigation Measure AES-1b

Mitigation Measure AES-1b calls for installing visual barriers between construction work areas and sensitive receptors and along access routes to block views of construction work. The DEIR/EIS acknowledges that such barriers would "introduce a visual intrusion" but claims they would "greatly reduce the visual effects" associated with the massive construction project. (DEIR/EIS, p. 17-185, lines 16-17.) In its discussion of Alternative 1A, the DEIR/EIS asserts, "[t]he visual barriers are an effective means of reducing the visibility of active construction work areas, thereby minimizing the impact on existing localized visual quality." (DEIR/EIS, p. 17-62, lines 23-35.) However, the DEIR/EIS does not provide any information about these barriers until much later in the document, in the discussion of impacts under Alternative 4, where the barriers are described as being "a minimum of 6 feet tall." (DEIR/EIS, p. 17-185.)

Due to the size and scale of construction activity, and the fact that much construction-related activity will occur well above or below the grade of the existing roadway network, it is likely the barriers themselves would need to be massive – much taller than 6 feet – in order to shield views from residents, visitors or passing motorists. How large would they need to be to effectively shield views from the various types of affected sensitive receptors, considering their actual locations relative to proposed facilities, construction areas, and construction truck routes? No information is provided regarding the estimated maximum linear extent of visual barriers required "to prevent light spill from truck headlights toward residences." Given the extent of construction, and limited number of roads in the area, their winding nature, and the location of homes adjacent to the road, it is easy to visualize a "mitigation" measure that results in barricading both sides of a scenic highway, creating a virtual tunnel experience for drivers and residents alike. The DEIR/EIS should include a map showing the precise areas in which it is assumed that visual barriers must be installed under the proposed mitigation, and the height of the barriers in each area. The map should include the precise location of all sensitive receptors, so that residents can assess the relative benefit or impact that the proposed mitigation may have.

Without more detailed information about the mitigation, it is impossible to assess whether such barriers would "greatly reduce" the visual effects of 10 years or more of construction activity, as asserted by the DEIR/EIS. Based on the limited (and inconsistent) information provided, logic would dictate that the barriers themselves would have the visual effect of creating a fortress in the currently rural bucolic Delta setting and would simply substitute one significant adverse visual impact for another. A determination that such barriers would have any effect in reducing visual impacts, let alone be capable of "greatly reducing" such effects, defies logic, is clearly arbitrary and capricious, and is yet another example of the DEIR/EIS's attempt to minimize the scale of the BDCP's impacts to Delta communities.

Mitigation Measure AES-1g –Implement Best Management Practices to Implement Project Landscaping Plan

Mitigation Measure AES-1g provides:

> In addition to the guidance set forth in DWR's WREM No. 30a, *Architectural Motif, State Water Project,* the BDCP proponents will utilize landscaping treatments to visually enhance key gateways, major thoroughfares, and scenic roadway corridors by using the following: street trees, welcome signs, decorative lighting, and other streetscape design techniques. (DEIR/EIS, p. 17-189.)

This mitigation measure does not describe the DWR guidance nor does the DEIR/EIS explain how it applies to or will minimize the adverse effects of introducing massive industrial facilities into the rural Sacramento River Delta. The DEIR/EIS must explain what is intended by "visually enhancing key gateways, major thoroughfares, and scenic roadway corridors by introducing street trees, welcome signs, decorative lighting, and other streetscape design techniques." Does the BDCP intend to install welcome signs to welcome Delta visitors to the CM-1 facilities? How would welcome signs and decorative lighting, which would attract attention to the massive proposed facilities, substantially lessen the significant adverse change in the aesthetics of the Delta caused by the introduction of a decade of construction activity and the permanent introduction of massive industrial facilities? If the BDCP intends to rely on mitigation techniques and performance standards in other documents, those techniques and standards must be described in the BDCP DEIR/EIS so that the public and decisionmakers can understand what exactly is proposed and evaluate whether the proposed mitigation is feasible and capable of reducing the project's adverse effects.

The DEIR/EIS is also ambiguous about when Mitigation Measure AES-1g will be implemented. At one point (DEIR/EIS, p. 17-172.) the DWR guidance is quoted as requiring planting within 1 year of project completion. However, Mitigation Measure AES-1g specifically calls for landscape mitigation planting to be installed "within 2 years following project completion." (DEIR/EIS, p. 17-190.) Which deadline will apply to the mitigation as used in the BDCP? What is the basis for this significant – 2-year delay in implementing mitigation? Mitigation plantings should be installed immediately following construction of each project element, not deferred until two years after completion of the entire project. Deferring mitigation for up to two years until the entire project is complete is unreasonable and only exacerbates the severity of project impacts by extending the time in which the public is exposed to the visual scarring associated with BDCP construction and facilities.

Mitigation Measure AES-4b: Minimize Fugitive Light from Portable Sources Used for Construction

This mitigation measure is so vague as to be meaningless. The measure repeatedly describes that light and glare will be "minimized" "to the extent feasible." (DEIR/EIS, p. 17-200, lines 1-15.) No information is provided by which to assess how minimization or

feasibility will be assessed. What is the minimum spacing assumed to be required to meet safety requirements? When will a proposed lighting plan be developed and who will assess the proposed lighting plan's compliance with this mitigation measure?

Mitigation Measure AES-4c: Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences

The visual barriers required by mitigation measure AES-4c are intended to address significant adverse effects of night lighting by preventing "light spill from truck headlights toward residences." (DEIR/EIS, p. 17-199, lines 23-24.) The barriers are described as a being "a minimum of 5 feet high" that "will provide a continuous surface impenetrable by light. This height may be obtained by installing a temporary structure, such as fencing (e.g., chain link with privacy slats)." (DEIR/EIS, p. 17-200.) The requirement that barriers to mitigate light spill be 5 feet high is inconsistent with mitigation requiring 6-foot visual barriers to shield views of construction activity. (*See* Mitigation Measure AES-1b.) What is the basis for the 5-foot requirement for barriers intended to shield light spill from truck headlights versus 6 feet to shield construction views? Further, a chain link fence with privacy slats does not meet the mitigation's performance standard of a "continuous surface impenetrable by light" as a chain link fence with privacy slats, is neither a continuous surface nor is it impenetrable by light.

As with the barriers proposed under Mitigation Measure AES-1b, due to the fact that much construction-related activity will occur well above or below the grade of the existing roadway network, it is likely the barriers themselves would need to be massive – much taller than 5 feet – in order to effectively shield views from the various types of affected sensitive receptors, considering their actual locations relative to proposed facilities, construction areas and construction truck routes. No information is provided regarding the estimated maximum linear extent of visual barriers required "to prevent light spill from truck headlights toward residences." This mitigation measure, like Mitigation Measure AES-1b, raises more concerns than it addresses.

Additional Mitigation for Impacts of Permanent Structures

The proposed mitigation measures largely address long-term construction impacts to aesthetics. Mitigation on permanent facilities is limited to transmission line location, a spoil/borrow material management plan, aesthetic design treatments, and fugitive light mitigation. The County would like to see additional mitigation to address the significant impacts of permanent facilities with more specificity. In that vein, the County requests that the DEIR/EIS incorporate the following additional mitigation, at a minimum:

> The following measures will be implemented, to the extent feasible, to minimize aesthetic impacts of all BDCP structures and other facilities in the Delta including, but not limited to:

- Provide landscaping as appropriate to break up undesirable visual patterns, or block facilities from view.
- Use design motifs on structures in keeping with the natural setting or similar themes (e.g., rivers, historical place).
- Minimize the height of structures when feasible.
- Locate structures as far away from the River Road as feasible.
- Minimize obtrusive fixtures on buildings, e.g., antennas or other equipment that could be located in another less obtrusive location.
- Provide shielding for fixtures to buildings that cannot be relocated.

Cumulative Visual Impact of Barrier Mitigation

It should be noted that the DEIR/EIS does not address the cumulative impact of the visual barriers called for in Mitigation Measures AES-1b and AES-4c. Because no information is provided about the extent of the proposed mitigation, the severity of the impact cannot be assessed. However, given the extent of construction activity and the size and scope of proposed facilities, it is reasonable to assume that extensive barriers would be required, and these barriers themselves would fundamentally and adversely affect the visual character of the scenic roadways, residences, recreation areas, and other visitor serving uses in the Delta.

Inconsistency with the Sacramento County General Plan

The Sacramento-San Joaquin River Delta is long known for its collection of unique natural and scenic resources, particularly those located along and proximate to the designated scenic corridors and roadways that run through the Delta. The protection and preservation of these resources is recognized in the General Plan's Circulation Element. For example, several County roadways in the Delta run on the crowns of levees along the rivers and sloughs. These narrow roads often provide uninterrupted views of water/riparian habitat on one side and views of rich farmland on the other. In addition, these roads run through the Delta's historic (legacy) communities of Courtland, Freeport, Hood, Isleton, Locke, Ryde, and Walnut Grove and provide direct access to the Delta's recreational resources. The River Road (Highway 160) is a designated scenic corridor. The scenic corridor designation extends 500 feet to each side of the river, as measured from the middle of the channel or by a minimum of a corridor 300 feet from the edge of the river.

The Circulation Element includes specific objectives and policies that call for the following:

> Retention of the River Road's (State Route 160) designation as an official State and County Scenic Highway and to preserve and enhance its scenic qualities. Further, Policy CI-53 states that roadway improvements along established scenic corridors shall be designed and constructed so as to minimize impacts to the scenic qualities of the corridor.

The Delta's unique scenic values and qualities are well documented. The size, scale and location of the proposed BDCP facilities will have significant and unavoidable impacts to the scenic qualities of the scenic State Route 160 corridor. The DEIR/EIS's failure to identify adequate and appropriate mitigation for permanently impacting these longstanding scenic qualities, or an alternative that would substantially lessen or avoid the impacts and conflicts with County General Plan policies, is neither good public policy nor an acceptable outcome under CEQA and NEPA.

Chapter 18: Cultural Resources

The DEIR/EIS fails to clearly identify the methodology used to evaluate cultural resource impacts, and it does not evaluate the full range of potential impacts to cultural resources within Sacramento County. It also does not accurately describe the Section 106 consultation process.

Incomplete Discussion of Regulatory Setting

The DEIR/EIS omits regulatory information regarding the following Special Planning and Neighborhood Preservation Areas, as identified in the Zoning Code of Sacramento County, Title V: Courtland (504-500); Locke (504-400); Walnut Grove (504-20). (*See* DEIR/EIS, Section 18.2.3.6, p. 18-38.) The DEIR/EIS should be revised to include regulatory information regarding these areas, which are subject to additional protective measures because of their unique historic and cultural resources.

Failure to Identify Scope of Cultural Resource Impact Evaluation

The DEIR/EIS states, "As necessary, additional site-specific studies and analyses will be conducted pursuant to CEQA, NEPA, and Section 106 of the National Historic Preservation Act (NHPA) as part of the *second tier environmental review* [emphasis added] for the *program-level* components of the selected alternative pursuant to mitigation measures identified in this chapter." (DEIR/EIS, p.18-1, lines 9-12, emphasis added.) The DEIR/EIS needs to clearly state at what level cultural resources have been evaluated and how future studies and analyses will proceed. The sentence cited above provides the only reference to "tiered" or "program-level" analysis in the Cultural Resources chapter; however, "phased identification" is noted in a later section regarding Section 106 of the National Historic Preservation Act. (DEIR/EIS, p. 18-29, lines 6-7, ("phased identification and evaluation of cultural resources will be completed as authorized by 36 CFR 800.4[b][2] and 36 CFR 800.14 [b][1].").) The document needs to clearly state at what level (programmatic or project) cultural resources were reviewed for this DEIR/EIS; if there are on-going identification and/or consultation efforts; and what analysis/studies may happen in the future. It should be revised to provide a clear methodology that states at what level cultural resources have been reviewed in the DEIR/EIS and how "tiered," "phased," and all other future studies will be conducted. Project level review must be conducted for the selected/preferred project.

Incomplete Discussion of Impacts to Historic Districts

The DEIR/EIS fails to evaluate the full range of potential impacts to cultural resources. Impacts to historic districts must include impacts to the district and to the contributing resources that make up that district. For example, potential impacts must be identified to both the Locke National Historic Landmark District and to the 53 contributing resources within the district. The Walnut Grove Japanese American Historic District contains 22 contributing resources and the Walnut Grove Commercial/Residential Historic District contains 18. The DEIR/EIS must also evaluate potential impacts to the proposed Delta National Heritage Area. Both Appendix 18B, which forms the basis for the DEIR/EIS cultural resources section, and the DEIR/EIS impact analysis itself, must be revised to address potential impacts to the proposed National Heritage Area, and both to Historic Districts and the historic resources that contribute to those districts.

In its discussion of Historic Districts (Section 18.1.7.4) the DEIR/EIS omits regulatory information regarding National Historic Landmark (NHL) Districts and National Heritage Areas. As identified in Code of Federal Regulations, Title 36, Part 65 "the purpose of the National Historic Landmarks Program is to identify and designate National Historic Landmarks, and encourage the long range preservation of nationally significant properties that illustrate or commemorate the history and prehistory of the United States." In addition to being a Historic District listed on the National Register of Historic Places, the Town of Locke was listed as a National Historic Landmark on 12/14/1990.

In Section 85301 of Senate Bill X7-1 (Delta Reform Act of 2009), the Legislature charged the Delta Protection Commission (DPC) with developing:

> A proposal to protect, enhance, and sustain the unique cultural, historical, recreational, agricultural, and economic values of the Delta as an evolving place.... The Commission shall include in the proposal a plan to establish state and federal designation of the Delta as a place of special significance, which may include application for a federal designation of the Delta as a National Heritage Area.

In accordance with the Delta Reform Act, the DPC prepared a Feasibility Study for a Sacramento-San Joaquin Delta National Heritage Area (July 2012). As noted by the National Park Service, "National Heritage Areas (NHAs) are designated by Congress as places where natural, cultural and historic resources combine to form a cohesive, nationally important landscape."

The regulatory framework must include information regarding the National Historic Landmarks Program and note that Locke was listed as an NHL on 12/14/1990. A discussion regarding National Heritage Areas must also be added. The DEIR/EIS also should identify that in accordance with the Delta Reform Act, the Delta Protection Commission prepared a Feasibility Study for a Sacramento-San Joaquin Delta National Heritage Area (July 2012) and present the results of its findings.

Consultation with Native American Organizations

The DEIR/EIS indicates that Native American organizations have been notified of the BDCP project;[8] however, it is not clear whether consultation has occurred under Section 106 of the National Historic Preservation Act. The DEIR/EIS does not summarize consultation efforts under Section 106 and simply notes that "steps will be completed in consultation with the SHPO and Indian Tribes, the ACHP, and other interested parties that choose to participate in the Section 106 process." (DEIR/EIS, p. 18-29, lines 17-18.)

In summary, the document fails to demonstrate that Section 106 consultation has occurred. Notification does not constitute consultation. The DEIR/EIS should be revised to summarize what Section 106 consultation has occurred to date.

Inadequate Information and Analysis of Section 106 Process

The DEIR/EIS does not adequately introduce, define, or discuss the Section 106 process. The following sentence is an example: "Section 106 *review will be* performed for *relevant federal actions* that qualify as undertakings and that are necessary to implement the BDCP." (DEIR/EIS, p. 18-29, lines 5-6, emphasis added.) According to 36 Code of Federal Regulations section 800.1, "[t]he section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings though *consultation* among the agency official and other parties with an interest in the effects of the undertakings on historic properties, commencing at the early stages of project planning. The goal of *consultation* is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." (Emphasis added.) Section 106 is not a "review." The purpose of the process is to provide meaningful consultation among interested parties. The reference to "relevant federal actions" is redundant. By definition, undertakings are subject to Section 106 consultation.

The DEIR/EIS implies that the BDCP is subject to Section 106, and states that "Section 106 review *will be* performed." (DEIR/EIS, p. 18-29, lines 5-6, emphasis added.) According to the National Preservation Institute,

> Section 106 review should be conducted during preparation of any EIS. Scoping, identification, and assessment of effects should be done during the analysis leading to the draft EIS (DEIS), *and the results should be presented in the DEIS.* Consultation to resolve adverse effects should be coordinated with public comment on the DEIS, with the results reported in the final EIS (FEIS).

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[8] "In addition, representatives of the following Native American organizations also responded and indicated that there were no objections or concerns about the BDCP at that time, but wished to be kept apprised of future progress on the project: Wintun Environmental Protection Agency; Cortina Indian Rancheria (CIR); Rumsey Indian Rancheria; and the United Auburn Indian Community of Auburn Rancheria. No additional comments have been received to date." (DEIR/EIS, p. 18-5, lines 21-25.)

> Any Memorandum of Agreement (MOA) developed under Section 106, or the final comments of the ACHP, should be addressed in the ROD. Unless there is some compelling reason to do otherwise, the Section 106 MOA should be fully executed before the ROD is issued, and the ROD should provide for implementation of the MOA's terms. (National Preservation Institute, *NEPA and Section 106 of the National Historic Preservation Act: General Rules for NEPA-Section 106 Coordination*, available at http://www.npi.org/NEPA/sect106 (accessed 5/2014), emphasis added.)

The DEIR/EIS does not summarize the Section 106 consultation conducted to date, nor does it specify whether the findings and mitigation measures outlined were developed through the Section 106 process. The DEIR/EIS indicates that Section 106 consultation will occur; in order for consultation to be meaningful, the process should already be underway. As a cooperating local agency, the County has not been notified of Section 106 consultation for the BDCP. The County requests participation in the Section 106 process as a Consulting Party.

In conclusion, the County finds the DEIR/EIS deficient in its discussion of Section 106 of the National Historic Preservation Act. The relationship between Section 106 and the EIR/EIS must be defined and a summary of consultation and findings provided. To accomplish this, DEIR/EIS sections 18.2.1.2 (Section 106 of the National Historic Preservation Act of 1966) and 18.2.1.3 (Compliance with Section 106 of the National Historic Preservation Act for the BDCP) will require substantial revision. Finally, the County seeks notification of the Section 106 process for the BDCP and requests participation as a Consulting Party.

Errors in Built Historical Resources Evaluation Report

There are several erroneous Sacramento County Assessor's Parcel Numbers (APNs) noted within the Built Historical Resources Evaluation Report. Because street addresses are less reliable, the correct APN is critical. The APNs should contain 10-digits. It appears that for those APNS that contain extra numbers, the first two digits (3 and 4) are extraneous. For example, the APN for the Vorden Cannery is noted as 341460060057. The APN should be 146-0060-057.

Further, historic resources are not accurately identified and documented in the Built Historical Resources Evaluation Report. For example, the report includes a description of the George B. Greene House, which was assigned survey identification number of PTO_016_001. The report describes the property at 11275 River Road, Courtland, and notes its APN as 341320210044. (As noted in the previous comment, the first two digits of this APN are incorrect; therefore, the correct APN is 132-0210-044). The associated maps depict the Greene House at this APN; however, the aerial underlay of the maps does not appear to depict the Greene House. The rooflines of the buildings on the aerial maps do not match the photo of the Green House in the Built Historical Resources Evaluation Report.

Sacramento County has two records for Greene-Hemly parcels in the vicinity of Courtland. One is located at 11300 Randall Island Road (APN 132-2021-0044); and the second is located approximately three miles to the south and has a mailing address of 11275 Highway 160 or River Road (APN 146-0020-0450). The address, APN, aerial maps, and photographs for the Greene House do not appear to match and as a result, the location of the property is unclear.

The discussion of the Rosebud Rancho (PTO_010_002) also appears to be based on incomplete and or inaccurate information about this resource. The Built Historical Resources Evaluation Report concludes that the Rosebud Rancho, originally designed by Nathaniel Goodell (architect of the Governor's Mansion), should be de-listed from the National and California Registers of Historic Places because of damage it sustained from a fire in 1989. The property was restored and reconstructed in the 1990s by local historic architect Bob McCabe in keeping with the National Park Service Treatment of Historic Properties, which includes interrelated guidelines for Preservation, Rehabilitation, Restoration, and Reconstruction. (*See Sacramento River Delta Historical Society Newsletter*, June 1994, attached as Exhibit I.) The property has not been officially de-listed, nor does the County support de-listing. The proposed Pipeline Tunnel Options (PTO) will directly and indirectly impact Rosebud Rancho. The DEIR/EIS must evaluate these impacts in relation to Rosebud Rancho as a historic resource listed on the National Register.

The DEIR/EIS relies on the Built Historical Resources Evaluation Report. Errors and the lack of clear documentation of historical resources in that report undermine the validity of the impact analyses and determinations described in the DEIR/EIS. Appropriate corrections and clarifications to that report must be made and the DEIR/EIS impact analyses revised accordingly.

Chapter 19: Transportation

General Comments

The Sacramento County Department of Transportation (DOT) anticipates that the BDCP will significantly change the nature of travel in the Delta. Heavy construction traffic will be introduced for many years into a setting that is accustomed to a rural way of life. Not only will people be affected by traveling with a heavy increase in construction traffic, but pavement conditions in the Delta will deteriorate to a point of disrepair. Much of the Delta's early roadway network was built over old trails that ran along the tops of levees. Roadways were built with the structural standards of that time, and they no longer meet the present structural standards. Construction impacts to roadways will be significant, and roadways may need to be reconstructed to current structural standards. Close coordination with Sacramento County on the nature and extent of mitigation will be required.

Traffic Effects to Delta Way of Life

Sacramento County roads Hood Franklin, Lambert, Twin Cities, Sutter Slough, River, Walnut Grove, Isleton, and Race Track will all experience significant hourly volume increases during construction, even though level of service (LOS) calculations may show acceptable operations. (*See, e.g.,* DEIR/EIS, Table 19-8, p.19-49.) Various alternatives show that some of the study roads will operate unacceptably in Sacramento County when construction traffic is added. For these roadways, as specified in Mitigation Measure TRANS-1c, the BDCP proponents shall be responsible for capacity enhancements needed to mitigate the BDCP's substantial adverse effects to County residents and communities.

While roadway capacity is one measure of operations on a roadway, the nature of the construction traffic for the BDCP will consist of significant amounts of heavy equipment on roads that do not normally experience this type of traffic. Were passenger car equivalents (PCE's) for construction equipment traffic taken into consideration with this volume analysis? Residences and activities that occur along these roadways will experience a difference in roadway operations for a significant length of time. The length of construction and nature of traffic (heavy vehicles) should also be taken into consideration in assessing the nature and extent of the BDCP's impacts.

Of significant concern to the County is the BDCP's impact on the safety of Delta citizens from an increase in roadway safety hazards, including interference with emergency routes during construction on already heavily congested roadways including I-5, I-80, SR 50, SR 99, SR 160, Lambert Road, Grant Line Road, Hood Franklin Road & River Road. (*See* DEIR/EIS, Impact TRANS-3 – *Increased Safety Hazards and Interference with Emergency Routes*, p. 69.) BDCP construction traffic will greatly increase an already lengthy law enforcement response time to the residents of the river Delta communities. Current emergency law enforcement response times to the communities of Locke, Hood, Isleton, and the many recreational sloughs and islands are in excess of 25 minutes. Based on the Sheriff Department's experience with prior roadway and bridge construction projects in that area, the BDCP impact of roadway hazards, traffic control, and interference will increase this response time to more than 60 minutes. The only mitigation noted is a "good faith effort" to enter into agreements to enhance capacity of affected roads. This measure does not guarantee that mitigation or improvement will occur. Moreover, the impact discussion indicates that mitigation measure TRANS-1c will not reduce the severity of the impact to a less than significant level. (*See* DEIR/EIS, p. 19-70, lines 18-22.) This is unacceptable and will adversely affect law enforcement response and community safety for a period of 9 to 12 years.

In that vein, quality of life impacts from construction traffic should be addressed in this document as well. Traffic and road disruption not only has an adverse effect on agricultural and recreational uses within the Delta, the safety of Delta residents and the Delta economy, but in doing so conflicts with the co-equal goals for the Delta as adopted by the

Legislature (as noted in our comments above, regarding the project's inconsistency with the Delta Reform Act).

Mitigation for Capacity-Related Traffic Impacts

i. Mitigation Measures TRANS 1-b

Mitigation measure TRANS-1b calls for limiting construction activities so that construction traffic remains below acceptable LOS levels on roadways. In the County's experience, more than likely it will not be efficient or feasible for construction-related traffic to be confined to designated or approved routes. Moreover, it is almost impossible to enforce. How will this mitigation measure be achieved? Will someone perform hourly volume counts on various roadways in the study area and shut down construction traffic if LOS capacities are reached? These mitigation measures should require that the transportation management plan specify short- and long-term roadway use and include enforcement provisions. However, due to the significant uncertainties in the feasibility of this mitigation, the DEIR/EIS should not rely on it to determine that impacts could be mitigated below a level of significance.

ii. Mitigation Measure TRANS-1c

This mitigation measure calls for making good faith efforts to enter into mitigation agreements to enhance capacity on congested roadway segments. What constitutes a good faith effort? Also, more information is needed about the specific capacity enhancement projects that will be required to mitigate impacts. What is the expected location and extent of these improvements, and where have the impacts of capacity enhancement been studied? If roads must be widened to mitigate BDCP traffic, will homes, businesses or agricultural land be lost? Which of the needed improvements are included in an existing program of planned improvements and what is the funding status of that program? Making a good faith effort or paying a fair share is not sufficient mitigation if there is no evidence that mitigation will actually result. (*Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1122 (traffic impact fee inadequate mitigation because no plan for requiring fees from other projects or definite commitment to make road improvements was in place).) Finally, any needed capacity or improvement work needed to ensure that roads will be in a condition to survive the construction activity that will occur should be performed by the BDCP proponents prior to BDCP construction.

Impacts to Physical Condition of Roadways

The DEIR/EIS appropriately recognizes that BDCP construction traffic is likely to substantially degrade Delta roads. However, the analysis of construction impacts does not address the full scope of the BDCP's impacts to County roads, and mitigation is not adequate to avoid or substantially lessen significant impacts.

i. Impacts to Side Roads

The DEIR/EIS identifies roadway segments for impact study based on the likelihood that they would be utilized for construction-related activities. (*See* DEIR/EIS, Table 19-1, p. 19-5.) The analysis does not evaluate the impacts to side roadways that may be used during construction. An evaluation of current goods movement operations in the Delta has revealed that a large percentage of sub-contract haulers do not adhere to prescribed hauling routes, primarily due to limited oversight and enforcement. Specifically, Herzog Road, Vorden Road, Russell Road, and Terminous Road will be negatively affected. Degradation of these and all roadway segments must be adequately mitigated to the satisfaction of Sacramento County DOT.

Impact TRANS-2

The DEIR/EIS suggests that the only roadway segments that will be damaged by the project are those identified as being in presently unacceptable condition (as in Tables 19-10 and 19-26). Mitigation is limited to impacts to road segments identified in those tables, namely roads with currently unacceptable road conditions that have traffic added to them. This approach fails to account for impacts to presently acceptable roadways that will substantially deteriorate as a result of project traffic. These impacts also need to be recognized and mitigated. Any construction traffic that will be added to both these types of roadways, due to the nature of heavy loads, is expected to break down pavement conditions significantly.

Due to the age and condition of the infrastructure in the Delta, roads not built to current standards will deteriorate more rapidly as a result of heavy construction traffic, the existing geologic and hydrologic conditions in the area (roadways constructed on levees and on peat or in tidal areas), the heavy volume of construction traffic, and the nature of that traffic (heavily laden trucks), the BDCP likely will result in significant deterioration of roadways that are presently in acceptable condition. Impacts will not be limited to roadways that are identified in the DEIR/EIS (Table 19-26) as currently deficient. Road deterioration can result in additional traffic delays, damage to vehicles, and increased safety hazards. The analysis should be revised to evaluate potential effects to the Delta's entire roadway network as existing conditions will be greatly impacted by the extensive construction work.

Mitigation Measures TRANS-2a and b

These measures call for prohibiting or limiting construction activity on existing physically deficient roadway segments if feasible. While this is a good idea, it may not be feasible.

Mitigation Measure TRANS 2-c

This mitigation measure addresses the effect of construction traffic on roadways that currently have unacceptable pavement conditions by improving the physical condition of affected roadways. While the County appreciates the inclusion of Mitigation Measure TRANS-2c, it is too narrowly focused to adequately mitigate the BDCP's impacts to County roads. As shown in Table 19-5 – *Existing Pavement Conditions in the Study Area,* the pavement conditions on most of the Sacramento County roadway segments in the study area are unacceptable. (DEIR/EIS, p. 19-19.) Furthermore, the few that are classified as acceptable have a Pavement Condition Index (PCI) rating on the border of unacceptable. Adding construction traffic to these roadways will make them deteriorate to unusable conditions. Furthermore, any roads used, whether they have an existing pavement deficiency or not, are expected to deteriorate due to the nature of construction activity. Roadways with a current PCI slightly higher than 56 out of 100 may be considered "acceptable," but they are very close to becoming unacceptable. The introduction of significant amounts of heavy construction traffic will quickly cause them to deteriorate into the unacceptable category. Mitigation measure TRANS-2c fails to account for or mitigate significant impacts to these roadway segments. All roadways that will carry construction traffic will be affected (including side roads) and should be subject to this mitigation measure, not just the roads identified in the Pavement Conditions tables such as 19-10 and 19-26.

Due to the lengthy construction period, the BDCP proponents should not only be required to restore roadways to pre-construction condition or better at the end of the construction period, but they also should be required perform routine maintenance on substandard or damaged roadways prior to and throughout construction activities to ensure that roads remain safe and in acceptable condition for other users, including emergency vehicles. As drafted, this mitigation measure requires restoration of roads to their "pre-construction" condition. This seems impractical. For roads that are presently deficient, or on the verge of being deficient, the DEIR/EIS should explain how the contractor ultimately will restore these roads to an "unacceptable" condition. Rather than "restoring" roads to an unacceptable condition, at the end of construction activities, the BDCP proponents shall deliver acceptable roadways back to Sacramento County as determined by the director of the DOT.

Finally, regarding the BDCP proponents' obligation to pay the BDCP's "fair share" of road repair costs, mitigation measure TRANS-C (page 19-182) states: "The fair share amount would be *either* the cost to return the affected roadway segment to its preconstruction condition." (DEIR/EIS, p. 19-182, emphasis added.) Either the word "either" is misplaced, or the measure has omitted an alternate means of calculating fair share amount. Please clarify and correct what is intended.

Railroad Corridor Use

The BDCP proposes to use railroad corridors for construction access. (*See, e.g.,* Figure M3-1 sheets 8, 9, and 1). Sacramento County DOT does not support the use of railroad corridors for construction roads. Even railroad corridors that are infrequently or not used any more can be turned into transportation amenities for alternative modes of travel (i.e., pedestrians, bicycles, equestrians, etc.). The use of these corridors for construction or operation access roads is not supported without further study.

Job Site Access

The entrance and egress for construction-related job sites must be wide enough for doubles trucks[9] to go out and come in from the same direction. Provisions also must be made for maintenance and repair of affected side roads. On levee roads within the County, contractors routinely set up entrance ramps going one direction (e.g., west bound) and egress ramps going out in the same direction so as to keep the traffic flowing. Trucks thus go around the block to get back to the site, such as a borrow pit. This causes damage to side roads when they cut back across the islands to get back to the stockpiles. The DEIR/EIS needs to provide more detail showing how trucks are to enter and leave the job sites and follow haul routes. Without this information, DOT is unable to evaluate the full scope of potential traffic and road impacts or comment on the adequacy of the proposed mitigation measures.

Bridges

The DEIR/EIS appears to evaluate only impacts to drawbridges. (*See* DIER/EIS, p. 19-23.) An evaluation of "other bridges" should be included in the DEIR/EIS. At a minimum, the DEIR/EIS should include a listing and map of all stationary bridges affected by the construction and future operation of water operation facilities linked to CM-1. The aging drawbridges listed in Table 19-6 *Roadway and Rail Draw Bridges in the Study Area*, are currently operating at their threshold capacity. As a result, any additional transportation-related activities that occur as a result of the BDCP can easily put these bridges above their safe operating levels of service. Presently, no oversized and/or overweight trucks over 80,000 pounds are allowed on most of Sacramento County's draw bridges, including Freeport Bridge, Snodgrass Bridge, Walnut Grove Bridge, and Tyler Road Island Bridge.

Does the existing traffic impact analysis take into account the weight limits for these draw bridges, and the limitations on road use and construction vehicle access they present? To help the reader understand how the constraints imposed by draw bridges might affect construction traffic routing, the DEIR/EIS should include a location map identifying all existing draw bridges. Use of these bridges for the construction of the proposed water

[9] California Legal Truck-Semitrailer-Trailers, as defined at http://www.dot.ca.gov/hq/traffops/engineering/trucks/truckmap/truck-legend.pdf.

operation/diversion facilities (i.e., CM-1) must be coordinated with and approved by the DOT for structural limits on each bridge. Lastly, the "Notes" section on page 19-24, includes an incorrect numerical reference for Sacramento County; it should read "24", not "23".

Existing Conditions

Page 19-20: *Table 19-5 Existing Pavement Condition in the Study Area*: The DEIR/EIS incorrectly identifies Isleton Road as having a Pavement Condition Index (PCI) of 85. The correct PCI for this road is 60.

Bicycle Access and Safety

As recognized in Impact TRANS-7, bicycle routes will be adversely affected by BDCP construction. Impacts, however, are not limited to access. Moreover, simply posting warning signs about road hazards is insufficient to mitigate adverse effects to bike routes and to the safety of cyclists. Not only will access to bike routes need to be maintained during construction, but bike routes will need to be maintained during construction activity. Mitigation Measure TRANS-2c should be modified to provide for ongoing maintenance to bicycle routes as well as vehicular routes.

Barge Traffic

Page 19-184, lines 39-40: Barge traffic that requires the operation of draw bridges located in Sacramento County will be subject to a 72-hour advance notice by the project contractors/proponents to the DOT. DOT will require a two-week advance notice of barge traffic at the Twin Cities Road bridge.

Air Traffic Effects

The DEIR/EIS does not include Sacramento International Airport within the transportation study area, and therefore potential adverse effects to air traffic operations associated with the increased risk and likelihood of bird strikes associated with CMs 2-11 were not included in the transportation analysis. However, the five-mile general flight zone encompasses the entire Freemont weir component of CM-2. (DEIR/EIS, p. 30, lines 4-6.) The east levee of the Yolo Bypass is 2.00 miles from Sacramento International's west runway (16R/34L) and 3.16 miles from the east runway (16L/34R). The west levee is 3.60 miles and 4.83 miles from the west and east runways, respectively. The Fremont weir concrete structure is 5.00 miles from the west runway. The flight paths for both runways cross near and over the BDCP Conservation Zone 2. Therefore, attracting more birds to this area would put them in the path of approaching and departing aircraft.

Chapter 20: Public Services and Utilities

Effects on Law Enforcement, Fire Protection and Emergency Response Services

The DEIR/EIS acknowledges that existing demand for local law enforcement protection in Sacramento County already exceeds the supply of resources. (*See* DEIR/EIS, p. 20-17, lines 20-23.) Growing demand and a relatively slower growing resource base leads to an inability to maintain historic levels of service. The County disagrees with the DEIR/EIS's determination that the BDCP will not have a significant impact on public service demands. This determination is not supported by evidence or analysis.

Projected employment estimates are roughly 4,000 or more workers over the length of the 9 to 12 year project. (DEIR/EIS, p. 20-39.) The DEIR/EIS indicates the workforce population would primarily come from within the existing five-county labor force already served by law enforcement and only specialty positions would be hired from outside. What is the basis for this determination? There is no language in the DEIR/EIS citing specific hiring practices to favor local residents. New residencies created by the workforce would likely also include additional family members. An increase in workforce population moving to the area of this size would also likely increase the demand on law enforcement.

The scale and duration of the construction required also could result in increased demand on law enforcement, especially near major construction sites. (DEIR/EIS, p. 20-40.) The mitigation offered would provide 24-hour onsite private security to ensure no adverse effect on local law enforcement. According to the Sacramento County Sheriff's Department, private security may offer limited deterrent to potential thefts; however, it does not negate the need for law enforcement to respond to crimes that do occur. Additionally, the BDCP is highly contentious and continues to draw significant criticism and opposition from political and ecological groups. A threat assessment has been completed by the California Central Intelligence Center indicating an elevated threat for destructive acts both during construction and upon completion. The high profile and controversial nature of the BDCP, which puts it at an unusually high risk for criminal behavior, only increases the potential burden on law enforcement and the risk to the safety of Delta residents.

Failure to Analyze Impacts of Wastewater Treatment and Disposal

Project tunnel boring activities will generate "substantial" amounts of contaminant-laden wastewater, in rural areas, that will require treatment and disposal. (DEIR/EIS, p. 20-119.) The DEIR/EIS states wastewater treatment services required for the preferred alternative "would be provided by temporary facilities and treated onsite. Construction of Alternative 4 would not require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities. This effect would not be adverse." (p. 20-120.) No evidence or analysis is provided in support of the determination that impacts from the treatment and disposal of a substantial amount of wastewater would not be adverse.

Although the volume of wastewater is characterized as "substantial" (DEIR/EIS, p. 20-119.), the total amount of wastewater is not quantified, and the type of treatment that is proposed and impacts of such treatment are not specified. What type of wastewater treatment process is proposed for the tunnel boring wastewater? What are the estimated concentrations of contaminants that will be in the wastewater? What type of treatment process and associated treatment facilities will be implemented? What are the impacts of constructing and operating the wastewater treatment facilities, and where and how will the wastewater be disposed? What will the impacts of wastewater disposal be? Because no information is provided about this potential impact, the County is unable to assess the actual scope of impacts or any necessary mitigation. The DEIR/EIS's bare conclusion about wastewater treatment and disposal impacts, without any explanation of its factual and analytical basis, violates CEQA's requirement that an EIR "include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.* (1988) 47 Cal.3d 376, 405.)

Lack of Water Supply Analysis for CM-1 Activities

The Preferred Project (Alternative 4) would require massive amounts of water for workers, operations, and concrete batch plants. The DEIR/EIS cites a total potable water demand of 165.7 million gallons of water over the nine-year construction period. (DEIR/EIS, Table 20-3, p. 20-45.) This is the equivalent amount of water required to serve 200 or more homes, under average potable water consumption rates in the Sacramento area.

The DEIR/EIS on page 20-120 concludes:

> CEQA: While construction of Alternative 4 would require 165.7 million gallons of potable water, this supply could be met by non-municipal sources without any new water supply entitlements. Additional needs for wastewater treatment and potable water could also be served by non-municipal entities. Water for construction activities would be brought to the site in water trucks. Wastewater services for construction crews would be provided by temporary portable facilities. Construction of Alternative 4 would not require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities. This impact would be less than significant. Mitigation is not required.

The discussion of operational water supply impacts (DEIR/EIS, pp. 20-127 – 20-130.) suffers from the same flaws as the construction water analysis. The DEIR/EIS does not adequately discuss/analyze where water needed to support BDCP operations will come from or indicate the potential impacts that could result from the shifting of this large amount of water from the aquifer or surface water in the river/Delta.

No evidence or analysis supports the determination (DEIR/EIS, p. 20-130.) that the BDCP's construction or operational water demands can be met from available entitlements and supplies or what the impacts of supplying water would be. What non-municipal sources

are proposed to be used to supply project water? What evidence supports a determination that adequate supplies exist, and that the BDCP's use of those supplies will not adversely affect other uses, such as local residents or agricultural uses? If water is proposed to be pumped from local groundwater wells, more information is needed about well locations and capacities, and aquifer capacity, as well as pumping-related impacts, including potential interference with other area wells, aquifer depletion, subsidence, and potential surface water depletion impacts to the Sacramento or San Joaquin Rivers.

What is the quality of the proposed project water sources, and will any treatment be required to meet drinking water standards? Water for construction activities is estimated to amount to 147 million gallons. What is the proposed source for that water, and how many trucks, of what size, would be required to supply the water? Were the truck trips associated with delivering water to the construction sites factored into the project traffic impact analysis and impact determinations? Without this information, there is no evidence to support the DEIR/EIS's determination that there are adequate supplies of water to serve the project, and that the BDCP would not require or result in the construction of new water or wastewater treatment facilities.

Finally, there is no mention of potential impacts to local water systems, particularly wells, due to BDCP construction. Potential impacts include possible geological degradation of the aquifers due to partial or full soil liquefaction due to construction or operation of the BDCP.

Relocation of Hood Fire Station

A number of alternatives would require relocation of the Hood Fire Station. Mitigation Measure UT-2 proposes replacement of the station to maintain the existing service response times of 5 to 10 minutes. (DEIR/EIS, p. 20-42.) The DEIR/EIS does not identify any possible locations for replacement of the fire station, so it is impossible for the County to assess whether this mitigation measure is viable and what the potential impacts of relocating the station might be.

Solid Waste Impacts Associated with Project Operation

The BDCP will generate nearly 300,000 cubic yards of dry solids requiring land disposal. The DEIR/EIS states, "[a]s designed, it is anticipated that a portion of the solids would be stored and reused at alternative facilities and some portion would be transported for offsite disposal." (DEIR/EIS, p. 20-128.) Where are the alternative facilities that will be used for dry solids storage and reuse? How much area is required to store the solids? Will the storage area be lined to ensure that solids storage does not contaminate groundwater? What type of containment system will be provided to ensure that stored solids do not present runoff or erosion problems? Solids storage has the potential to result in odor and vector impacts. What measures will be implemented to avoid these types of impacts? How many truck trips would be required to move solids to storage areas, and were these trips factored into the traffic impact analyses?

Lack of Water Supply Analysis for Conservation Measures 2-22

Impact UT-8 (DEIR/EIS, p. 20-56, line 37) discusses needed water for BDCP mitigation and restoration activities. Again, there is no analysis of where these water supplies will originate or the impacts of obtaining and delivering that water. While specific details about mitigation and restoration projects may not be known, that does not excuse the failure to evaluate, at a program level, the projected water demand of those activities and likely sources for project water. In numerous areas the DEIR/EIS analysis of water export project (CM-1) impacts, and the viability of the HCP/NCCP itself, depends on the success of conservation measures 2-22. If these conservation measures are not feasible because there is an insufficient water supply to ensure their success, or the impacts of supplying that water will be so great as to negate other anticipated BDCP benefits, the public needs to know, so that the merits of the project can be adequately considered.

Correction to Table of Water Service Providers (Appendix 20A)

The SCWA address provided in Table 20A-8 is incorrect. (DEIR/EIS, p. 20A-29.) The correct address is 827-7th Street, Room 301, Sacramento, CA 95814.

Chapter 21: Energy

Inadequacy Due to Data Discrepancies, Omissions and Overall Complexity

The DEIR/EIS's analysis of BDCP energy impacts fails to comply with CEQA and NEPA in several respects. The problems relate both to its readability and use as an informational document. With regard to readability, the complicated text makes it very difficult for the reader to easily understand the potential impacts of each alternative. The presentation of data also makes it difficult for the reader to obtain a clear understanding of the BDCP's impacts.

The tables are unclear, not described very well, and the information does not seem to be consistent with other parts of the document. For example, Table 21-11 provides information on annual *average* pumping and net energy use (in gWh) for the alternatives for the north Delta and south Delta, with "points of comparison" relative to the No Action Alternative (NEPA baseline) and Existing Conditions (CEQA baseline). However, the impact determinations refer to the *maximum* power requirements in MW, which are completely different from the figures provided in Table 21-11, and do not appear to come from any other reference source in the section. In addition, the significance conclusions seem to be based only on the north Delta energy use (from Table 21-11), which is much lower than energy use for the south Delta. However, it is unclear why only north Delta energy use would be used here and what the relationship to the "maximum power requirement" to operate the alternative would be. If the information is in the section, it is not clear and buried. Why include both north and south Delta energy use in Table 21-11 if only north Delta energy use is relevant to the significance conclusions?

As detailed below, the section also fails to clearly describe or analyze key elements related to energy use, including transmission infrastructure and the need for new power generating facilities.

Lack of Clear Description of Electrical Transmission Infrastructure

Although the Energy chapter is a logical place to go to find descriptions of the electrical transmission infrastructure that will be associated with the BDCP, this information is actually scattered throughout other topical chapters. While it makes sense to describe the physical impacts of that infrastructure in the relevant topical chapters, this chapter should clearly articulate what facilities are needed, and where they may be located.

The DEIR/EIS states: "DWR will conduct a System Impact Study which will evaluate the electrical transmission and power needs for the conveyance facilities. The study will be completed in time to procure the necessary power to support construction and operation of the facilities [ ]. This System Impact Study for BDCP is expected to take between five and seven years." (DEIR/EIS, p. 21-22.) This statement appears to imply that the impact of the project's energy demand on the existing transmission system is totally unknown at this time. Because the DEIR/EIS intends to provide a project-level review of impacts, it must include sufficient evidence and articulate the likely magnitude and scope of any impacts. Otherwise, existing plans or facilities may be inadequate to handle the system changes, necessitating further construction impacts, but we will only know this after the project has been approved. Deferring the analysis until a later time deprives reviewers of the information necessary to make meaningful comments on this topic.

Improper Deferral of Impacts Associated with New or Expanded Electrical Power Generating Facilities

Although the BDCP will consume vast amounts of energy, the DEIR/EIS fails to evaluate whether the BDCP's energy demand will result in the need for new or expanded electrical power generation facilities, and what the impacts of developing and operating such facilities would be. Rather the DEIR/EIS merely states, "The potential for new or expanded electrical power generation facilities is therefore not discussed in this section as it will be addressed through SWP power purchase programs." (*See* DEIR/EIS, p. 21-32, lines 11-13.) This sentence highlights our continuing concerns about this chapter (and others), and the fact that analyses critical to understanding the scope and magnitude of potential project impacts are being deferred to a future time. If new or expanded electrical power generation facilities are needed either directly or indirectly as a result of the BDCP, then that information must be disclosed and described in this DEIR/EIS.

Lack of Analysis to Support Impact Determination

The analysis of alternatives (DEIR/EIS, p. 21-40 onward) is conclusory. Although the energy demands reported are substantial, the analysis consists of a single paragraph, which states that "all feasible control measures" will be used to reduce energy consumption, even though measures are not described, and no mitigation is provided that ensures compliance. There is no connection between the stated energy consumption and the significance conclusion, because no nexus is provided between the information in the preceding 40 pages and why that information could lead to a conclusion that impacts are less than significant or not substantial.

Alternative 1A will use an average of 158 gWh/yr during the nine-year construction period, which is roughly equivalent to the amount of power consumed by 14,000 average American homes each year. During the operational period, the energy consumption increases to 308 gWh/yr, which is roughly equivalent to the amount of power consumed by 29,000 average American homes each year.[10] It is worth noting that Alternative 1A is not even the most energy-intense alternative; some will require substantially more energy.

By comparison, Alternative 9 will only require 9 gWh/yr to operate, but no attempt is made in the analyses to compare the alternatives to one another. An argument could easily be made that if there is an alternative that could substantially achieve the project goals but uses hundreds of gWh less of energy, that it would be a wasteful or inefficient use of energy to adopt a more energy-intense alternative. The lack of a clear comparison hinders the ability of the public and decisionmakers to evaluate the relative merits of the various alternatives. The data on each alternative (DEIR/EIS, pp. 21-29 – 21-31) should be consolidated in a table using uniform metrics for easy comparison. There are substantial differences in energy loss between the alternatives, which should be clearly displayed.

Inadequate Cumulative Impact Analysis

The cumulative impact analysis inappropriately concludes that impacts will be less than significant by comparing the energy demand of this project to the total energy demand of the state. (DEIR/EIS, p. 21-61.) In *Friends of Oroville v. City of Oroville* (2013) 219 Cal.App.4th 832, the Court of Appeal rejected the comparison of project greenhouse gas emissions against statewide emissions as a basis for determining the significance of impacts. The court stated, "[o]f course, one store's GHG emissions will pale in comparison to those of the world's eighth largest economy." This same logic applies to the DEIR/EIS's analysis of the BDCP's energy consumption. There is unlikely to be any single project in California that will ever result in significant cumulative energy consumption if the comparison point is the energy consumed by all operations throughout California.

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[10] Source: US Energy Information Administration, located at http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3

In addition to the comparison problem, even though the first sentence references construction energy, the remainder of the analysis only addresses operational energy. No analysis of cumulative construction energy use and impacts has been provided.

Chapter 22: Air Quality and Greenhouse Gases

Failure to Adequately Evaluate Health Effects of Pollutant Emissions

The DEIR/EIS identifies numerous adverse health effects caused by exposure to pollutants that will be emitted during construction and operation of the BDCP, including adverse effects from particulate matter, ozone, NO_2 and CO. (*See* DEIR/EIS pp. 22-4-6.) The DEIR/EIS states, "Mobile and stationary construction equipment exhaust, employee vehicle exhaust, and dust from clearing the land would generate emissions of ozone precursors (ROG and NO_X), CO, PM_{10}, $PM_{2.5}$, and SO2." (DEIR/EIS, p. 22-224, lines 35-36.) The DEIR/EIS further states that emissions of a number of these pollutants will exceed air quality standards and that the highest levels of dangerous emissions will occur in Sacramento County communities where the intake and pumping plant and forebay sites will be built. (*See Impact AQ-2: Generation of Criteria Pollutants in Excess of the SMAQMD Thresholds during Construction of the Proposed Water Conveyance Facility,* DEIR/EIS, p. 22-229, lines 6-10, 22-29.) However, the DEIR/EIS does not provide any information about the potential for these BDCP emissions, other than particulate emissions, to result in adverse health effects.

Despite the acknowledged potential for adverse effects from pollutants such as ozone, NOx, CO and others, the DEIR/EIS's assessment of adverse health effects appears to have been limited to an evaluation of risks from particulate matter exposure, including diesel particulate matter (DPM). (*See* DEIR/EIS, pp. 22-35, lines 10-11 and *Impact AQ-11: Exposure of Sensitive Receptors to Health Threats in Excess of SMAQMD's Health-Risk Assessment Thresholds*, DEIR/EIS, pp. 22-249-250 (failing to evaluate health effects of BDCP emissions for any pollutants other than particulate matter).) The DEIR/EIS does not evaluate or explain whether the BDCP's emissions of pollutants other than particulate matter would have adverse health effects on Sacramento County residents. To satisfy CEQA's informational mandate, the DEIR/EIS must include an analysis that correlates the BDCP's emission of air pollutants, both from construction activity and heavy truck traffic, to its impact on human health on residents of the County and greater Delta. (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704.) That analysis must explain whether the BDCP-related levels of emissions from *all* pollutants that have the potential to cause adverse health effects, not just particulate matter or TACs, will in fact have adverse effects on sensitive receptors.

Failure to Evaluate Potential for Crop Damage/Loss or Nuisance

The BDCP will create substantial amounts of fugitive dust, in exceedance of regulatory thresholds. BDCP construction will occur in and around areas of high value agricultural production. The DEIR/EIS does not evaluate the potential for BDCP-related fugitive dust emissions to adversely effect agricultural uses, including the potential for

reduced crop yield. Moreover, fugitive dust emissions have the potential to violate State nuisance law (Health & Safety Code section 41700), which prohibits the "discharge from any source whatsoever quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or that endanger the comfort, repose, health, or safety of any of those persons or the public, or that cause, or have a natural tendency to cause, injury or damage to business or property."

Impacts of CM-2

The DEIR/EIS inadequately analyzes the effect on air traffic from CM-2 (Yolo Bypass Fisheries Enhancement), which will include the excavation of a minimum of 1 MCY of sediment every other year from channels and drains plus removal of another 1 MCY within one mile of the Fremont Weir every five years. (DEIR/EIS, p. 11-199, lines 2-9; BDCP, p. 67, lines 11-17.) There are a multiplicity of impacts which could result from CM-2 which have either not been addressed or have been inadequately addressed. Increased particulate pollution from dust produced during the large excavation process may impact air quality and adversely impact visibility for pilots of aircraft operating in the vicinity. The excavation of 1 MCY of soil also has the potential to attract large flocks of birds because prey, seeds, and nutrients would be exposed. This would have the potential to increase the likelihood of bird strikes during periods of sediment removal, and therefore significantly impact flight operations at Sacramento International Airport.

Page 22-403 indicates that CM-2 could generate significant construction-related NO_x and particulate matter, but provides no modeling or other analysis. While it is understood that an analysis of cumulative effects need not be as comprehensive as an analysis of the BDCP, this section is far too vague. A good faith effort to estimate the magnitude of the impacts must be made, and is lacking here.

Incorrect Threshold for PM_{10}

Page 22-35, line 16: This line states that the Sacramento Metropolitan Air Quality Management District (SMAQMD) uses a mass emission threshold for PM_{10}, which is not accurate. The current thresholds for SMAQMD are located here http://airquality.org/ceqa/cequguideupdate/Ch2TableThresholds.pdf, and show that a concentration-based threshold is used. Later portions of the EIR/EIS accurately use the concentration-based threshold, so it is assumed that the statement on this line is merely an error that did not impact later analysis. Please correct.

PM_{10} dispersion modeling

Page 22-37, Section 22.3.1.4: This section describes the dispersion modeling methodology. The section specifically states in multiple places that modeling for PM_{10} was only completed for Alternative 4, but never addresses why this was the only alternative to receive this analysis. Either add a justification for this decision, or add PM_{10} dispersion

modeling for each alternative. Given that the EIR/EIS analyzes DPM and $PM_{2.5}$ fugitive dust for all alternatives, it is particularly odd that PM_{10} modeling was limited to only one of the alternatives. There is nothing about the characteristics of PM_{10} which would make it appropriate to model $PM_{2.5}$ and yet not appropriate to model PM_{10}.

Page 22-233 includes the mitigation for exposure to severe particulate matter concentrations. While this measure appears accurate, it may need to be expanded based upon the additional analysis that is required, as noted above.

Appendix 22c, page 7, line 16 accidentally references DPM; this line should be deleted.

Appendix 22c, page 17, line 29 incorrectly states that SMAQMD has no significance threshold for $PM_{2.5}$. The current thresholds for SMAQMD are located here http://airquality.org/ceqa/cequguideupdate/Ch2TableThresholds.pdf, and indicate that the threshold for $PM_{2.5}$ is to be no greater than 5% of 12 micrograms per cubic meter (annual arithmetic mean). The result of this error is that no analysis of $PM_{2.5}$ impacts has been provided for the SMAQMD jurisdiction, which is a serious oversight. Analysis of $PM_{2.5}$ for the SMAQMD jurisdiction must be included.

Chapter 23: Noise

There are numerous noise-sensitive receptors associated with residential and recreational land uses in the Delta that will be significantly impacted by the BDCP. The DEIR/EIS's analysis with respect to these receptors is inadequate.

Failure to Use Correct Thresholds of Significance

Page 23-14 provides the correct thresholds for non-transportation noise, and the correct code section for the control of noise generated *on-site* by construction operations. However, the DEIR/EIS does not include thresholds for impacts associated with transportation noise. The Noise chapter includes an analysis of noise generated by off-site trips, but fails to use the County significance thresholds. According to page 23-24, lines 18 and 19, the analysis used Caltrans Protocol, which requires an increase of 12 dB before a substantial impact occurs. The County standards are much more rigorous.

General Plan Policy NO-9 includes language applicable to capacity-enhancing roadway projects or new roadway projects, but the latter portion of this policy also applies *in general.* Sacramento County relies on the standards at the end of this policy to determine, pursuant to the CEQA Guidelines, whether a project will result in a substantial increase in ambient noise. In accordance with this policy, an impact is significant if it affects the pre-project noise environment as specified in the policy. Include this policy language in the chapter, and provide the attendant analysis.

Page 23-35 and all other similar tables (those which show impacts due to noise increases on area roadways) will need to be modified to reflect the more stringent County standards for those roadways that are in the County (and which affect sensitive receptors), consistent with the comment above.

Impact NOI-1 and Mitigation Measure NOI-1b

While we concur that the impact is likely to be significant and unavoidable in some areas (DEIR/EIS, p. 23-41, lines 22–25), the mitigation measure for this impact (NOI-1b) must be expanded to include performance standards. No definition of "reasonable measures" is included (*see* DEIR/EIS, p. 23-42, lines 8–16), which makes it infeasible for the County to determine whether this measure will address the impact to County citizens to the extent feasible. Mitigation measures that are so undefined that it is impossible to assess their effectiveness are legally inadequate. (*Preserve Wild Santee v. City of Santee* (2012) 210 Cal.App.4th 260 (plan for active habitat management failed to describe anticipated management actions or include standards or guidelines for actions that might be taken).)

Noise Impacts to Campgrounds (Regional Parks)

Noise impacts to campgrounds are insufficiently analyzed under all alternatives. The DEIR/EIS fails to identify the specific campgrounds that would be impacted and fails to measure the potential loss of revenue associated with camping including boat launch fees, day use fees, and consumer purchases. Long-term impacts (two years or greater) to a public or private campground could result in complete business losses.

Further, mitigation measures NOI-1a and NOI-1b are inadequate to address noise impacts to recreational users because they are designed to mitigate to standards applicable to residential housing tracts not transient recreation occupancy. These standards fail to account for consumer choice and thus do not avoid significant impacts to campers, who seek a quieter, more rural destination. Moreover, mitigation measures for noise impacts include notice to surrounding residents but fail to include notification to impacted overnight recreation visitors to the Delta. The BDCP proponents should be required to provide notice of noise-generating activity to operators of all affected recreation facilities and also to post notices at those facilities of the hours and days when significant noise impacts will occur, and the type of activity that will cause the adverse effects, so that recreational users can adjust their use of the facilities accordingly.

Noise Impacts to Waterfowl

See Airport Comments, Ex. E hereto.

For the Yolo Bypass, the excavation proposed under CM-2 will occur during the dry season when waterfowl are not present. However, that is the time when large numbers of grassland species will be displaced due to excavation in the grasslands. No mention of any

seasonal limitation on tunnel boring was found. Noise and vibration, as well as associated activity, from year round tunnel boring has the potential to disturb wintering waterfowl from as early as October through March. To reduce the potential for aircraft collisions with displaced waterfowl, it would be preferable to avoid boring the tunnels during the months with high numbers of wintering waterfowl (i.e., October-March).

Other Comments

Page 23-14, line 10, references the City of Isleton, but this section is on Sacramento County and should not reference the City.

Chapter 24: Hazards and Hazardous Materials

Inadequate Analysis of Bird Strike Hazards

The County has serious concerns about the BDCP's significant increase in hazards and risk to human health as a result of increased bird strikes. Sacramento International Airport currently ranks first among airports within the FAA's Western Pacific Region, and within the top ten nationally, in reported bird strikes. Numerous aspects of the BDCP have the potential to significantly increase bird strikes. For example, notch operation of the Fremont Weir and subsequent inundation of the Yolo Bypass during mid-November through mid-May coincides with the period during which the majority of damaging bird strikes occur, particularly near Sacramento International. Most damaging strikes are caused by waterfowl, which would be the most likely species to be attracted to the inundated Yolo Bypass. As detailed in the comments of the Sacramento County Department of Airports (attached), the DEIR/EIS analysis of this risk is inadequate because it (1) relies on incomplete data that results in minimizing the potential for bird strikes; (2) omits consideration of the effect of numerous BDCP-related actions on increased bird strikes; and (3) does not include adequate mitigation to attempt to reduce risks.

Impacts of CM-2

The DEIR/EIS inadequately analyzes the effect on air traffic from CM-2 (Yolo Bypass Fisheries Enhancement), which will include the excavation of a minimum of 1 MCY of sediment from channels and drains every other year plus removal of another 1 MCY within one mile of the Fremont Weir every five years. (DEIR/EIS, p. 11-199, lines 2-9; BDCP, p. 67, lines 11-17.) These massive sediment removal actions will have the potential to attract large flocks of birds because prey, seeds, and nutrients would be exposed. This would have the potential to substantially increase the likelihood of bird strikes during periods of sediment removal. Further, increased particulate pollution from dust produced during the large excavation process may impact air quality and adversely impact visibility for pilots of aircraft operating in the vicinity. Taken together, sediment removal has the potential to significantly impact flight operations at Sacramento International Airport as well as the safety of air passengers.

Inadequate Discussion of HazMat Plans

While the DEIR/EIS includes a fairly detailed discussion of the numerous environmental regulations that could potentially apply to the proposed CMs, it fails to discuss/describe the full suite of Sacramento County-related hazardous materials (HazMat) ordinances. This is important because most every business (including construction activity lasting over 90 days) must file a Hazardous Materials Business Plan (HMBP) with the local Certified Unified Program Agency (CUPA). The DEIR/EIS makes no mention of this requirement. The DEIR/EIS should be revised and expanded to describe all relevant Sacramento County specific HazMat ordinances that are applicable to the proposed water operation and habitat restoration CMs being proposed. At a minimum, the following chapters from the Sacramento County Area Plan should be included in the environmental document's analysis: Chapters 6.34 (Underground Storage Tanks (USTs)), 6.35 (Aboveground Storage Tanks (ASTs)), 6.96 (Hazardous Materials Business Plans (HMBPs)) and California Accidental Release Prevention (Cal ARP) Program), and 6.98 (Hazardous Waste).

Page 24-37 (lines 4-7) of the DEIR/EIS discusses the environmental commitments, which include developing Stormwater Pollution Prevention Plans (SWPPPs), Spill, Prevention, Containment, and Countermeasure (SPCC) Plans, and Hazardous Materials Management Plans (HMMPs). However, the draft environmental document should also describe "development, completion and submittal" of the HMBP, per Health and Safety Code section 25507(a). This comment applies to any portion of the DEIR/EIS where HMMPs are discussed

The DEIR/EIS should also include a mitigation measure that commits the State and/or federal government to coordinating the preparation of all future emergency response plans for the Delta with the applicable Sacramento County department(s).

Mitigation Measure HAZ-1a

This proposed mitigation measure calls for preconstruction surveys, including soil and groundwater testing, at known or suspected contaminated areas within the construction footprint of the proposed water conveyance/operations facilities (CM-1) and remediation and/or containment of contamination. However, HAZ-1a should also commit the State and/or federal government to conduct a Phase 1 Environmental Site Assessment (ESA) performed in compliance with the American Society for Testing and Materials (ASTM) Practice E 1527-13, and which is free of "data gaps."

Need for a Phase 2 Environmental Site Assessments

Any known or potential hazardous materials contamination revealed during a Phase 1 ESA triggers the need for a Phase 2 ESA. The Phase 2 ESA shall be performed in accordance with a Site Assessment Workplan (SAW) to be reviewed and accepted by the Local

Enforcement Agency (LEA) prior to the investigatory work being performed. When completed, the resulting work product shall be submitted for review to the LEA for evaluation for case-closure status, or to receive directive(s) for further assessment toward the goal of case-closure status (Health and Safety Code § 25187(a)(1)).

Impact HAZ-5

Regarding the onsite fire suppression system, all wells proposed to be used for onsite fire suppression should be tested for contamination prior to reliance on them for fire suppression. Any wells demonstrating contamination should not be used for fire suppression, due to the risk of contaminating surface and groundwater.

Mitigation Measure HAZ 8

This measure acknowledges that the BDCP's impact from the increased risk of bird strikes is adverse (NEPA) and significant and unavoidable (CEQA). Nevertheless, consultation with the County Department of Airports to determine the best management practices to reduce the level of risk will occur only after plans are finalized. Deferring consultation has the potential to limit the number and type of suitable practices available for discouraging hazardous wildlife near airports. To be effective, consultation should occur well before any detailed plans are developed.

Corrections

The discussion of the Aboveground Petroleum Storage Act (APSA) of 2007 on page 24-19 (lines 29-36) of the DEIR/EIS should be corrected to read as follows:

> California adopted a statewide program to determine the amount and type of hazardous substances being stored in aboveground tanks under the Health and Safety Code Division 20, Chapter 6.67, Sections 25270–25270.13. APSA applies to storage tank facilities with aggregate petroleum storage capacities <u>of</u> ~~greater than~~ 1,320 gallons <u>or more</u> and requires development and implementation of a SPCC Plan consistent with 40 CFR 112. Facilities must submit annual Tank Facility Statements and, depending on Certified Unified Program Agency (CUPA) requirements, may be required to submit to periodic inspection.

Page 24-24 Local Plans, Policies, and Regulations: The DEIR/EIS should, at a minimum, include a reference to the Sacramento County Area Plan.

Chapter 25: Public Health

Failure to Address Potential for Loss of Life

The DEIR/EIS does not discuss or analyze the potential for increased bird strikes or the increased potential for loss of life as a public health risk associated with the BDCP. Both the CEQA and NEPA analyses conclude the project will result in significant, adverse, and unavoidable increases in bird strikes. Additional information demonstrating the potential for a significant increase in bird strikes is contained in the attached comments of the Sacramento County Department of Airports (Ex. E). Increased bird strikes increases the risk of serious, if not catastrophic, airplane accidents that would result in substantial injury and loss of life.

This significant impact of the BDCP should be disclosed in the DEIR/EIS. To the extent the impact is unavoidable, the Lead Agencies and BDCP proponents must set forth the specific considerations they believe the known project benefits (primarily a modest increase in water availability for south of Delta commercial agricultural operations – all other benefits of CMs 2-22 are purely speculative at this point since no specific projects, funding, environmental analysis or commitment has been made to them) justify a significant increase in the risk of loss of human lives.

Need for Well and Septic System Abandonment

Facilities such as sedimentation basins, solids lagoons, and forebays and all areas that will be inundated by the BDCP have the potential to create public health hazards as a result of surface and groundwater contamination, due to the presence of septic systems and wells. The DEIR/EIS should include a mitigation measure that will require all septic systems and all wells (including but not limited to agricultural, monitoring, and domestic water) that will be inundated as part of this project to be abandoned under permit from the Sacramento County Environmental Management Department (pursuant to Uniform Plumbing Code Section 722 and Sacramento County Code 6.28.030).

Chapter 28: Environmental Justice

General Comments

The Environmental Justice chapter repeatedly acknowledges the fact that census blocks with a meaningfully greater minority population and block groups with low-income populations exist throughout the study area and specifically along the modified pipeline/tunnel alignment associated with the preferred alternative. Largely because of this fact, each of the alternatives analyzed results in disproportionate effects on minority and low-income communities and the DEIR/EIS admits that even with mitigation, these effects would remain disproportionate and adverse.

The environmental justice analysis lacks any discussion of alternatives that could avoid or minimize the disproportionate effects on environmental justice populations and the reasons why such alternatives were not chosen. Additionally, there is no explanation as to why it is infeasible to relocate the planned structures outside areas where high concentrations of environmental justice populations live or why the proposed facilities need to be located where they are. Further, the DEIR/EIS analysis dismisses identified effects associated with the project because they would "affect the general population." However, this ignores the overarching fact that minority and low-income communities predominate the study area. Thus, even if the effect impacts the "general population" because that population contains a high concentration of minority and low-income communities, any impact in that area would result in a disproportionate effect on environmental populations necessitating appropriate mitigation

Land Use – Removal/Relocation of Permanent Structures

As mitigation for the removal/relocation of permanent structures, DWR will provide compensation to "property owners." The proposed mitigation does not necessarily address the effects of this impact on environmental justice populations. It is reasonable to assume that the minority and low-income communities that constitute the environmental justice populations of concern are renters rather than property owners. As a result, the proposed mitigation does not address the effect of this impact on environmental justice populations. The mitigation for this impact should be re-evaluated and additional mitigation specific to alleviating the effect on environmental justice populations should be proposed.

Land Use – Physical Structures Around and Through Existing Communities

Several of the proposed alternatives identify impacts that would negatively affect the community of Hood in Sacramento County. Construction activities would bisect Hood and would substantially alter the setting of that community. Additionally, permanent structures associated with the alternatives would substantially alter Hood's surroundings.

Only TRANS-1a and TRANS 1-b are identified as mitigation to address the effects of these impacts. Yet, these measures only address the environmental impacts associated with increased traffic resulting from the BDCP. The proposed mitigation does not address the effects on environmental justice populations. Admittedly, the only way to mitigate these impacts would be to select a different alternative or approach that is not located near environmental justice populations. Nevertheless, the DEIR/EIS should acknowledge this adverse impact.

Socioeconomics

Construction and operation of the BDCP would reduce agricultural land under cultivation resulting in the direct and indirect loss of a varying number of agricultural jobs each year. Although the analysis admits that this impact will have a disproportionate effect

on minority and low-income populations, the true effect of this impact is not clear. A certain number of agricultural jobs will be lost each year, but for how long? Fifty years? Ten years? The analysis is incomplete without an explanation of the number of years over which the expected job losses will occur. Additionally, there is no analysis of the effect these job losses will have on Sacramento County resources associated with unemployment, child support, and other financial assistance programs.

The County is obligated by state law to support all incompetent, poor indigent persons that are County residents not otherwise supported or relieved by family, friends, their own means, or state institutions. Job loss and unemployment created by BDCP impacts may result in unmitigated strain on the County programs like its child support collection and enforcement program, its General Assistance program (funded entirely by the County's general fund), and medical support programs for the indigent. There is no discussion of mitigation for these losses and strain on County programs. Although the BDCP will result in the creation of jobs, the DEIR/EIS admits that newly created jobs would not be filled by displaced agricultural workers because the required skills for the new jobs are not comparable.

Groundwater

The DEIR/EIS claims that BDCP effects on local groundwater resources would not result in a disproportionate effect on environmental justice populations because local groundwater changes and effects on wells adjacent to dewatering areas would be mitigated, and thus these effects are not evaluated. (DEIR/EIS, p. 28-22, lines 8-11.) As discussed in comments regarding Chapter 5, Groundwater (above), the mitigation proposed for impacts to local wells is not adequate under CEQA and thus the BDCP likely will have significant impacts to groundwater supplies. The affected areas all have disproportionately high minority and/or low-income populations, and thus the DEIR/EIS must be revised to address and acknowledge this additional adverse effect on environmental justice populations.

Chapter 29: Climate Change

See Airport Comments, Ex. E hereto.

Water Temperature

The DEIR/EIS purports to provide an analysis of how the BDCP affects the resiliency and adaptability of the BDCP area to the effects of climate change. Specifically, it claims to analyze "the clear and measurable ways that the BDCP alternatives will ameliorate these impacts or add flexibility to the system so that the Plan Area can continue providing water supply benefits with sufficient water quality and supporting ecosystem conditions that maintain or enhance aquatic and terrestrial plant and animal species." (DEIR/EIS, pp. 29-3 – 29-4.) Notwithstanding the fact that the DEIR/EIS, in fact, contains no such analysis, but rather bare conclusions, the statement itself reveals the project bias inherent throughout the

DEIR/EIS. CEQA requires that an EIR evaluate a project's potential to have a significant adverse effect on the environment. With respect to the BDCP's effects on resiliency and adaptability of the plan area to climate change effects, the available evidence suggests that impacts will be significant and adverse, by decreasing water quality (increasing salinity), and reducing flows, when climate change is doing the same thing.

With respect to Delta smelt, which already are endangered, a key factor in smelt survival is water temperature, including sufficient cold water flows through the Delta. According to the DEIR/EIS, climate change will cause Delta waters to warm and become more saline, decreasing suitable habitat for delta smelt. Without any meaningful analysis or evidence, the DEIR/EIS nevertheless concludes that the BDCP, which will increase exports by as much as 18 percent (*See* DEIR/EIS, Table 29-25, p. 29-21), will "help buffer potential negative effects of increased water temperatures thereby adding resiliency to increased water temperatures." It does not follow that if more water is exported from the Delta, including in the north Delta, where it does not have the chance to flow south and dilute salinity and decrease temperature, that the project can "add resiliency to increased water temperatures." What specific evidence and analysis supports the conclusion that restoring habitat on a large scale will "add resilience to increased water temperatures" and that any such resilience will benefit Delta smelt? The mere citation to multiple technical appendices in support of this naked conclusion is insufficient to satisfy CEQA's requirement that EIRs be organized and written in a manner that makes them "meaningful and useful to decisionmakers and to the public." (Pub. Resources Code, § 21003(b).) An EIR should be written in a way that readers are not forced "to sift through obscure minutiae or appendices" to find important components of the analysis. (*San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 659; *California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219, 1239.)

Chapter 31: Other CEQA/NEPA Required Sections

Impact BIO-179 - *Loss or Conversion of Habitat for Wintering Waterfowl as a Result of Implementation of Conservation Components* and Mitigation Measure BIO-179b – *Conduct Food Studies and Monitoring to Demonstrate Food Quality of Palustrine Tidal Wetlands in the Yolo and Delta Basins*: Both of these note that the Yolo Watershed will lose 2,600 acres of wetlands. The mitigation measure will study where there is a loss in food production. If it is determined that the loss results in a reduction in the food available to waterfowl, additional acres will be protected or creation of managed wetlands will occur in the Yolo Watershed. This could attract waterfowl to the Yolo Bypass even when it is not inundated. Creation of managed wetlands within the five-mile radius of Sacramento International Airport would constitute an increased attractant to waterfowl, which would result in an increase in the potential of aircraft bird collisions with air traffic from the airport.

Appendix 3B: Environmental Commitments

The Summary of Environmental Commitments (page 3B-50) and the Subtitle 3B.1.13 (page 3B-27) should read: "Develop and Implement Spill Prevention, ~~Containment~~ Control, and Countermeasure Plans"

Appendix 3C: Description of Alternatives

Page 3C-4 (*Construct Detour Roads):* Throughout the DEIR/EIS when discussing potential traffic access issues/impacts, there are incorrect references to Table 3C-7, which is titled "Borrow, Spoils and Reusable Tunnel Material Storage." The correct table reference or cite is Table 3C-8, on page 3C-58 ("Access and Construction Work Areas"). The applicable corrections should be made. Further, the DEIR/EIS also should include language, possibly in the transportation-related mitigation measures, that all proposed detour road construction be planned, coordinated with, and approved by DOT.

Page 3C-4 (*Construct New Perimeter Berm/Widen Levee Top):* According to the DEIR/EIS, it will be necessary to widen levees in order to realign SR160 and/or to provide turnout access for maintenance and construction. This work should be coordinated with and approved by DOT.

Page 3C-5 (*Excavation):* The DEIR/EIS indicates that the massive amounts of excavated material will be hauled offsite. This hauling activity is expected to damage existing roadways significantly. As noted in our comments regarding the Traffic chapter, mitigation should be revised to require the BDCP proponents to perform routine maintenance on damaged roadways throughout the construction period and at the end of the construction activity deliver an acceptable roadway back to Sacramento County. This applies to both imported material hauling and construction equipment hauling.

Page 3C-5 (Under *Foundation Pile Driving):* This activity will require the use of heavy equipment. Where this heavy equipment will damage the roadway the applicant shall repair both during construction as well as deliver an acceptable roadway back to Sacramento County at the completion of construction.

Any structure, forebay, tunnel, etc., that is part of the BDPC that may disrupt the use of an existing roadway or transportation facility in Sacramento County must be identified, discussed with County staff, and mitigated prior to the commencement of construction work. The type of mitigation must be approved by Sacramento County, which must issue an encroachment permit.

Page 3C-12 (*Parking, Lighting, Fencing):* It should be noted that these activities near levees cannot interfere with levee maintenance. All activities near levees must be coordinated with the appropriate Reclamation District and with the County to ensure that maintenance needs are not impeded.

Page 3C-13 (*New Utility Corridors):* The construction impacts of the new transmission lines should be mitigated similar to the comments above.

Page 3C-58 (*Table 3C-8, Access and Construction Work Areas Roads)*: The applicant will have to coordinate with Sacramento County Maintenance and Operations staff to ensure that the construction roads meet County standards. Furthermore, the placement of these roads must be approved by Sacramento County.

Page 3C-59 (*Table 3C-8 Access and Construction Work Areas Detour Roads):* All detour roads will need to be coordinated with DOT.

Page 3C-59 *Table 3C-8, Access and Construction Work Areas Temporary and New Access/Haul Roads):* All temporary and new access/haul roads will need to be coordinated with DOT.

Appendix 5C: Description of Alternatives

Page 5C.2-5 (Rules for North Delta Intake Diversions): The new bypass flow rules for the north Delta intakes are not completely spelled out in their entirety and are only described as to how they will operationally impact various species and operational aspects. "COA" does not have an identified acronym in the BDCP and is not identified as a Coordinated Operations Agreement until Appendix A.5. These rules have the potential to substantially affect operation of the Freeport Intake, and adversely affect water quality and supply in the Delta. Without any details about the rules or analysis of their broader impact, the County is unable to determine whether and to what extent County resources may be affected.

CONCLUSION

Both the BDCP and the DEIR/EIS fail in their fundamental purpose. As stated by its proponents, the purpose of the BDCP is to improve the reliability of water supplied through the Sacramento-San Joaquin Delta while improving ecosystem health and ensuring long-term protection of threatened and endangered fish species. The BDCP falls far short of these goals, and as a result is fundamentally deficient. Further, the draft Implementing Agreement (IA) does little, if anything, to provide the details and guarantees necessary to implement the proposed, flawed plan – much less a critical, substantive decision-making role for those local governments that will be irreversibly impacted by the Plan's proposed water management/ operation and ecosystem restoration strategies.

"[T]he purpose of an EIR is not only to protect the environment but to demonstrate to the public that it is being protected." (CEB, Kosta & Zischke, *Practice Under the Environmental Quality Act*, 2d ed. §1.18 at p. 1-16 (3/14 update), citing *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810.) As explained in the County's comments, the DEIR/EIS fails to provide meaningful information, or to present information in a way that

adequately informs the public of the BDCP's many significant impacts. Despite its length, the DEIR/EIS is so "fundamentally and basically inadequate and conclusory in nature" that public comment is essentially meaningless. (*Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.* (1993) 6 Cal.4th 1112; CEQA Guidelines, § 15088.5(a); *Mountain Lion Coalition v. Fish and Game Comm'n* (1989) 214 Cal.App.3d 1043.) The failure to provide sufficient information about the BDCP or credible evidence and objective analysis to support the DEIR/EIS's impact determinations has deprived the public of a meaningful opportunity to understand and comment on the project's substantial adverse impacts. Correcting these errors will require the addition of significant new information and, thus, the DEIR/EIS must be revised and recirculated for public review. (CEQA Guidelines, § 15088.5a.)

Exhibits:
Exhibit A: Helliwell Letter, February 26, 2014
Exhibit B: Science Panel Report, March 2014
Exhibit C: BDCP Blog
Exhibit D: ISB Report, May 2014
Exhibit E: Airport Comment Letter, February 11, 2014
Exhibit F: DSC Letter, July 11, 2013
Exhibit G: Economic Sustainability Plan Executive Summary, January 19, 2012
Exhibit H: Michael Report, May 16, 2014
Exhibit I: Historical Society Newsletter, June 1994

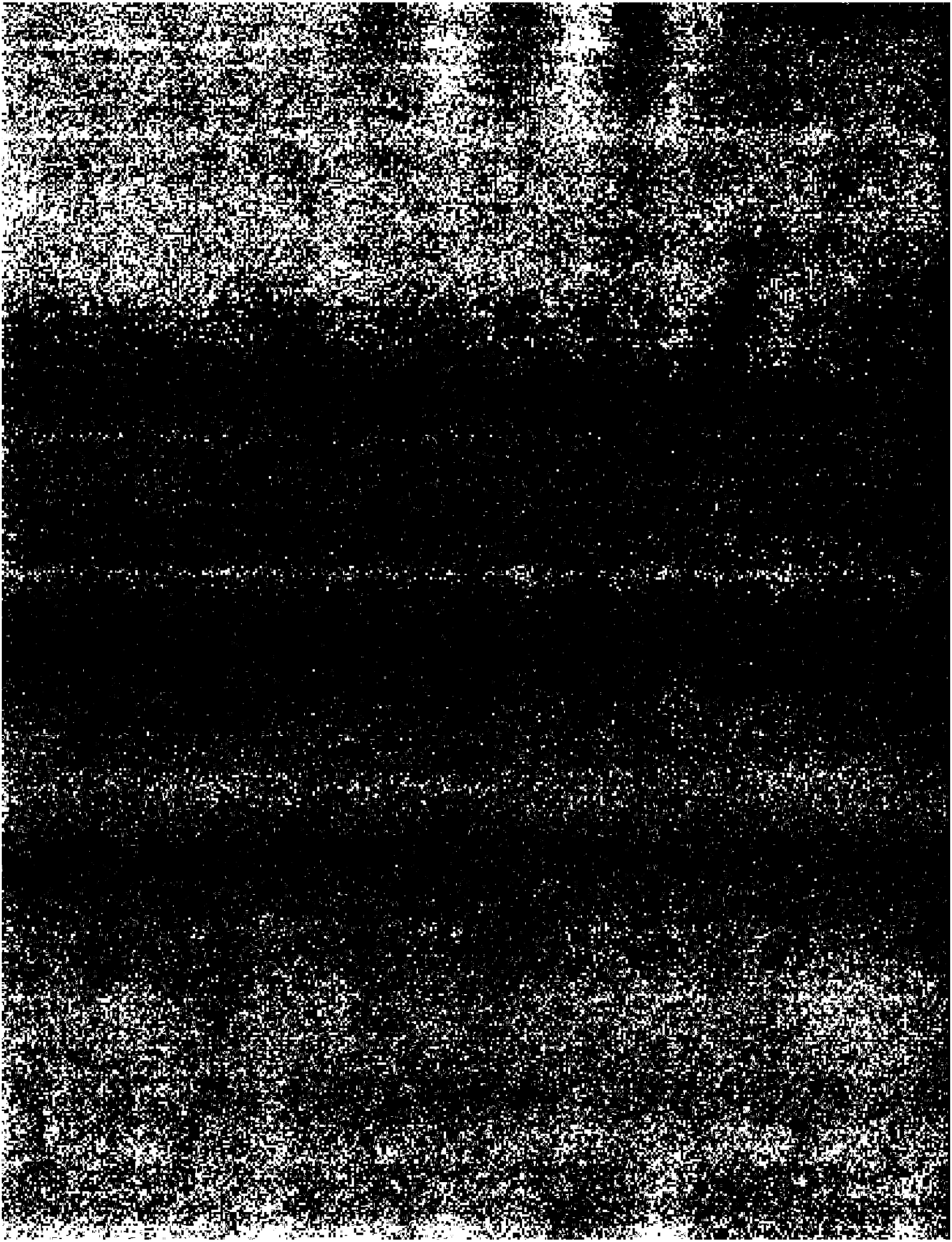
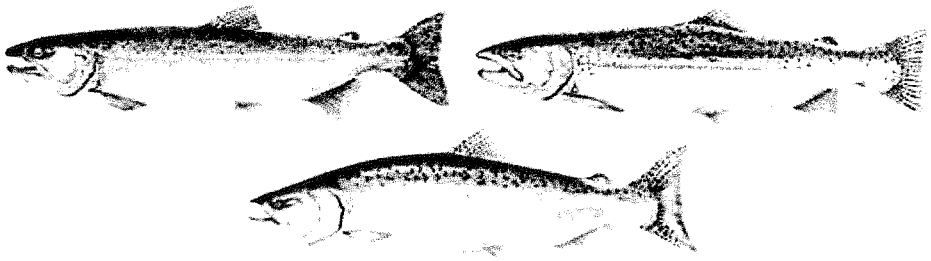


EXHIBIT A

Helliwell Letter

February 26, 2014



California Advisory Committee On Salmon and Steelhead Trout

February 26, 2014

Charlton H. Bonham, Director
California Department of Fish and Wildlife
1416 Ninth St., 12th Floor
Sacramento, CA 95814

Subject: Recommendation to deny incidental take permit and Natural Communities Conservation Plan for Bay Delta Conservation Plan

Dear Director Bonham;

The California Advisory Committee on Salmon and Steelhead in our capacity to advise you, the director of the California Department of Fish and Wildlife, in preparing and maintaining "a comprehensive program for the protection and increase of salmon, steelhead trout, and anadromous fisheries" in California,[1] recommends that the you deny issuance of an incidental take permit for the Bay Delta Conservation Plan's Alternative 4 (BDCP) as a Natural Communities Conservation Plan (NCCP). The BDCP does not meet the requirements of Fish and Game Code 2820 for an NCCP and cannot legally be approved because it will contribute to the further decline of Sacramento River Winter Run and Spring Run Chinook salmon.

All races and runs of Central Valley salmon and steelhead populations have experienced over 90% declines since the State Water Project came on line in the 1960's. In particular, naturally produced Chinook populations have experienced severe declines resulting in the listing of Sacramento Winter Run as endangered and the Spring Run as threatened under the federal and state Endangered Species Acts. Adult returns of these two species are far below the fish doubling goals of the Anadromous Fish Restoration Program. Attachments 1 and 2 are figures from the Anadromous Fish Restoration Program showing the severe declines these two runs of Chinook salmon have experienced in the Sacramento River basin.[2]

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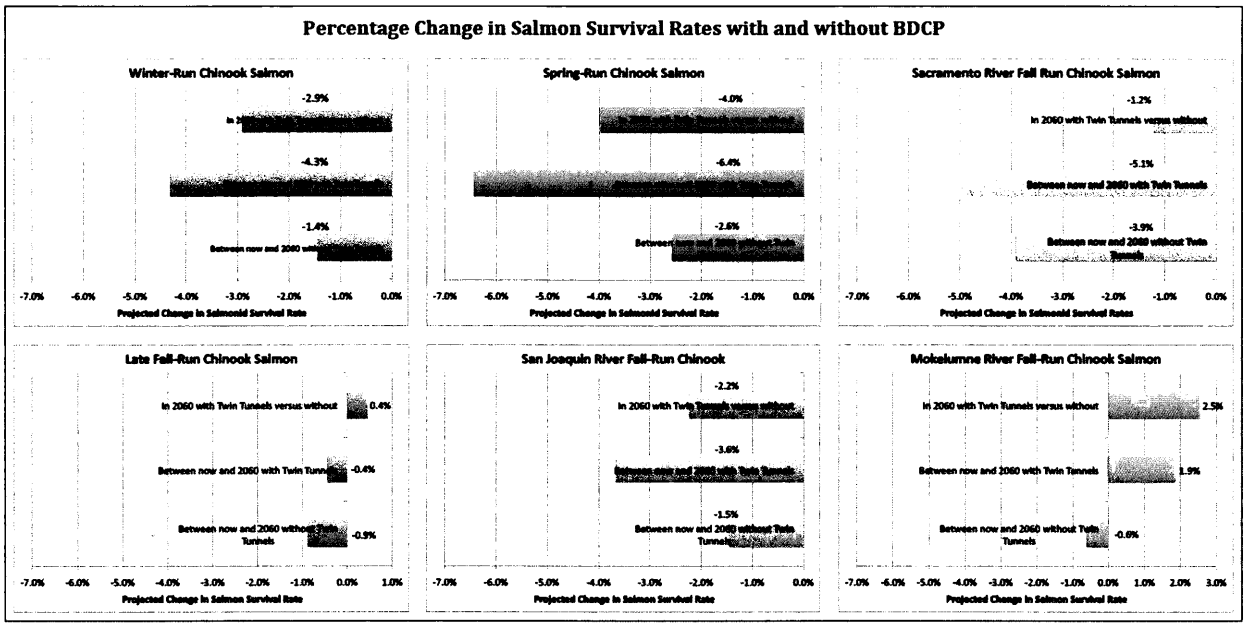
[1] California Fish and Game Code § 6920 (2008)
§ 6920. Preparation and maintenance of program; Consultation with public agencies
(a) The department shall, with the advice of the Advisory Committee on Salmon and Steelhead Trout and the Commercial Salmon Trollers Advisory Committee, prepare and maintain a detailed and comprehensive program for the protection and increase of salmon, steelhead trout, and anadromous fisheries.

[2] http://www.fws.gov/stockton/afrp/Documents/Doubling_goal_graphs_020113.pdf

Furthermore, according to data from Chapter 5, Effects Analysis of the November 2013 Draft BDCP, operation of the Twin Tunnels project will reduce winter run and spring Chinook salmon smolt survival by 2.9% and 4%, respectively. See Salmon Survival Rates Figure below taken from BDCP Chapter 5. Supporting data and source tables are shown in Attachment 3.[3]



BDCP promotes the unproven scientific hypothesis that habitat restoration can substitute for flow. However, the State Water Resources Control Board has already indicated that Delta inflows and outflows are presently insufficient to help listed species recover their former abundance.[4] BDCP would reduce Delta outflow, which contributes to the decreases to salmon smolt survival rates modeled by BDCP.

The concept of improving riparian and subtidal habitat to create an aquatic food supply for the Delta to make up for too much water diverted is an unproven theory that has been criticized extensively by federal agencies in their "red flag" comments on the BDCP.[5] Climate change will

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[3] Figure A taken from Draft Bay-Delta Conservation Plan, Chapter 5, Effects Analysis, Sections 5.5.3 through 5.5.6, Tables 5.5.3-10, 5.5.4-5, 5.5.5-8, 5.5.5-10, 5.5.5-18 and 5.5.5-20 See http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_5_-_Effects_Analysis.sflb.ashx

[4] "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem Prepared Pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009." SWRCB, August 3, 2010. Page 4, second bullet. See http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf

[5] See http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Federal_Agency_Comments_on_Consultant_Administrative_Draft_EIR-EIS_7-18-13.sflb.ashx and http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library_-_Archived/Effects_Analysis_-_Fish_Agency_Red_Flag_Comments_and_Responses_4-25-12.sflb.ashx and http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/NMFS_Progress_Assessment_Regarding_the_BDCP_Administrative_Draft_4-11-13.sflb.ashx and http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/NMFS_Evaluation_of_Flow_Effects_on_Survival_-_BDCP_Admin_Draft_-_4-11-13.sflb.ashx and

contribute to sea level rise directly in the Delta; this will help push X2 eastward into the Delta. BDCP analysis also shows that Sacramento River inflow will decrease directly from operation of the Twin Tunnels, and to some degree from lower upstream runoff (controlled by climate change and reservoir operation). The combined effect of continued high diversions from the Delta through BDCP (for the sake of "increased reliability") and the effects of climate change and X2 movement eastward will have a deleterious effect on Sacramento Winter Run and Spring Run Chinook salmon.

All of the conservation measures in BDCP with the exception of CM1 (Twin Tunnels) are programmatic in nature. Funding is far from assured, as identified in a recent Legislative Analyst's report. The LAO report identified that ecosystem restoration funding has not been secured and cost overruns are likely for land acquisition for habitat restoration. According to the report, [6]

"If bond funds are not available in the near future and no additional funding sources are identified, some ecosystem restoration may not be funded, including the restoration actions needed before the tunnels begin operation. The BDCP states that the SWP and CVP will not pay additional costs or forgo water in the event of a funding shortfall."

The funding plan at Table 8-37 of Chapter 8 in BDCP confirms the LAO's conclusion. The state and federal water contractors propose that they will only pay for 68.4 percent of BDCP's costs. Nearly 95 percent of their financing commitment is solely to the Twin Tunnels project in Conservation Measure 1, and the rest of BDCP's costs would be borne by taxpayers at large.

Because Sacramento River Winter Run and Spring Run Chinook salmon are already significantly depleted and BDCP will further reduce smolt survival, the Department of Fish and Wildlife cannot make a finding that the BDCP NCCP will lead to recovery of the species.

None of the alternatives considered in the BDCP Draft Environmental Impact Statement and Report would lead to the recovery of Sacramento River Winter Run and Spring Run Chinook salmon. None of the alternatives analyzed reduces the amount of water diverted upstream of or within the Delta. None of the alternatives analyzed considers meeting or moving toward meeting the State Water Resources' Control Board's Delta Outflow Criteria of 2010 that was specifically required by the legislature in 2009 "to inform planning decisions for the Delta Plan and the BDCP."[7]

Therefore, findings approving a NCCP for the Bay-Delta Conservation Plan cannot be made pursuant to Section 2820 of the Fish and Game Code for the following reasons:

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http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/U_S_Fish_and_Wildlife_Service_Staff_BDCP_Progress_Assessment_4-11-13.sflb.ashx

[6] "Financing the Bay-Delta Conservation Plan", Legislative Analyst's Office, 2/12/14. p 8. See http://www.lao.ca.gov/handouts/resources/2014/Financing-the-BDCP-02-12-14.pdf

[7] Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem by the State Water Resources Control Board, August 3, 2010. See http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf

1. BDCP does not contribute to recovery and would jeopardize the continued existence of Sacramento River winter-run and spring-run Chinook salmon because smolt survival through the Delta is reduced by the project. (Fish & Game Code Section 2081(c))
2. The concept of habitat restoration measures to offset impacts from increased water withdrawals from the Delta (increased "reliability") is not supported by science, including but not limited to the 2010 SWRCB Delta Outflow Criteria. (Fish & Game Code Section 2081(b)(2))
3. The applicants do not assure funding and water supplies for habitat restoration measures. Habitat restoration measures will not be "shovel-ready" when the Twin Tunnels begin construction. (Fish & Game Code Section 2081(b)(4) and 2820(a)(10))
4. BDCP does not include analysis of an alternative or alternatives that would meet the recovery goals for Sacramento River Winter Run and Spring Run Chinook salmon. Such an analysis should at least take into consideration the State Water Resources Control Board's 2010 Delta Outflow decision. (Fish & Game Code Section and 2820(e))

In summary, the Bay-Delta Conservation Plan does not meet the requirements of the California Endangered Species Act or the Natural Communities Conservation Plan Act to recover Sacramento River winter-run and spring-run Chinook salmon. The BDCP NCCP is to be submitted to support issuance of an incidental take permit by the Department of Fish and Wildlife. For all of the above reasons, we urge you to reject approval of the BDCP as an NCCP.

We thank you for your consideration of these points and look forward to hearing back from you on this important matter.

Sincerely,

Vivian Helliwell, Chairman
P.O. Box 307
Eureka, CA 95502
vhelliwell@mcn.org

cc: Honorable Wesley Chesbro, Chairman Joint Committee on Fisheries and Aquaculture
Kevin Shaffer, CDFW Program Manager, Anadromous Fisheries Branch

Attachments:

1- Anadromous Fish Restoration Program Figure 4: Estimated yearly adult natural production, and in river adult escapements of Winter Run Chinook salmon
2- Anadromous Fish Restoration Program Figure 5: Estimated yearly adult natural production, and in river adult escapements of Spring Run Chinook salmon in the Central Valley rivers and streams.
3- Central Valley Salmon Smolt Survival With and Without BDCP

ATTACHMENT 1

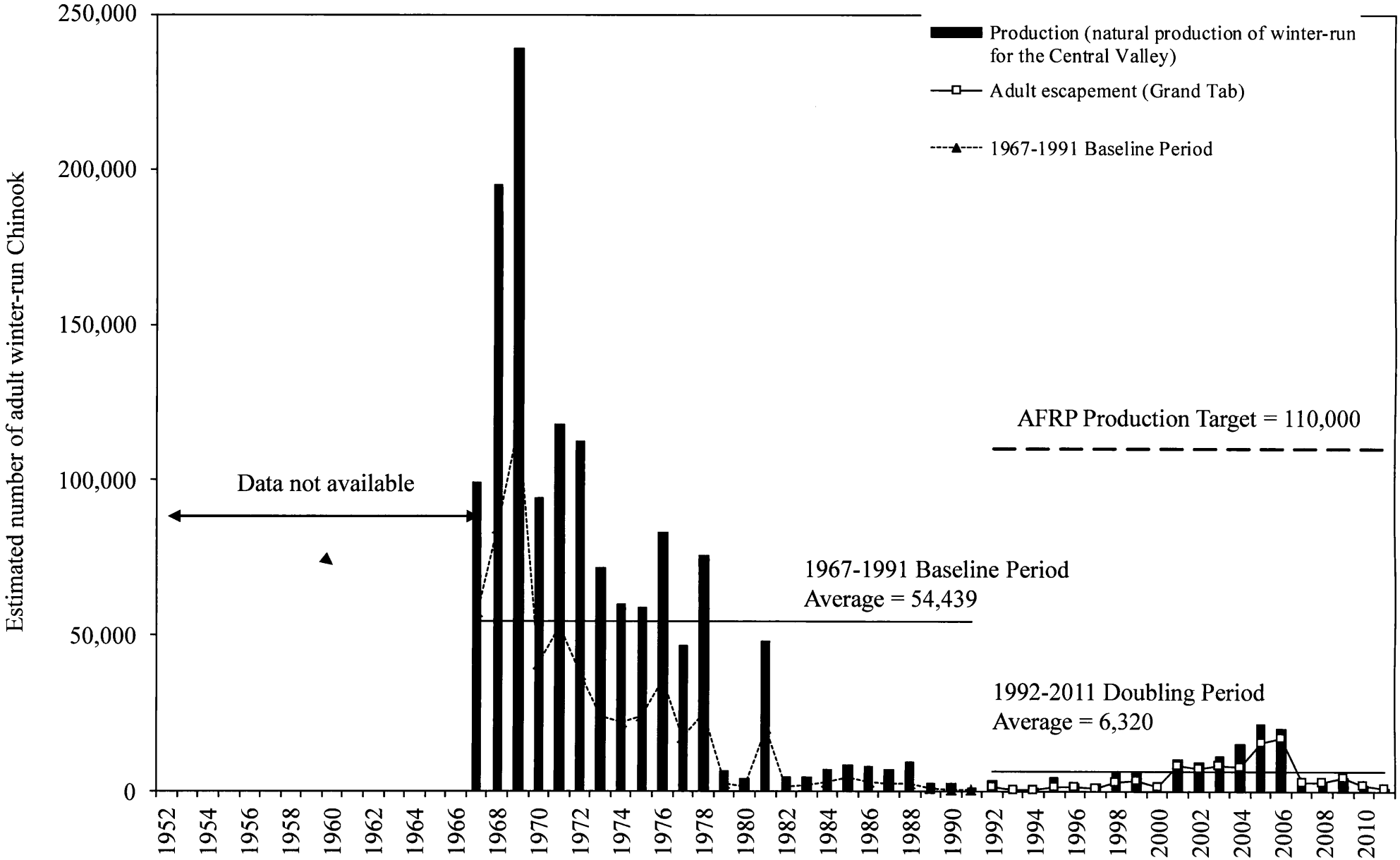

Figure 4. Estimated yearly adult natural production, and in river adult escapements of winter-run Chinook salmon in the Central Valley rivers and streams. 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).

ATTACHMENT 2

2-1-13

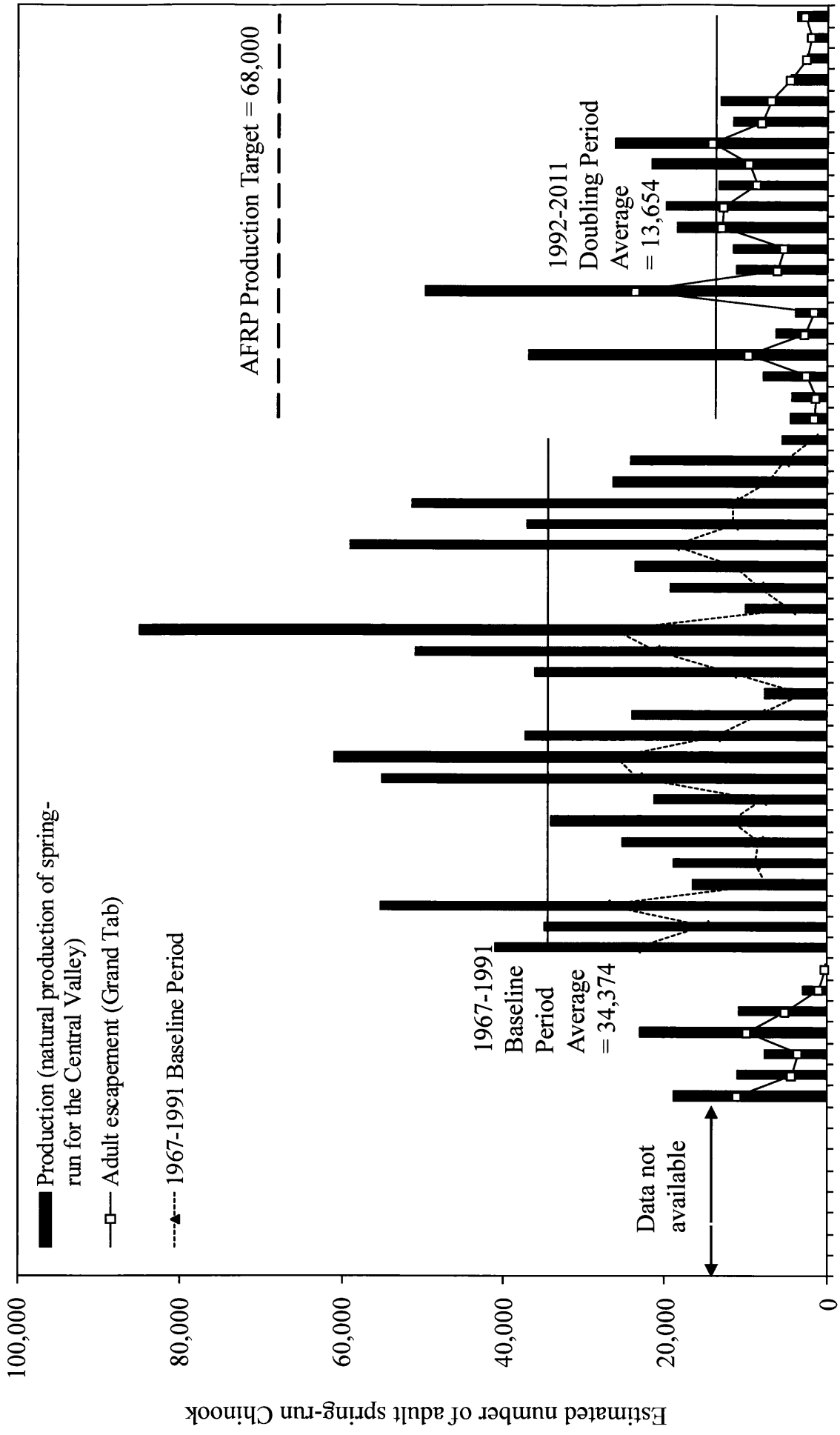

Figure 5. Estimated yearly adult natural production, and in-river adult escapements of spring-run Chinook salmon in the Central Valley rivers and streams. 1960 - 1966 and 1992 - 2011 numbers are from CDFG Grand Tab (Apr 24, 2012). 1967-1991 Baseline Period number are from Mills and Fisher (CDFG, 1994).

ATTACHMENT 3

Percentage Change in Salmon Survival Rates with and without BDCP

Salmon Run/Statistic	BDCP Chapter 5 Source Table	Baseline Conditions Now (EBC1)	Baseline Conditions in 2060 Without BDCP (EBC2-LLT)	Twin Tunnels Operation in 2060 (ESO-LLT)	Between Now and Without Twin Tunnels by 2060	Between Now and With Twin Tunnels by 2060	In 2060 With Twin Tunnels versus Without
Winter-Run	5.5.3-10						
Average		34.7%	34.2%	33.2%	-1.4%	-4.3%	-2.9%
Median		32.4%	31.8%	28.7%	-1.9%	-11.4%	-9.7%
Spring-Run	5.5.4-5						
Average		31.1%	30.3%	29.1%	-2.6%	-6.4%	-4.0%
Median		27.0%	26.4%	25.1%	-2.2%	-7.0%	-4.9%
Sac River Fall Run	5.5.5-8						
Average		25.7%	24.7%	24.4%	-3.9%	-5.1%	-1.2%
Median		22.8%	21.6%	22.4%	-5.3%	-1.8%	3.7%
Late Fall-Run	5.5.5-10						
Average		23.1%	22.9%	23.0%	-0.9%	-0.4%	0.4%
Median		20.1%	20.6%	21.3%	2.5%	6.0%	3.4%
San Joaquin River Fall-Run	5.5.5-18						
Average		13.7%	13.5%	13.2%	-1.5%	-3.6%	-2.2%
Median		10.7%	10.3%	12.1%	-3.7%	13.1%	17.5%
Mokelumne River Fall-Run	5.5.5-20						
Average		16.0%	15.9%	16.3%	-0.6%	1.9%	2.5%
Median		15.2%	14.0%	14.1%	-7.9%	-7.2%	0.7%

Source: Chapter 5, Effects Analysis, Sections 5.5.3 through 5.5.6, Bay Delta Conservation Plan, 2013.

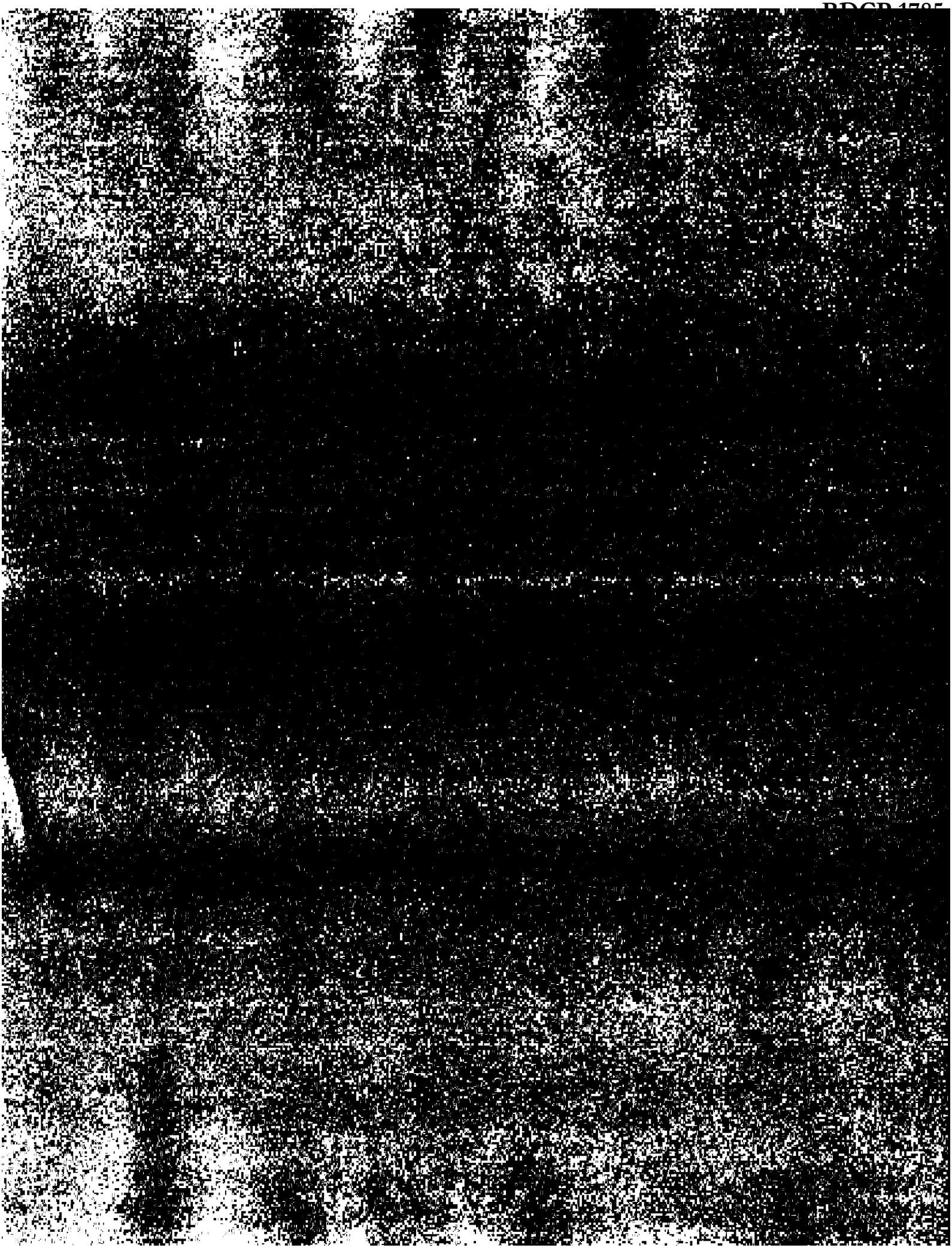

EXHIBIT B

Science Panel Report

March 2014

Delta Science Program Independent Review Panel Report: BDCP Effects Analysis Review, Phase 3

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Executive Summary

Under the auspices of the Delta Science Program, the seven-member Independent Scientific Review Panel (Panel) reviewed the adequacy of the Effects Analysis component of the Bay Delta Conservation Plan (BDCP or Plan). This report represents the third phase of the Effects Analysis review; the Phase 1 (completed in November 2011) and Phase 2 reviews (completed June 2012) were partial reviews of the Effects Analysis and were completed as the Conceptual Foundation and Analytical Approach were still under development. These documents are available online at: http://deltacouncil.ca.gov/science-program/independent-review-draft-bay-delta-conservation-plan-effects-analysis. The present, Phase 3 review covers the first complete public draft of the BDCP Chapter 5 Effects Analysis and its associated technical appendices, made available in December 2013.

Four broad themes emerged from the Panel's review of the BDCP Effects Analysis. Firstly, the long, highly detailed document was difficult to review and comprehend. The vastness of the Effects Analysis report and appendices are both its strength and weakness. Although highly improved from the documents that the Panel reviewed during Phase 2, Chapter 5 continues to be fragmented in its presentation and sometimes inconsistent with the technical appendices. While the sheer scope of the analysis is impressive, the inefficient organization and incomplete cross-referencing among sections within the Effects Analysis (e.g., the 8 supporting appendices, totaling ~4500 pages) as well as with the larger BDCP planning documents make interpretation of anticipated net effects of BDCP implementation difficult at best. The 745-page Chapter 5: Effects Analysis does not represent a stand-alone document and it relies extensively on the associated appendices and other chapters for the presentation of scientific information, with insufficient guidance for the reader. As concluded from the Phase 2 report, the Panel universally believes that by itself, Chapter 5: Effects Analysis inadequately conveys the fully integrated assessment that is needed to draw conclusions about the Plan, in part because of incomplete information on factors affecting the covered species.

The second theme in the Panel's review is an apparent disconnect between the assessments of the levels of scientific uncertainty presented in Chapter 5 versus what is characterized in the technical appendices. In many cases, the Panel felt that there was appropriate characterization of high uncertainty within the technical appendices but Chapter 5 did not sufficiently acknowledge or articulate this reality, especially when using professional judgment to reach overall net effects of the BDCP on key species. In particular, the Panel observed that the critical uncertainties associated with presumed beneficial effects of tidal wetland restoration were not recognized in the Chapter 5 summary. Given the magnitude of the BDCP, the inherent natural and anthropogenic complexity in the Bay-Delta ecosystem, and the long time horizon for BDCP implementation and rehabilitated community development, most of the potential BDCP effects carry a relatively high level of uncertainty. For these reasons, the Effects Analysis must provide clear guidance for conceptual models, monitoring, metrics that assess underlying ecosystem processes, explicit thresholds and triggers, alternative hypotheses, special studies to address critical information gaps, and structured decision making in the form of a rigorously institutionalized adaptive

management process.

The third major theme of this review is the lack of an integrated or quantitative assessment of net effects, echoing a similar review comment in the Phase 2 review. The Panel acknowledges that considerable effort has been made in documenting the complex information used to determine net effects. However, in the case of covered species, effects could not be quantified and only two of the sixteen existing life cycle models were deemed to be relevant to BDCP. For these and other reasons, a systematic approach to synopsize the overall net effect on each species was not used. Instead, professional judgment was used instead of a ranking approach to quantify a synthesis of cumulative effects and associated certainty in the projected outcome. Finally, in one paragraph, Chapter 5 accurately portrayed the anticipated BDCP effects: "*These expectations represent a working hypothesis of the relationship between actions, stressors, and biological performance*". However, this statement was not emphasized throughout the document.

The fourth major theme reflected on the need to address the extensive uncertainties associated with the assumptions and predictions of the beneficial effects of the BDCP conservation measures. While the Phase 2 Effects Analysis accurately reflected the detailed process and implementation structure to apply an adaptive management approach to resolve uncertainties, the Panel was concerned that it defaulted to rather "passive learning" instead of a rigorous, institutionalized adaptive management process that resolved effects on covered species and their requisite ecosystems through an active, experimental approach.

Together with background obtained during Phase 1 and 2 of the BDCP Effects Analysis review, the Panel provides the following synopsis of the Panel's responses to their General Charge Questions; further responses to specific issues and the adequacy of supporting documents are provided in the body of the report.

1. How well does the Effects Analysis meet its expected goals?

The Phase 3 review-version of the Effects Analysis is a much improved and impressive compilation of background material and scientific and technical knowledge about the Bay-Delta that provides a plausible basis for the conservation measures. The Panel concluded that much of the available data and arguments for the rationale behind the Effects Analysis assumptions and conclusions are contained within the BDCP documents. However, we suggest that the Effects Analysis (Chapter 5) itself is still poorly substantiated and leaves too much to appendices and other BDCP chapters without explicit cross-references. The lack of accessibility to information within the chapter or clear reference to supporting detail inhibits rather than elucidates comprehension of the findings and thus conveys an unsatisfying "trust us" message.

Our conclusion of the Effects Analysis is that many of the critical assumptions in modeling effects and justifications behind the supposed benefits of the conservation measures are highly uncertain. Much of the conservation measures center around restoration activities and management actions to improve current conditions. Our impression, therefore, is that the foundation of the BDCP is weak in many respects and the default burden to ensure covered species benefit, if not recovery, depends on adaptive management. The adequacy of the BDCP therefore rests not in the intent and development of the conservation measures, but in the rigor and application of

adaptive management to ensure that the critical uncertainties are addressed and strategically incorporated into a progressively refined Plan.

2. How complete is the Effects Analysis; how clearly are the methods described?

Chapter 5 provides a comprehensive overview of the spatial and temporal scope of the analysis, definitions of project baselines that differ depending on regulatory authority, recognition of climate change information, identification of a variety of models used to evaluate effects, treatment of viable salmon population criteria, and the approach to determining net effects on fish and wildlife. As might be expected, with the size of the Effects Analysis task, the quality of the assessments ranged in scientific rigor based on the amount of available data and best available science. Some aspects of the assessment, such as water quality and flow, were quantitatively assessed using sophisticated mathematical models. Some aspects of the Chinook salmon assessments were also based on empirical data and process-based models. However, for many of the other fish species and their potential stressors, conceptual models supported by the scientific literature were the only recourse.

3. Is the Effects Analysis reasonable and scientifically defensible? How clearly are the net effects results conveyed in the text, figures and tables?

The approach to net effect conclusions needs to be reconsidered and revamped. The Effects Analysis assessment of net effects, particularly for covered fish, tries to incorporate information on potentially beneficial or detrimental effects covering 12 different stressors, 32 attributes, and multiple life stages using best available information and science. Only a perfect life-cycle model with perfect information on all the effects and their interactions could possibly weight the results correctly and draw unambiguous conclusions. A serious limiting factor of the current consolidation of Net Effects is a near complete absence of any weighting of the biological importance to particularly sensitive life history stages of the many attributes under consideration. As a result, whether and how any critical life stages or attributes are being adversely affected by the BDCP is generally unclear. The net effects conclusions for a fish species needs to therefore take into account the relative importance of the various life history stages, make them explicit, and interpret Plan effects within that context on a species-by-species basis. Similarly, the simple summation of the number of acres of suitable habitat that are removed or restored for each species by the conservation measures does not consider landscape-level effects such as connectivity and patch size, nor does it take into account variation in habitat quality.

The net effects analysis tends to overreach conclusions of positive benefits for covered fish species, given the inability to quantify the over-all net effects and the realization of high uncertainty. In particular, it does not adequately defend conclusions regarding the net effects of habitat restoration. Restoration of tidal wetlands (and other communities) is highly uncertain and at least an extremely long process. The Effects Analysis does not adequately justify the critical assumption of the benefit of tidal wetland restoration as a food web subsidy for covered pelagic fish given the uncertainties of tidal wetland restoration itself. A critical issue is the implicit expectation that restoration activities will result in increases in abundance of lower trophic levels, but it is uncertain whether the resulting increased production will result in food web pathways supporting covered species. The presentation of phytoplankton-based and tidal wetland macrophyte

detritus-based food webs as alternative ecosystem processes, rather than as an integrated system, also significantly complicates the interpretation of the potential benefit of BDCP restoration. For foraging salmonids, the Effects Analysis did not evaluate the reduced extent to which salmonids would have access to rehabilitated habitat when the north Delta intakes are operating and flows are reduced.

Only one configuration of Restoration Opportunity Areas (ROAs) were modeled by the hydrodynamic models and the locations of these assumed Restoration Opportunity Areas are not available. Some details of the hydrodynamic modeling, especially where 1D and 2D models did not agree or situations where counter-intuitive results were reported, could not be evaluated due to the limited information provided.

4. How well is uncertainty addressed? How could communication of uncertainty be improved?

A broad consensus exists among the Panel that Chapter 5 does not adequately acknowledge the extensive uncertainty associated with the BDCP's assumptions and predictions. In its current form, at the level of detail conveyed, in the models used, and in the verbal assessments and conclusions, the level of uncertainty is often downplayed. Within appendices sometimes more explicit discussion of uncertainties can be found, but there is a disconnect between the summary pages with the conclusions drawn in Chapter 5. In situations in which an array of outcomes may be possible, only the more beneficial outcomes are used in conclusions about the BDCP. Communication of uncertainty would be improved by consideration of a range of potential outcome values in models.

5. How well does the Effects Analysis describe how conflicting model results and analyses in the technical appendices are interpreted?

The Panel found models describing salmonid Delta passage and habitat suitability for terrestrial species to be appropriate and any conflicting results adequately explained. Because hydrodynamic models are sensitive to how the open water regions are represented and how they are connected to the adjacent channels, and because the panel was not provided the bathymetric configuration of the ROAs or the order in which the ROAs were established, it is not feasible for the Panel to evaluate the sensitivity of the models to the placement of the Restoration Opportunity Areas.

Overall, the Panel found the Chapter 5 text describing the two life cycle models (IOS and OBAN), which provide alternative views of BDCP effects compared with other analyses, to be complicated and somewhat confusing. It was not clear whether or not the models were appropriately applied to evaluate a portion of the BDCP attributes.

The Effects Analysis modeling of salmon sensitivity to water temperature during egg incubation in the Sacramento River is not clear, given that the BDCP has no effect on upstream conditions according to some sections of Chapter 5. The Chapter 5 evaluation needs clarification, including a clear description of how the BDCP might affect flow and temperature in this area.

6. How well does the Effects Analysis link to the adaptive management plan and associated monitoring programs?

While both the need for and operative structure of adaptive management is identified considerably more in the Phase 3 review version of the Effects Analysis, it remains

characterized as a silver bullet but without clear articulation about how key assumptions will be vetted or uncertainties resolved to the point that the BDCP goals and objectives are more assured. The concept of adaptive management is appropriately described and allocated a prominent role in the implementation structure. However, the commonly acknowledged process of adaptive management is easily misunderstood and misapplied, often resulting in a loss of rigor and commitment in application. Because of the extensive uncertainties surrounding the assumptions and predictions of the BDCP, the Panel strongly emphasizes institutionalizing an exceedingly rigorous adaptive management process. This is critical in order to avoid the high risk associated with ecological surprises that will be difficult or impossible to reverse once they have occurred. BDCP must make a commitment to the fundamental process, and specifically the required monitoring and independent science review, not just the concept of adaptive management.

Introduction

This report describes the results of an independent scientific review of the Bay Delta Conservation Plan (BDCP) Effects Analysis. At the request of the BDCP participants, the Delta Science Program convened an Independent Science Review Panel (Panel) to assess the scientific soundness of the BDCP Effects Analysis, guided by a Panel Charge with explicit questions to address.

Background and History

The BDCP Working Draft was initially released November 18, 2010 without a detailed effects analysis. This review has been conducted in three phases and was initiated in October 2011. The Panel's initial (Phase 1) review was conducted on the Draft BDCP Effects Analysis' Conceptual Foundation and Analytical Framework and the Entrainment Appendix as an example of the application of the conceptual understanding, methods and analyses discussed in the Conceptual Foundation and Analytical Framework. In the most recent drafts of the BDCP Effects Analysis, the Foundation and Framework (originally Appendix A) concepts were incorporated into Chapter 5: Effects Analysis. During Phase 2, the Panel reviewed drafts of the BDCP Chapter 5: Effects Analysis and drafts of many of the associated technical appendices. Appendices 5.E: Habitat Restoration and 5.G: Fish Life Cycle Models were not reviewed during the Phase 2 review. The BDCP Chapter 5: Effects Analysis and all of its associated technical appendices were reviewed during the Phase 3 review that is summarized in this report.

BDCP Goals and Role of Effects Analysis

The overall goal of the BDCP is to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. Component goals include:

- provide for the conservation and management of Covered Species within the Plan Area;
- preserve, restore and enhance aquatic, riparian and associated terrestrial natural communities and ecosystems that support Covered Species within the Plan Area through conservation partnerships;
- allow for projects to proceed that restore and protect water supply, water quality, and ecosystem health within a stable regulatory framework;
- provide a means to implement Covered Activities in a manner that complies with applicable State and Federal fish and wildlife protection and laws, including California Endangered Species Act and Federal Endangered Species Act, and other environmental laws, including the California Environmental Quality Act and National Environmental Policy Act;
- provide a basis for permits necessary to lawfully take Covered Species;
- provide a comprehensive means to coordinate and standardize mitigation and compensation requirements for Covered Activities within the Planning Area;
- provide a less costly, more efficient project review process which results in greater conservation values than project-by-project, species-by-species review; and,
- provide clear expectations and regulatory assurances regarding Covered Activities occurring within the Planning Area.

The Effects Analysis is a critical component for the BDCP. Its purpose is to provide the best scientific assessment of the likely effects of BDCP actions on the species of concern and ecological processes of the Bay-Delta system. The Effects Analysis will, out of necessity, rely heavily on the application of models to quantify the likely results of the BDCP. These include conceptual, numerical, hydrodynamic, operational, and species models. The BDCP Effects Analysis is being conducted and documented through Chapter 5: Effects Analysis and a series of technical appendices centered on common stressors or groups of similar effects. The draft appendices reviewed in Phase 1 of the Effects Analysis review included the Conceptual Foundation and Analytical Framework Appendix (Foundation and Framework) and the Entrainment Technical Appendix. The Foundation and Framework described the high-level vision, purpose, and regulatory foundation for the Effects Analysis. It also provided an overview of the proposed methods to accomplish the analysis. In the most recent drafts of the BDCP Effects Analysis, the Foundation and Framework (originally Appendix A of the BDCP) concepts have been incorporated into Chapter 5: Effects Analysis.

Panel Members

- Alex Parker, Ph. D., California Maritime Academy, California State University (Panel Chair)
- Charles "Si" Simenstad, M.S., University of Washington (Lead Author)
- T. Luke George, Ph.D., Colorado State University
- Nancy Monsen, Ph.D., Stanford University
- Tom Parker, Ph.D., California State University San Francisco
- Greg Ruggerone, Ph.D., Natural Resources Consultants, Inc.
- John Skalski, Ph.D., University of Washington

The Panel member's biographies are included in Appendix A of this report.

Charge to Panel

The Panel was charged with assessing the scientific soundness of Chapter 5: Effects Analysis and the associated technical appendices, including recommendations for how these might be improved with respect to achieving their stated goals (Appendix B). The charge directed the Panel to address six general questions on Chapter 5: Effects Analysis and review of eight specific topics that had been formulated by the BDCP agencies. In addition, seven other questions were addressed on the approach, analysis and models described in the Chapter 5 technical appendices.

Review Schedule

- October 2011
  - The Panel convened in Sacramento to discuss the Foundation and Framework and Entrainment Technical Appendix and made initial recommendations.
- November 2011
  - Phase 1 Panel report completed November 28, 2011.
- April/ May 2012
  - The Panel reconvened in Sacramento to discuss BDCP Chapter 5: Effects Analysis and the many of the technical appendices. Appendices 5.E:

Habitat Restoration and 5.G: Fish Life Cycle Models were not reviewed at this time.

- June 2012
  - Phase 2 Partial Review Panel report completed.
- December 2013
  - An informational briefing was provided for the Panel. It included an overview of changes to the Effects Analysis and associated technical appendices since the Phase 2 review, including the changes made in response to the Panel's previous comments.
- January 2014
  - The Panel convened in Sacramento to discuss the BDCP Chapter 5: Effects Analysis and technical appendices on January 28-29.
- March 2014
  - Phase 3 report completed.

Organization of Report

We have sought to organize the Panel's review comments and recommendations around the questions framing the Charge to the Panel (Appendix B). Given the extensive volume of review material in Chapter 5 and its associated appendices, our ability to draw on other chapters in the entire BDCP document and all other supplemental material provided to the Panel was considerably limited and inconsistent. However, we attempted to reduce our own uncertainties by exploring the whole body of the BDCP as much as was feasible within the constraints on our time and resources.

For each of the Panel Charge questions we provide a brief ***summary*** section, a series of bulleted ***recommendations***, and a ***comments*** section with more detailed discussion. In order to maintain this structure throughout the report, there is some redundancy, particularly between the summary comments and detailed comments sections.

Summary observations

Reponses to Phase 1 and Phase 2 Panel recommendations

Many of the recommendations from the Phase 2 report should still be referenced while developing the adaptive management plan and initial rules for operating the north Delta diversion facility. Highlighted below are some Phase 2 recommendations that are relevant in this Phase 3 report.

Recommendation 1: Analysis of biological effects needs more consistency and specificity

In some respects, the current draft of the Effects Analyses lacks even more specificity than before, although it may be that sections were moved to other chapters. The 'multi-author' problem is apparent in the variation in assessments found in different locations. Most biological objectives for covered fishes were not fully evaluated in Chapter 5 because information was deemed to be insufficient (Table 5.2.8). Requests for full aquatic food webs were followed and a reasonable conceptual food web was provided, but it was incomplete.

Recommendation 2: Net Effects Analysis needs greater objectivity

Regardless of the degree of uncertainty and the number of linkages without analyses, the conclusion is often overstated as the most beneficial result. Many biological models were analyzed without any sensitivity analyses; consultants would say, 'there's no data,' but they could have said, 'what if we were just 90% correct here, or 60% correct', or 'what if the benefits of restoring wetlands are delayed 10-15 years over our most positive perspective' – but none of those alternative scenarios were considered.

Recommendation 3: Increase consistency of stressor analysis across covered species, and provide more detail.

Chapter 5 identified a ranking approach that addressed: 1) importance of attribute to the population; 2) effect of stressor on individuals; and, 3) certainty of 1 & 2. However, the analysis did not transparently follow through with this approach.

Recommendation 4: Chapter 5 must be a "stand alone" document

The synthesis quality of the Effects Analysis was improved. But reference to specific sections of technical appendices and other supporting documentation could be improved in many sections. Given uncertainty in effects analysis, more description of monitoring and adaptive management would be worthwhile to show that the BDCP would adequately address the uncertainty.

Recommendation 5: Clarify the baseline

The baseline(s) was described, although the baselines vary with regulatory agency. This complicated an already very complicated and lengthy Effects Analysis.

Recommendation 6: Provide systematic understanding and planning for conservation actions, especially restoration

Achieving beneficial conservation measures requires understanding limiting factors, ecosystem processes, sequencing, adaptive management responses, thresholds for certain actions, and interactions and other consequences of these actions. Otherwise, this isn't a conservation plan, but rather a conservation menu that generally fails to describe how major uncertainties will be resolved. For instance, while the Effects Analysis recognizes that suspended sediment has been declining in the Sacramento River and that the new diversions would remove an additional 8-9%, all analyses used a high and constant amount with no mention of downstream sediment effects on either Suisun or San Francisco Bay. Similarly, the uncertainty about being able to remove *Egeria* or other invasive species is not directly addressed in Chapter 5. *Egeria* is certainly poorly considered in the context of the aquatic food webs. Bivalves are not incorporated into aquatic food web analyses, although they're mentioned as 'uncertainties'.

While the conceptual model of food web enhancement support of covered species through restoration of tidal wetlands is more thoroughly covered, potential changes in the contributions of different food web sources and subsidies are still treated as disparate. Discussion of the Delta's potential food web structure and dynamics under BDCP conservation measures still fails to treat the Delta as a system, with spatially and temporally integrated sources of phytoplankton-based and detritus-based secondary

production. There remains the need to provide a synthetic view of the potential benefit of restoration to the covered species that represents the integrated ecosystems and processes that fuel that food web, and potentially enhance it under the BDCP.

No additional detail has been provided for the Restoration Opportunity Areas (ROAs), other than their general locations. There is very little mention of how they will be connected, interact or be sequenced. What criteria have been developed to provide that guidance, or is it entirely dependent on opportunity (real estate costs, availability, public land, etc.)? Ultimately, adaptive management incorporating an extensive management structure and large representation of stakeholders will need to be implemented in order to resolve issues and uncertainties. There is a tremendous trust embodied in an ill-defined adaptive management process.

Recommendation 7: Include indirect effects of contaminants as part of Appendix 5.D: Contaminants

Indirect effects of contaminants on covered species via food web effects (i.e., contaminant effects on the microorganisms that make up the food web that covered species depend on) are almost certainly important.

Recommendation 8: Accurately characterize food resources and food webs

While there is now more comprehensive assessment of both phytoplankton- and detritus-based food web pathways proposed to be enhanced by BDCP conservation measures, the Effects Analysis still leaves the impression that phytoplankton and macrophyte (e.g., tidal marsh) production are separate, almost "opposing" alternative food webs. Only a simple depth model is used for phytoplankton production, nothing else incorporated. Many things are now mentioned in the text, no analyses incorporated, no discussion of potentially modified planktonic composition, etc.

Recommendation 9: The hydrodynamic modeling needs to capture the entire domain of effects

1) New guidelines will need to be put in place to regulate tidal (and maybe tidally averaged reverse flows) in the north Delta channels including Steamboat, Sutter, and Georgiana Sloughs. The operation of the Delta Cross Channel also needs to be rethought. These new guiding regulations need to be in place *before* exports start to occur in the system.

2) The current Effects Analysis does not consider the influence of shifting timing of withdrawals on San Francisco Bay circulation patterns and ecology. This is a significant omission with ecologically important implications.

Recommendation 10: Incorporate life cycle models for all species, as quantitatively as possible

Appendix 5.G identified a number of life cycle models, but eliminated all but two to be used in the effects analysis. The Panel questioned whether some models were inappropriately dismissed. The two models used in Chapter 5 both involved winter Chinook salmon. Thus, the large majority of covered species were not evaluated with life cycle models. The Panel asks why the BDCP did not develop life cycle models when beginning the process.

Recommendation 11: Consider salmonids at stock and life history scale

This aspect of the Effects Analysis was also improved. Each salmonid stock was evaluated. "Forager" versus "migrant" life histories were compared and evaluated, but proportions of each life history type did not seem to be considered in the analysis of net effects. Furthermore, the relative proportion of wild versus hatchery fish contributing to each life history type was not considered.

Recommendation 12: Identify analytical tools that need to be developed to address the extremely high uncertainty involved with calculating sediment supply and turbidity

Multiple statements within Chapter 5 and Appendix 5.C indicate that turbidity distribution is largely unknown.

Recommendation 13: Levels of uncertainty are not adequately addressed

The Effects Analysis provides an improved recognition of uncertainty, but there's not better resolution of uncertainty than in previous drafts and the more complete discussion of uncertainty is often buried in the appendices. As a result, Chapter 5 reflects the lowest common denominator in terms of uncertainty. The level of uncertainty was often mentioned when evaluating the effect of a stressor on a species. Uncertainty was also mentioned when estimating net effects. However, conclusions regarding covered fish often overstated potential beneficial effects while not adequately addressing the lower-end effects.

Recommendation 15: Include sensitivity analyses and model validation in the effects analysis for covered fish species

While sensitivity analyses would have informed the Effects Analysis in the case of some of the biological models, this recommendation was generally not followed.

Recommendation 16: Provide more detail about the specific approaches that will be used when implementing adaptive management

Given the tremendous levels of uncertainty associated with critical assumptions and predictions inherent in the Effects Analysis, the burden of sustaining or enhancing covered species will seemingly fall almost entirely on adaptive management, particularly "active" adaptive management where explicit interventions may be required. However, it remains unclear how many of the critical uncertainties can or will be addressed as explicit experiments. While the Adaptive Management Plan is appropriately, and often effectively, designed to specifically address the major uncertainties, thresholds, triggers and alternative measures need to be explicitly derived from conceptual and numerical models. In some cases, metrics or success criteria have yet to be identified (e.g., Table 3.D.2). Furthermore, the critical monitoring that would be required for effective decision making and adjustments are often relegated to research actions rather than mandated effectiveness monitoring, which presents potential lack of commitment or delay in timely resolution of critical uncertainties. Given the critical importance of monitoring and adaptive management to BDCP success, it would be worthwhile to have an explicit section within Chapter 5 that specifies how monitoring and adaptive management has

been designed and implemented to address specific uncertainties, test critical assumptions and predictions and sequenced to improve the chance of success.

Recommendation 17: Ensure a declining fish population (e.g., longfin smelt) does not decline further while waiting for possible beneficial effects of habitat restoration

The key assumption is that food production will be the primary benefit to longfin smelt from habitat restoration measures. Winter-spring flow is also believed to be key factor affecting abundance. Chapter 5 states that the key question is the extent to which abundance can be increased through improved food production and how these improvements interact with the spring outflow-abundance relationship. Recognition of the length of time needed to restore habitats and increase food production for longfin smelt could be strengthened in Chapter 5.

Accessibility of Effects Analysis elements

The Panel recognizes that the complexities involved in the process to develop and the ultimate structure of the BDCP are enormous, and as a consequence reviewing one component such as the Effects Analysis can be inhibited by lack of clear knowledge of the other components, expanded detail or underlying rationale. Furthermore, the Panel found it difficult to readily track down key information in the 745 page Effects Analysis (Chapter 5), which was supported with eight appendices containing an additional 4,500 pages. In general, in spite of its length, we often found assumptions or conclusions stated in the Effects Analysis to be lacking in sufficient detail to stand alone without links to Effects Analysis appendices or other BDCP chapters that provided the necessary detail or background. Although outside the charge of the Panel, we often found after digging further into the BDCP documents that the Effects Analysis was supported with some information. We recommend that for recognition of the voluminous and detailed information supporting the Effects Analysis, and ease of migrating through it, a simple system of (appendix/chapter and page-line number) cross referencing be employed to point the reader to that supporting information.

General Charge Questions

1. How well does the Effects Analysis meet its expected goals?

Summary

Compared to the initial development of the BDCP Effects Analysis, the Panel consensus is that the Phase 3 version is a much improved and impressive compilation of background material and scientific and technical knowledge about the Bay-Delta that provided a plausible basis for the conservation measures. The Panel concluded that all of the available data and arguments for the rationale behind the Effects Analysis assumptions and conclusions are contained within the BDCP documents, although we suggest that the Effects Analysis (Chapter 5) itself is still poorly substantiated and leaves too much to appendices and other BDCP chapters without explicit cross references. The lack of accessibility to information conveys a "trust us" message.

Evaluation of BDCP effects was typically systematic in that it attempted to identify key attributes affecting Covered Species and described, to the extent possible, the

importance of that attribute, the potential effect of the BDCP on the attribute, and uncertainty regarding the evaluation. Findings from multiple approaches taken to assess potential effects were described and strengths and shortcomings were identified when possible. However, this level of detail, which sometimes included conflicting information, inhibits rather than elucidates comprehension of the findings.

The tenuous conclusion drawn from the Effects Analysis is that many of the critical justifications behind the supposed benefits of the conservation measures are highly uncertain. Other than the impression that the foundation of the BDCP is weak in many respects, the default burden to ensure Covered Species benefit, if not recovery, rests on adaptive management. The adequacy of the BDCP therefore rests not in the intent and development of the conservation measures, but in the rigor and application of adaptive management to ensure that the critical uncertainties are addressed and strategically incorporated into a progressively refined Plan.

There is great potential in the area of decreasing invasive aquatic vegetation (IAV) abundance. Control of extremely invasive IAV, such as *Egeria densa* (Brazilian waterweed) and *Eichhornia crassipes* (water hyacinth), could be substantial and effective if the Plan follows through on its actions. The prospects of success with predator control appear marginal and then only if hotspot actions are followed through year after year. The effects of water withdrawals by the Plan may lead to expanded populations of the non-indigenous, invasive clams *Potamocorbula amurensis* and *Corbicula fluminea* without further direct actions to control their population growth. The fate of *Microcystis aeruginosa* is also not promising. Between trends in climate warming and planned water withdrawals, the prospects for *Microcystis* blooms appear to remain unchanged or slightly worse under the Plan, although the direction of these potential outcomes is highly uncertain.

The Effects Analysis develops a robust conceptual model of aquatic food webs and the diverse linkages that may impact the net production of food for covered fish species. Yet, the Effects Analysis contains a number of assumptions, some of which are inappropriate (such as the magnitude and location of invasive clam depression of phytoplankton production), and others highly uncertain. Uncertainties are mentioned, but no effort was made to include conservation efforts reaching only a portion of the biological objectives and goals. Thus the analysis of effects further assumes only the most beneficial potential results, but doesn't incorporate other possibilities. Other aspects of food webs in aquatic habitats are described but remain unanalyzed, some of which may enhance, while others may inhibit achievement of biological objectives. While the overall conceptual model is adequate, integration and synthesis is lacking. Consequently the conclusions and net effects are not appropriate given the gaps in analyses and the uncertainties.

For terrestrial communities and covered species, the Effects Analysis provides a simple accounting of the number of acres of natural communities and suitable habitat that will be removed and restored but very little information is provided about the management actions that will be implemented to maintain them over the duration of the conservation plan.

Recommendations

- Provide detailed cross-referencing and indexing between Chapter 5 and the associated technical appendices as well as other chapters of the BDCP, especially the Adaptive Management Plan.
- Improve reporting of uncertainty levels within Chapter 5 Effects Analysis, including within the Executive Summary.
- Identify the most relevant monitoring indicators necessary to evaluate the trajectory of outcomes with respect to the biological objectives,
- Complete work on biological objectives.
- Provide triggers for adaptive management
- Guide the scientific community by highlighted research priorities to address critical information gaps.
- Improve on the systematic approach for integrating net effects for Covered Species.
- Develop life cycle models for each of the Covered Species in order to evaluate BDCP effects

Comments

The length and detail of the text and accompanying tables indicate considerable effort to document information used to determine the net effects. However, this level of detail, which sometimes included conflicting information, inhibits rather than elucidates comprehension of the Effects Analysis findings.

Overall, the BDCP and the 22 conservation measures have the goal to enhance fish and wildlife species in the Plan Area. Twenty-one of the conservation measures involve actions intended to restore habitat and benefit Covered Species. Conservation Measure 1 (Water Facilities and Operation) also has the goal to benefit covered species but this specific action involves activities that may adversely impact species (e.g., water removal and construction activities) while also benefiting some species (e.g., reduced entrainment at the south Delta pumps). Therefore, a key goal of the BDCP Effects Analysis is to determine whether the overall positive effects of the conservation measures outweigh the adverse effects of water removal and project construction, and if so, to what degree.

The Effects Analysis attempted to evaluate the effects of the BDCP on each covered fish species in an open, unbiased manner. Sixteen life-cycle models for Covered Species were examined for applicability to the BDCP, but only two were deemed to be relevant. It was not clear why life cycle models were not developed for the specific purpose of evaluating BDCP effects on each of the Covered Species. Quantitative effects could not be described, rather effects of each attribute were ranked as zero, low, moderate, or high effect. A systematic approach to synopsize the overall net effect on each species was not used even though a ranking approach that could have been used in a systematic roll-up was described. Instead, professional judgment was used to assess the overall net effect.

If there is one area of general scientific consensus among the Panel about the implementation of the Bay Delta Conservation Plan is that its outcomes remain highly uncertain. As such, one would expect that the Effects Analysis would reflect this general

conclusion by stressing a high level of uncertainty around all of its conclusions. There is also general consensus among stakeholders that the high level of uncertainty should not be an impediment to any action in the restoration of the Bay Delta ecosystem. The only way to address the highly uncertain outcomes of BDCP implementation is through rigorous monitoring and adaptive management. The BDCP Effects Analysis should better integrate where uncertainty exists, identify the most relevant monitoring indicators necessary to evaluate the trajectory of the outcome, provide triggers for adaptive management and guide the scientific community by highlighted research priorities to address critical information gaps. On these points the Effects Analysis as a stand-alone document falls short.

Table 5.2-8 identifies the biological objectives for each of the covered fish species and whether or not the Effects Analysis was able to assess the likelihood of the BDCP achieving the objectives. Some of the biological objectives were quantitative, thereby providing a specific metric that could be evaluated both prior to BDCP implementation and after implementation. For example, for winter-run Chinook originating in the Sacramento River, the objective is to achieve a 5-yr geometric mean survival through the Delta of 52% by year 19 (from an estimated 40% at present), to 54% by year 28, and to 57% by year 40. Although the table notes that this objective is interim and subject to possible change as new data are collected, the Review Panel complements the BDCP team for developing quantitative biological objectives to be achieved within specific time periods. Ideally, the Effects Analysis should evaluate likelihood of the BDCP achieving each biological objective.

The inability to fully evaluate the likelihood of achieving each biological objective at this time highlights the need for a rigorous monitoring and Adaptive Management Plan. Chapter 5 seems to recognize this need in light of the incomplete evaluation of biological objectives. The Panel was not tasked with reviewing monitoring and adaptive management plans. Nevertheless, monitoring efforts should be designed to quantify whether or not the biological objectives are being achieved. The adaptive management plan needs to be linked to monitoring with identified trigger points and actions to steer the effort towards achievement of the biological objectives.

For terrestrial communities and covered species, the Effects Analysis, for the most part, provides a simple accounting of the number of acres of natural communities and suitable habitat that will be removed and restored but very little information about the management actions that will be implemented to maintain them over the duration of the conservation plan. The estimates of habitat restoration assume that restoration targets for the different habitats will be achieved with certainty, an assumption that unlikely to be met. In addition, the contribution of natural community restoration to species habitat restoration is estimated by multiplying the percentage of modeled habitat comprising the natural community by the total acres of natural community restoration in the plan area. This approach, however, confounds the spatially explicit nature of many of the species distributions within the Plan Area. For instance, only the riparian woodland south of Highway 4 within the Plan Area is considered potential riparian woodrat habitat which makes sense given their current distribution. The riparian woodland in this region currently comprises approximately 12.1% of the riparian woodland in the entire Plan Area. It is inappropriate to apply this percentage the estimate the amount of restored habitat in the Plan Area that will be available to riparian woodrats. If none of the

restored habitat occurs south of Highway 4 then none of it will be potentially available to riparian woodrats. It makes much more sense to identify only riparian woodland restored south of Highway 4 as potential riparian woodrat habitat. Because the distribution of many of the species in the Plan Area is limited by their current distribution and dispersal abilities, the potential for colonization of restored areas should be identified using spatially explicit information. In the case of the riparian brush rabbit and riparian woodrat, a specified number of acres of riparian woodland should be restored within their potential range in the Plan Area.

The issue of the management of terrestrial communities and covered species is addressed in very broad terms in Chapter 5. In some cases there is mention of maintaining communities in a successional state that will make it suitable for a particular species (e.g., early successional riparian forest for riparian brush rabbits and western yellow-billed cuckoo), but many of the uncertainties surrounding long-term management of species and habitats are subsumed into adaptive management. Adaptive management is unlikely to succeed unless clear targets and thresholds for alternative management approaches are identified.

2. How complete is the Effects Analysis; how clearly are the methods described?

Summary

The Effects Analysis is a monumental effort incorporating over 745 pages of text and another 4,500 page of supporting appendices. The assessment covers potential changes in the physical environment, natural communities (12), fish (11 species), wildlife (25) and plant (12) species associated with BDCP. For fish species, 12 different categories of stressors and 32 attributes were examined over four different life stages. As many as 14 different operating scenarios were examined from the status quo to the long-term effects of BDCP implementation with climate change. For terrestrial species, areas of habitat loss and gained through management actions were examined.

Chapter 5 provides an overview of the spatial and temporal scope of the analysis, definitions of project baselines that differ depending on regulatory authority, recognition of climate change information, identification of a variety of models used to evaluate effects, treatment of viable salmon population criteria, and the approach to determining net effects on fish and wildlife. Biological goals and objectives were identified; this is important because the Effects Analysis should address each biological objective.

As might be expected, with the size of the Effects Analysis task, the quality of the assessments ranged in scientific rigor based on the amount of available data and best available science. Some aspects of the assessment, e.g., such as water quality and flow, were quantitatively assessed using sophisticated mathematical models. Aspects of the Chinook salmon assessment were also based on empirical data and process-based models. However, for many of the other fish species and their potential stressors, conceptual models supported by the scientific literature were the only recourse. In the case of Effects Analysis on fish, a workshop of professional biologists was used to incorporate feedback and to better express levels of uncertainty associated with assessment conclusions. The distinction between conclusions drawn from quantitative models and conceptual models was made clear.

The vastness of the Effects Analysis report and appendices is both its strength and weakness. In order to draw conclusions regarding effects of individual stressors or net effects on a species, it was often necessary in the report to draw on information from a number of appendices or other sections of the report. In many cases, these sections were not referenced or the specific findings of those sections not restated. This leaves the reader to hunt for the pertinent facts. It also appears at times that conclusions are based on a select subset of the facts that influence both the strength and certainty of the conclusions.

Because the variety of topics that the BDCP covers, how clearly the methods are described varies between topics. Several panelists gave input into Question 2 based on their areas of expertise.

Covered Fish

Approximately 72% of the objectives for covered fish could not be fully evaluated at this time due to insufficient information. The overall net effects conclusion for each species seemed to be based on the judgment of the authors, rather than a systematic ranking of attribute importance, change in response to the BDCP, and uncertainty in the rankings. Sixteen life cycle models for Covered Species were examined for applicability to the BDCP, but only two were deemed to be relevant, although the Panel is concerned about the exclusion of some life-cycle models. A systematic approach for synthesizing the net effect on each Covered Species was not used even though a ranking system was described that could have been used as a semi-quantitative scoring approach. Instead, professional judgment was used to assess the overall net effect.

In section 5.5, the text describes a numeric ranking for evaluating the importance of the attribute to the species, and the effect of the BDCP action on the attribute. The summary table (e.g., Fig. 5.5.1-5) was extremely difficult to read, used text to describe the effect (zero to high) and color to describe certainty. A small, essentially illegible "-" sign identified negative rankings. This summary table needs to be redesigned to improve readability.

No major omissions for the scientific literature or failure to use best available data were found in the Effects Analysis. However, the Effects Analysis did not develop new methods when gaps in assessment capabilities were encountered. For example, no attempt was made to modify any of the existing delta smelt models for the express purpose of this assessment.

An inevitable risk in using any mathematical model is extrapolation outside the range of the model. This extrapolation is likely whenever projecting to environmental conditions that have not yet occurred such as the changes that could be brought about by the BDCP. It is imperative that model-based assessments clearly state when such extrapolation is occurring and the potential direction of bias that might likely arise.

Hydrodynamics

The coupling of the multi-D, DSM2, and CALSIM II models is not a standard method that would naturally be understood by the reader. The documentation for this coupling is part of the EIS documentation, not part of the BDCP documentation. A short summary of the method should be included in Chapter 5.

Terrestrial species

The methods for the terrestrial species are adequately described in the various appendices (but see specific comments on the description of the methods for the habitat restoration in Appendix 5.J.B).

Recommendations

Over-arching recommendations

- Include a table of cross-references for each section or appendix referenced in the Net Effects.
- Add formal comparisons of model results in the Effects Analysis and appendices.
- Include within the Net Effect sections, discussions of contradictions or non-supportive facts in order to better capture some of the uncertainty in the conclusions.
- Emphasize the following Effects Analysis statement: "*These expectations represent a working hypothesis of the relationship between actions, stressors, and biological performance.*"

Covered fish

- Model-based assessments should clearly state when extrapolation is occurring and the potential direction of bias that might likely arise.
- Redo the format of the effects on attributes summary tables (e.g., Fig. 5.5.1-5) to improve readability.

Hydrodynamics

- A short summary of the method to inter-link multi-D hydrodynamic models, 1-D (DSM2) models, and CALSIM II should be included in Chapter 5.

Comments

Effects on Covered Fish

Chapter 5 addressed topics that it should address given information available at this time. Chapter 5 provides an overview of the:

- spatial and temporal scope of the analysis
- definitions of project baselines that differ depending on regulatory authority
- recognition of climate change effects on future conditions
- identification of BDCP actions
- identification of a variety of models and their limitations for evaluating BDCP effects
- an ESA take assessment including effects on viable salmon population criteria
- a qualitative approach for determining effects of each attribute on species habitat and performance
- an approach for classifying certainty of the effects analysis, and
- a description of the approach for evaluating overall net effects of the BDCP on each fish and wildlife species.

Additionally, biological goals and objectives were identified in Chapter 5. Identification of biological goals and objectives in Chapter 5 is important because the Effects Analysis

should address the ability of the BDCP to achieve each biological objective. However, Chapter 5 states that approximately 72% of the objectives for covered fish could not be fully evaluated at this time due to insufficient information. It is noted in Chapter 5 that these information needs would be incorporated into monitoring and research actions, which are described in Section 3.6 (not reviewed by the Panel). Given the incomplete information, the Effects Analysis states, "*These expectations represent a working hypothesis of the relationship between actions, stressors, and biological performance.*" This is an important statement that should be highlighted in Chapter 5 rather than in the middle of a paragraph on page 5.2-36.

Implementation of methods for evaluating BDCP effects was not readily transparent. Section 5.5 describes a numeric ranking approach for evaluating 1) the importance of the attribute to the species, and 2) the effect of the BDCP action on the attribute. Rankings reportedly ranged from -4 to +4. These two values were reportedly multiplied to develop a ranking of effect for each attribute. Certainty was reportedly evaluated using the same numerical ranking approach for both the importance of the attribute on the species and the BDCP effect on the species attribute. This approach seems reasonable given the limitations of existing information, and the evaluation would be transparent. However, the numeric values of these rankings were not presented or discussed in the BDCP. Instead, figures were presented (e.g., Fig. 5.5.1-5) that used text to describe the effect (zero to high) and color to describe certainty. A small, essentially illegible "-" sign identified negative rankings. It was not clear whether this summary figure incorporated the importance of the attribute to the population, although importance of the attribute was often described in the text.

The numeric ranking approach described above was not used to evaluate net effects of the BDCP on each species, even though it seems that it could have been used and compared with the professional judgment evaluations. Instead, the overall net effects conclusion for each species seemed to be based on the judgment of the authors, rather than a systematic ranking of attribute importance, change in response to the BDCP, and uncertainty in the rankings. Chapter 5 notes that its conclusions were compared with professional judgments of agency personnel provided during a series of workshops in August 2013. This is worthwhile, but a table showing the variability in the judgments would have been useful as a means for indicating variability in the assessment rankings.

The Panel does not provide comments on methodologies presented in the technical appendices, except when discussed below. The level of detail in the descriptions of methodologies in the appendices varies considerably. In many cases, the original document must be consulted for a description of the methodology. Given the variety of information sources, referral to the original report for methodology was not unexpected.

Hydrodynamics

One of the issues that had to be worked through with the hydrodynamic models for the Effects Analysis was how to use hydrodynamic models that were designed for the current bathymetric configuration of the Delta and the watershed. The CALSIM II model is a watershed optimization model that has operational criteria based on salinity intrusion into the Delta. Changing main point of diversion in Conservation Measure 1, adding ROAs in Conservation Measure 3, and factoring in climate change (especially

sea level rise), all change the circulation patterns in the Delta and the associated salinity intrusion. It is necessary to use the physically based multi-dimensional hydrodynamic models to first calculate hydrodynamic parameters (stage and flow) and salinity throughout the system. Because the multi-dimensional models are computationally intensive to run, the results of the multi-dimensional models are used to calibrate the DSM2 (1-D) model. The DSM2 (1-D) model is then used to create the relationship between salinity intrusion and river input flows. This river inflow-salinity intrusion relationship is what CALSIM II needs for optimization.

The coupling of the multi-D, DSM2, and CALSIM II models is not a standard method that would naturally be understood by the reader. The documentation for this coupling is part of the Environmental Impact Statement documentation, not part of the BDCP documentation. A short summary of the method should be included in Chapter 5.

Effects on Terrestrial Species

The methods for the terrestrial species are adequately described in the various appendices (but see specific comments on the description of the methods for the habitat restoration in Appendix 5.J.B).

3. Is the Effects Analysis reasonable and scientifically defensible? How clearly are the net effects results conveyed in the text, figures and tables?

Summary

The effects analysis covers a multitude of topics. Each panelist provided input into Question 3 based on their areas of expertise.

Overall approach to determine net effects

The Effects Analysis, particularly for covered fish, tries to incorporate information on potentially beneficial or detrimental effects covering 12 different stressors, 32 attributes, and multiple life stages using best available information and science. Only a perfect life cycle model with perfect information on all the effects and their interactions could possibly weight the results correctly and draw unambiguous conclusions. Any and all actual effects analyses are far from that measure of perfection, including the BDCP. The effect summary figures (e.g., Figure 5.5.2-5) attempt to illustrate the multidimensional aspects of the assessment process and, along with the Net Effect narratives, try to convey an overall assessment conclusion. A serious limiting factor of the current cumulative Net Effects is a near complete absence of any explicit weighting (in summary tables) of the biological importance of the many attributes under consideration (e.g., Figure 5.5.1-5). Size and direction of anticipated effects on the attributes is provided in the summary figures, along with color coding levels of certainty. Even though summary tables show values for each life stage, what cannot be discerned is whether any critical life stages or attributes are being adversely affected by the BDCP. Consequently, it is also unclear whether the Net Effects conclusions are correctly taking critical life stages into account when deriving overall Net Effects conclusions.

The approach to net effect conclusions needs to be reconsidered and revamped. The net effect summary figure (e.g., Figure 5.5.2-5) does not include the relative importance of the categories (e.g., food, entrainment, etc.). Without incorporating their relative importance in the summary figure, net effect conclusions are potentially meaningless

and uncertainty cannot be characterized. The net effect conclusions for a fish species need to therefore take into account the relative importance of the various categories, make them explicit, and interpret Plan effects within that context on a species-by-species basis.

Covered Fish

The Effects Analysis does not adequately defend conclusions regarding the net effects of the BDCP, including habitat restoration. Habitat restoration certainly has the potential to increase the productivity of species such as salmonids, but the literature contains relatively few studies documenting the population response of salmonids to habitat restoration. The conclusion statements from Chapter 5 (and/or the Executive Summary) tend to overstate the beneficial effects of BDCP for many different fish populations (e.g., salmonids, delta smelt, green and white sturgeon). The net effects analysis tends to over-reach conclusions of positive benefits for covered fish species, given the inability to quantify the overall net effect and the realization of high uncertainty.

Key issues/questions that still need to be address for covered fish include:

1. The importance of interactions between BDCP flows and habitat restoration.
2. Will the migrant life history sufficiently benefit from conservation measures to offset moderate negative impacts related to reduced spring flows? Migrant salmonids may benefit less from conservation measures, and may experience a negative net effect.
3. To what extent is foraging habitat and exposure of foraging salmonids to predators affected by reduced spring flows?
4. The text does not distinguish between hatchery versus wild salmonids in the analysis.

Conceptual Models

In general, the conceptual models for dissolved oxygen and contaminants are well developed, although consideration of nutrient form and nutrient ratios (e.g., Glibert *et al.* 2011) would be a nice addition given the interest and recent publications on these topics. Also, algal toxins could be an attribute for monitoring to reduce uncertainty in contaminants and food web conceptual models.

Although there are good synthetic conceptual models developed for the Bay-Delta longfin smelt population encapsulated in the Effects Analysis (e.g., Baxter 2010; Rosenfield 2010), the conceptual model is still constrained by the lack of a life-history model that would elucidate the role of prey composition and abundance in population dynamics.

Food Webs

Restoration of tidal wetlands (and other communities) is highly uncertain and at least an extremely long process. The Effects Analysis does not adequately justify the critical assumption of the benefit of tidal wetland restoration as a food web subsidy for covered pelagic fish given the uncertainties of tidal wetland restoration itself. The conceptual model of the food web appears to include many of these processes. However, within the narrative current understanding as well as the implications of inherent uncertainties are not fully explored.

Organic matter subsidies to the Delta Food Web

There is an expectation that restoration activities will result in increases in abundance of lower trophic levels but the structure of the lower food web will be critical in whether this increased production can support covered species. Not only quantity, but also quality of the primary production that is supported by restoration activities is important. Water residence time within ROAs and other characteristic transport timescales for Delta channels are not the only factors to consider. The type of phytoplankton primary production that is stimulated is highly uncertain and likely dependent upon water temperature, nutrient concentrations, vertical mixing and grazing. In addition, an increased residence time may promote toxigenic cyanobacteria (*Microcystis aeruginosa*).

Hydrodynamics and physical changes at export facilities

For hydrodynamic modeling, only one set of ROAs were modeled. Because the locations of these assumed ROAs are not being presented to the public, there are details of the hydrodynamic modeling that cannot be factored into the Panel's evaluation of the Effects Analysis.

Conservation Measure 1 now includes significant modifications to Clifton Court Forebay. This region has been identified as a predation hot spot by multiple studies. Reduction in predation hot spots should be considered in the physical design.

Terrestrial species

The Effects Analysis for terrestrial species focuses almost exclusively on a simple summation of the number of acres of suitable habitat that are removed or restored for each species by the conservation measures. The simple accounting approach does not consider landscape-level effects such as connectivity and patch size nor does it take into account differences in habitat quality.

Recommendations

Overall approach to determine net effects

- Clearly indicate on effect summary figures (e.g., Figure 5.5.2-5) both beneficial (+) and detrimental (–) effects.
- In order to incorporate biological importance into the Net Effects process, the rows (i.e., categories, attributes) of the effects figures (e.g., Figure 5.5.21-5) could be ranked or rearranged in clusters according to biological importance for the specific species (e.g., high, medium, low). In this way, it would be easier to assess whether any biologically important attributes are likely to be negatively impacted and at what level of impact. It will also allow readers to discern whether any biologically important attributes also have high levels of uncertainty assigned to them.
- From the August 2013 Covered Fish workshops, it would be valuable to include in the Net Effects summary, what fraction of the attendees agreed with the Net Effects conclusions (i.e., direction, amplitude and level of certainty).

Covered fish

- Examine and re-write conclusion statements about population net effects in both Chapter 5 and the Executive Summary to objectively express the range in anticipated population effects.
- Evaluate effects of conservation measure attributes on species while considering all other potentially interacting conservation measures.
- Consider relative abundance of salmon life histories when evaluating net effects on each species.
- "Wild" salmonids should be considered separately from hatchery fish whenever possible.

Conceptual Models

- Consideration of nutrient form and nutrient ratios (e.g., Dugdale *et al.* 2007; Glibert *et al.* 2011) would be a nice addition to food web models given the interest and recent publications on these topics.
- Algal toxins could be an attribute for monitoring to reduce uncertainty in contaminants and food web conceptual models.

Food Web

- A simple surface area versus water volume calculation would provide a first-order estimate of potential food subsidy to open water habitats of the low salinity zone.
- Evaluate and compare the magnitude and temporal and spatial variation in the multiple organic matter subsidies to the Delta food web.
- Incorporate into the Effects Analysis the idea that tidal wetland restoration may mitigate some of the nutrient loading into Delta by acting as a nutrient sink through emergent vegetation production, phytoplankton production as well as fluxes to the atmosphere via denitrifcation.
- Estimate the potential food web subsidy attained based on the degree to which habitats are connected hydraulically to Suisun and Grizzly Bays. These areas could serve as "proof of concept" for other, unidentified Restoration Opportunity Areas.

Hydrodynamics and physical changes at export facilities

- When Conservation Measure 3 is implemented, the details of the connection between the Restoration Opportunity Areas and the adjacent channels and the order in which the Restoration Opportunity Areas are established need to be top design criteria.
- Since Conservation Measure 1 is proposing significant physical changes be made to Clifton Court Forebay, the identified predation hot spots within Clifton Court Forebay should be considered in the re-design.

Terrestrial species

- Landscape-level effects should be considered.

Comments

Effects on Covered Fishes

A Comprehensive Summary Figure Would Be Useful. For specific actions affecting covered fishes, the Effects Analysis summarizes findings of multiples investigations when available and often qualifies the findings with opinion statements of how important the attribute might be and how certain the finding is. This assessment by the authors of the Effects Analysis is often compared with a summary of conclusions, including a statement of uncertainty, developed from a workshop with agency personnel in August 2013. This approach is reasonable given the information available, but as noted elsewhere, improvements could be made to systematically summarize 1) the relative importance of the attribute, 2) the level of change caused by BDCP implementation, and 3) the certainty of this evaluation. The relative importance of an attribute was often provided within the narrative of Chapter 5, but a comprehensive table or figure summarizing this metric was not presented along with the effect of the BDCP on the attribute and the certainty associated with the rankings. A comprehensive summary figure is a key step leading to the overall net effect determination for each species. This figure would also enhance transparency in the final professional judgment of net effects. Furthermore, some sections of the Effects Analysis did not seem to reach a conclusion or describe the certainty about the findings, e.g., text description of Feather River flow effects on spring Chinook (see Feather River discussion below).

Salmonid Life History Increases Uncertainty. Salmonids have a variety of juvenile life history types that result in differential use of Delta habitats over time. The Effects Analysis characterized these life history types as foragers and migrants. Foraging juvenile salmonids are younger, smaller and typically inhabit shallower habitats compared with larger, older yearling salmonids that pass through the Delta relatively quickly. Recognition and consideration of these two life history strategies in the BDCP Effects Analysis (e.g., Fig. 5.5.3-4) is important. However, as noted below, the complex life history of salmonids, including life history differences between wild and hatchery origin fish, leads to greater uncertainty in the overall net effect of the BDCP actions on salmonid populations.

Literature Shows Major Restoration Needed to Improve Fish Populations. The Effects Analysis does not adequately defend conclusions regarding the net effects of the BDCP, such as habitat restoration, on fish species. Habitat restoration certainly has the potential to increase the productivity of species such as salmonids, but the literature, including published papers and technical reports, contains relatively few studies documenting the population response of salmonids to habitat restoration (see reviews by Roni *et al.* 2008, 2011). Findings in the literature on the response of salmonid populations to habitat restoration was not adequately addressed in the Effects Analysis when describing the net effect of each species, although the methods section (5.2.7.10.3) did provide a reference by NMFS stating that quantitative linkages between specific habitat actions and viable salmonid population criteria is difficult. The difficulty in documenting population responses to habitat restoration should be recognized and addressed with large and strategic habitat restoration projects and detailed monitoring. For example, in a comprehensive evaluation of salmon responses to habitat restoration in Puget Sound, Roni *et al.* (2011) concluded:

> "Given the large variability in fish response (changes in density or abundance) to restoration, 100% of the habitat would need to be restored to be 95% certain of achieving a 25% increase in smolt production for either species. Our study demonstrates that considerable restoration is needed to produce measurable changes in fish abundance at a watershed scale."

Conclusions Often Overstate Beneficial Effects. The Panel believes that the net effects analysis tends to over-reach conclusions of positive benefits for covered fish species, given the uncertainty and inability to quantify the overall net effect. Given the findings of Roni *et al.* (2011), it may be inappropriate to extend an uncertain but potentially positive effect conclusion to statements about species conservation, especially under future climate scenarios. For example, the following grand conclusion statements from Chapter 5 (and/or the Executive Summary) tend to overstate the beneficial effects of BDCP:

> "The magnitude of benefits for winter-run Chinook salmon at the population level cannot be quantified with certainty. Nonetheless, the overall net effect is expected to be a positive change that has the potential to increase the resiliency and abundance of winter-run Chinook salmon relative to existing conditions."

Statements about increased resiliency and abundance are inappropriate given the high uncertainty expressed in the initial sentence. The statements tend to focus on the upper end of beneficial effects rather than a balanced analysis that might capture the range in net effects. The Panel underlined the questionable text.

"The BDCP should help conserve the species in the Plan Area and help it cope with expected climate change...." The term "conserve" implies a large beneficial population effect for salmon that may help the population recover from ESA listing. Maybe the BDCP will lead to a positive effect, but the magnitude of the effect is uncertain, as stated above, so it seems inappropriate to imply the BDCP would eliminate attributes in the Delta that cause lower population viability. The life cycle models suggested climate change effects would overwhelm the evaluated BDCP actions on winter Chinook salmon.

The following conclusion for delta smelt overstates and over-emphasizes the potential for significant beneficial effects (by emphasizing great potential) while also noting the conflicting conclusion of high uncertainty in the net effect: "While there is great potential for large benefits for delta smelt, there is a high level of uncertainty regarding the resulting effects. However, combined with the Fall X2 decision tree, the BDCP will have at least a minor beneficial effect on the species, but a great potential for larger benefits depending on actual food production and location of delta smelt population in relation to restored areas." The high-end benefit is emphasized in the BDCP text. Perhaps there is higher certainty for a positive versus negative net effect but there is high uncertainty for the net effect of actions on the delta smelt population, ranging from little to high population effect. This evaluation would benefit by the removal of "great".

For green and white sturgeon, the BDCP concluded: "Therefore, the BDCP is expected to conserve both species in the Plan Area through improvements in abundance, productivity, life history diversity, and spatial diversity." The term "conserve" implies a large beneficial population effect that was not supported by the evaluation. The conclusion statement also implies and therefore overstates measureable positive

changes to four population viability criteria. These benefits may reflect the goals of the BDCP, but the uncertain magnitude of benefits to sturgeon should not be described as improving abundance, productivity, life history diversity, and spatial diversity.

Interactions between conservation measures. Interactions between BDCP flows and habitat was not adequately addressed in the report. For example, Table 5.5.3-4 shows that habitat units typically increased for foraging salmonids in response to habitat restoration, but the habitat analysis did not appear to consider whether salmonids would have access to the habitat during reduced flows under the BDCP scenarios (see Table 5.E.4-1). For example, flows were expected to be ~15% to 20% lower during January to April when many foraging salmonids are rearing in the Delta area. In other words, how much rearing habitat is available and what is the habitat quality for foraging salmonids when flows have been reduced 10-20%? The Cache Slough region is one example where key habitat restoration sites might be affected by reduced river flows. Perhaps tidal fluctuations overwhelm river flows in some of the lower habitats, but this should be stated in the report. For foraging salmonids, do reduced flows of the BDCP negate the reported habitat gains from some restoration activities? Recommendation: evaluate effects of conservation measure attributes on species while considering all other potentially interacting conservation measures. This approach was taken for some measures (e.g., Delta Passage Model evaluations) but not all.

Migrant salmonids may benefit less from conservation measures and may experience a negative net effect. The effect of each attribute on migrant versus forager salmonids was examined in Chapter 5, but summary Figure 5.5.3-2 did not capture differences in the assumed relative abundances of these life histories among the species. Plan area flows were typically ranked as a moderate negative effect on migrant salmonids in the Sacramento River and a low negative effect on foragers. However, this attribute was ranked the same for each salmonid species regardless of the proportion migrants versus foragers assumed in the population. The negative impact of reduced plan area flows should have been greater on Sacramento River species such as spring Chinook and steelhead that are dominated by migrant life histories.

Migrant life histories are less likely to benefit from habitat restoration activities, which are a key focus of the BDCP conservation measures. This implies that spring Chinook and steelhead may experience less benefit from BDCP actions than other salmonid species, or they may even experience a negative net effect in response to reduced spring flows. The key question, which deserves more attention in the BDCP, is whether the migrant life history will sufficiently benefit from conservation measures to offset moderate negative impacts related to reduced spring flows. This question is key for spring Chinook and steelhead that are composed mostly of migrant life histories.

Characterize uncertainty in plan area flow effects on salmonid life history types. The Delta Passage Model (DPM) is a key tool for this evaluation because it predicts survival of migrant salmonids while considering river flows, passage into interior areas, entrainment to pumps, and passage into the Yolo Bypass. The survival model is largely based on Chinook salmon exceeding 140 mm in fork length, therefore the DPM does not represent foragers or smaller migrants, which are the target of the habitat restoration activities.

The Effects Analysis states that it was assumed with moderate certainty that flow has high importance to foraging winter Chinook salmon, then notes that the moderate level of uncertainty reflects the relative lack of investigation on the influence of flows on smaller salmonids (Page 5.5.3-24, line 39-41). Moderate uncertainty is quite different from moderate certainty, which is also concluded in each salmonid summary figure (e.g., 5.5.3-4). If there is no information on how flows affect survival of smaller foraging salmonids in the Delta, it is difficult to accept a moderate level of certainty associated with the low negative impact of flows on foraging juveniles salmonids, especially when data suggest flow has a significant effect on larger salmonid (migrant) survival (Fig. 5C.5.3-4). To what extent is foraging habitat and exposure of foragers to predators affected by reduced spring flows? For winter Chinook and fall Chinook, the forager life history is the dominant type, indicating less certainty about the net effect of BDCP flows on these species compared with species dominated by migrant life histories that have been tagged and analyzed, e.g., Fig. 5C.5.3-4.

Hatchery versus "wild" origin salmonids. The presence of hatchery salmonids is typically noted in the introductory descriptions of each salmonid species in Chapter 5. The degree to which hatchery salmonids contribute to the two life history types was not described, though hatchery fish are released as migrants. For example, 80% of juvenile spring Chinook were assumed to be migrants. To what extent was this due to the release of migrants from hatcheries given that some of the natural population produces primarily foragers? The text does not otherwise distinguish between hatchery versus wild salmonids in the analysis. Although some hatchery stocks are protected by the ESA, it would seem that wild salmonids would have a higher priority than hatchery-produced salmonids, even though hatchery runs provide important role in the Central Valley and ocean fisheries. Perhaps resolution of effects and uncertainty inhibit analyses specific to wild salmonids. Nevertheless, wild salmonids should be considered independently from hatchery salmonids when possible.

Do habitat actions only affect salmonid capacity and not productivity? Fig. 5.5.3-2 shows BDCP effects on productivity of each salmonid species by attribute. No effect is shown for habitat attributes such as channel margin, floodplain, riparian, etc. In contrast, these attributes are scored in other Figures for each species, e.g., Fig. 5.5.3-4. Does this reflect an opinion that these habitat actions only increase the capacity of the habitat to support salmonids rather than habitat quality?

Obtain more information from life cycle models. Life cycle simulations were only performed for winter-run Chinook salmon using the OBAN and IOS models. Comparison of through-delta survival and adult returns by management scenario (Table 5.G-2) was very useful. One way to compare and evaluate the two models is to assess consistency in the management scenario rank (best to worst) for the various response variables. For instance, if the same management scenario always ranks first, then that would indicate high level of consistency and support for that conclusion. On the other hand, if management scenario rankings varied greatly between assessments then conclusions would have high degrees of uncertainty (See Table 1, below).

Some life cycle models inappropriately excluded. Appendix 5G excluded delta smelt life cycle models in the Effects Analysis without adequate justification. Based on the premise of using the "best available science," it is unclear how none of the delta smelt models could have reached that level of acceptance. One justification was that none of

the models used zooplankton data; however, the BDCP Net Effects assessment indicated zooplankton was only of moderate importance to delta smelts (Figure 5.5.1-5). It would therefore seem that some assumptions about zooplankton could have been made, allowing life-cycle modeling to be performed. Robustness studies could have accompanied the modeling process. Furthermore, if the BDCP team felt none of the delta smelt models to be adequate, why was there no investment made in model development for such an important species of interest?

Net Effects

The Net Effects summary figures (e.g., Figures 5.5.1-5, 5.5.2-5, etc.) are very useful for synopses for each fish species, but they are incomplete. It would be visually helpful to explicitly include both positive (+) and negative (–) signs for each combination of life stage and category. There continue to be discrepancies between conclusions regarding certainty and level of effect between the text and summary tables. The quantitative scoring method described on page 5.5.1 seems to be largely ignored. Instead, a qualitative ocular assessment of the summary tables seems to be applied separately to the certainty and level of effect dimensions. For salmonid species, weighting is discussed for migrant vs. foraging forms, but this too is seemingly ignored (or at least not mentioned) in the Net Effect conclusions.

The approach to Net Effects conclusions needs to be reconsidered and revamped. The Net Effects summary figures (e.g., Figure 5.5.2-5) do not include the relative importance of the categories (e.g., food, entrainment, etc.). Without incorporating their relative importance, Net Effects conclusions are potentially meaningless and uncertainty cannot be characterized. Levels of uncertainty have different weight depending on the importance of the various categories. An assessment might have high uncertainty for all low importance categories and still have high overall certainty if all the important categories carry with them high certainty. Conversely, the overall assessment would have low certainty, if one or more of the high importance categories carry high uncertainty. The Net Effects conclusions for a fish species needs to therefore take into account the relative importance of the various categories, make them explicit, and interpret Plan effects within that context on a species-by-species basis. Uncertainty plus uncertainty is more uncertainty. Uncertainty never averages or cancels out uncertainty; any more than noise plus noise is less noise. One graphical approach to conveying importance of the various categories and attributes is to order or group the rows of the figures according to their importance for a particular fish species. It would then be possible to see if any detrimental effects of the BDCP are associated with any important biological processes or not.

Life-cycle simulations were only performed for winter-run Chinook salmon (i.e., models OBAN and IOS). Comparison of through-Delta survival and adult returns by management scenario (Table 5.G-2) was very useful. One way to characterize model consistency is to assess how consistent the management scenarios rank (best to worst) across the models and different response variables. For instance, if the same management scenario always ranks first, then that would indicate a high level of consistency and support for that conclusion. On the other hand, if management scenario rankings varied greatly between assessments, conclusions would have a high degree of uncertainty.

Restoration of tidal wetlands (and other communities) is highly uncertain or at least an extremely long process

Restoration of tidal wetlands is considered in detail in the section on aquatic food webs (Question 12). In general, tidal wetland restoration of biological function is quite difficult with respect to ecosystem processes beyond tidal flux and especially with respect to ecological equivalency to comparable natural wetlands. This has been reviewed in a number of studies and conclusions have remained consistent over the past two or three decades (e.g., Kentula 1996, Simenstad and Thom 1996, Zedler and Callaway 1999, BenDoer *et al.* 2009, Moilanen *et al.* 2009).

Lack of specificity in Restoration Opportunity Areas limits conclusions of many aspects of Effects Analysis

For the hydrodynamic modeling, only one set of Restoration Opportunity Areas were modeled. (See discussion of implementation of models in Question 2.) Because the locations of these Restoration Opportunity Areas are not being presented to the public, there are details of the modeling that cannot be factored into the Panels evaluation of the Effects Analysis. As examples: 1) in Panel Question 7, the placement of the Restoration Opportunity Areas influences reverse flows in Georgiana Slough, 2) the calibration of the 1-D model based on the 2-D model results is sensitive to Delta Cross Channel operations, which could be the result of Restoration Opportunity Areas representation in the system. (See question 5 Restoration Opportunity Areas modeling discussion.) When Conservation Measure 3 is implemented, the details of the connection between the Restoration Opportunity Areas and the adjacent channels and the order in which the Restoration Opportunity Areas are established need to be top design criteria.

Clifton Court Forebay physical changes need more evaluation before implementation because of its reputation as a predation hotspot

Conservation Measure 1 now includes significant modifications to Clifton Court Forebay. These modifications include building a wall in Clifton Court Forebay to create two separate regions, the north region would receive water from the North Delta pump facilities and the south region would receive water from the existing south Delta channels. In addition, the current size of the Clifton Court Forebay would also be enlarged by flooding an adjacent tract of land to the south. Based on the public panel discussion with ICF and the Fish agencies on January 29, 2014, the philosophy behind the modifications is that the water coming from the North Delta facilities will have already been pre-screened for critical fish species. Therefore, there would be significant savings in not filtering north Delta diversion (NDD) water through the south Delta fish screening facility.

ICF acknowledged that this is a newer element of the design for Conservation Measure 1. There was no documentation in Appendix 5.H (Aquatic Construction and Maintenance Effects) regarding this construction. The building of a dam in the center of Clifton Court Forebay and dredging another tract should be considered in Appendix 5.H.

Clifton Court Forebay has been identified as a predation hot spot by multiple studies. The Fish Predation science panel (Grossman *et al.* 2013) stated in their final report that: "Clifton court Forebay (CCFB) has been identified by multiple sources as an inhospitable location for salmonids. Within CCFB several areas are particularly

hazardous including: 1) the deep scour hole just inside CCFB by the radial gates; 2) the trash gates in front of the Tracy Fish Collection Facility; and 3) section of Old River adjacent to the radial gates." Since Conservation Measure 1 is proposing significant physical changes be made to Clifton Court Forebay, these predation hot spots should be considered in the re-design.

Delta Food Web

5.3.38 Cache Slough and Suisun Marsh Restoration Opportunity Areas are suggested as areas of substantial increase in Prod-Acres. Given that these Restoration Opportunity Areas are defined, some work could be done to estimate the potential food web subsidy attained based on the degree to which habitats are connected hydraulically to Suisun and Grizzly Bays. These areas could serve as "proof of concept" for other, unidentified Restoration Opportunity Areas. An interesting outcome of such an exercise would be a determination of the potential for export and trophic transfer (a positive outcome) versus localized cultural eutrophication, increased biochemical oxygen demand and dissolved oxygen sags in tidal sloughs (negative outcome).

The discussion of water residence time throughout the Delta (Section 5.3.36) suggests an increase of 3 to 4 days as compared to the current configuration. But this analysis is also site-specific. The approach used to calculate residence time is also of concern. The residence time in each Restoration Opportunity Areas is a function of bathymetry, the exchange between the Restoration Opportunity Area and the adjacent channels. The 1-D DSM2 model does not have the capability to calculate this parameter. In addition, because the specific locations and configurations of the Restoration Opportunity Areas are not presented in the Effects Analysis, the panel has no basis to comment on the validity of the approach.

The phytoplankton productivity model that results in Prod-Acres is limited in terms of prediction or certainty in outcomes. Again, it comes down to a question not only of quantity but also quality of the primary production that is supported. The result of longer residence time is likely to increase phytoplankton primary production (i.e., "slower is greener") this may not hold when invasive clams are introduced to the system (Lucas and Thompson, 2012). Additionally, the type of phytoplankton primary production that is stimulated is highly uncertain and likely dependent upon water temperature, nutrient concentrations, vertical mixing and grazing. Lehman *et al.* (2013) suggested that increased residence and warmer water temperatures in excess of 19 - 20° C will promote toxigenic cyanobacteria including *Microcystis aeruginosa*. It should be recognized that *Microcystis* is only one potentially important toxigenic cyanobacteria in the Bay-Delta – *Aphanizomenon* was abundant in 2011 and 2012 in the Bay-Delta (Karobe *et al.* 2013).

Tidal wetland restoration may mitigate some of the nutrient loading into the Delta by acting as a nutrient sink through emergent vegetation production, phytoplankton production as well as fluxes to the atmosphere via denitrifcation. These ideas are not considered within the Effects Analysis. The decay of large amounts of invasive aquatic vegetation (a result of control measures) also has the potential to increase biochemical oxygen demand and inorganic and organic nutrient supply; this may shift phytoplankton community composition and promote local eutrophication. This issue is raised in a single bullet point on page 5.F-130, line 26

Terrestrial Species

Rather than using current estimates of habitat occupancy within the Plan Area to estimate occupancy of restored habitat, we recommend using spatially explicit occupancy models (see comments under question 4). In addition, the minimum width and maximum distance of riparian habitat corridors should be identified for terrestrial mammals that are restricted to riparian habitats (riparian woodrat and riparian brush rabbit). Persistence of these species in the Plan Area requires riparian habitat patches that are sufficiently large to support stable populations as well as riparian corridors that will allow movement between suitable habitat patches. Both the minimum patch size and minimum corridor parameters (width, distance, overstory cover) should be specified to ensure long-term occupancy of restored riparian habitat.

4. How well is uncertainty addressed? How could communication of uncertainty be improved?

Summary

A broad consensus exists among the Panel that Chapter 5 does not adequately address uncertainty. In its current form, at the level of detail conveyed, in the models used, and in the verbal assessments and conclusions, the level of uncertainty is downplayed. Within appendices sometimes more explicit discussion of uncertainties can be found, but a disconnect exists between the summary pages with the conclusions drawn in Chapter 5. In situations in which an array of outcomes may be possible, only the more beneficial outcomes are quantitatively assessed or used in conclusions about the BDCP. Communication of uncertainty would be improved by consideration of a range of potential outcome values in models.

The Panel cannot determine whether the conclusions about covered fish species or other species in the BDCP are accurate. Detailed monitoring is needed to evaluate the BDCP conclusions, in addition to the outcomes for the biological objectives that could not be fully evaluated at this time in the BDCP. The BDCP effects analyses are qualitative and conclusions regarding net effects on each species typically reflect professional opinion. Therefore, the Effects Analysis does not lend itself to evaluation of chained statistical uncertainties. The tremendous length of the documents did not reduce the uncertainty in the overall net effects.

Recommendations

- Unknowns and research needs should be incorporated into the BDCP as explicit conservation measures, in other words, as a required part of the BDCP.
- Monitoring needs, timing and intensity also need more explicit incorporation into the BDCP. While often well explicated in an appendix (e.g., within Appendix 5.F-Biological stressors on covered fish), they are frequently absent within the material discussed in Chapter 5 or treated as an uncertainty.
- Research needs are often mentioned as sections within appendices. These should be consolidated within Chapter 5. This would help guide future research priorities for the Delta.

Comments

Effects on Covered Fishes

For covered fishes, when evaluating the importance of an attribute to a species and evaluating the effect of the BDCP on that attribute, the Effects Analysis was typically careful to describe the level of certainty associated with this evaluation. The evaluation of certainty was typically a judgment by the BDCP authors rather than a quantitative measure of certainty (e.g., standard deviation), therefore estimates of certainty have their own level of uncertainty. The Effects Analysis did not lend itself to evaluation of "chained statistical uncertainties" as identified in the charge questions addressed to the Panel because the effects analyses were not quantitative. Nevertheless, the judgments of certainty have value, though they could be improved upon (see below).

Judgments of certainty were also compared with judgments provided by California agency scientists at the August 2013 workshops. However, identification of agency certainty seemed to be the interpretation by the BDCP authors of the agency response rather than a systematic evaluation of certainty scores. At the January 2014 Effects Analysis Panel meeting, ICF noted that they did not think it was possible to consistently document variability in Effects Analysis evaluations by agency personnel at the August 2013 workshops. As a result, evaluation of certainty of BDCP effects on attributes of each species is limited to the interpretation of the BDCP authors.

Please see discussion above on the overall net Effects Analysis for each species. Although conclusion statements typically stated high uncertainty in the overall net effects, they also tend to ignore uncertainty when highlighting the potential benefits to conservation without also stating the lower end of the effects range.

Monitoring and Research

As an example of the high uncertainty in the BDCP to achieve biological goals and objectives, many of the sections of appendices have sections on monitoring and research needs. These often highlight impacts of conservation measures in which the outcomes may have a range of positive to negative impacts. The unknowns and research needs should be better incorporated into the analyses of biological impacts of the BDCP. At a minimum they should be required as an explicit conservation measure. In a number of instances, especially in Appendices, for example Appendix 5.F, needs are highlighted for a robust monitoring and evaluation program, coupled with a detailed, prescriptive adaptive management plan. BDCP success will depend on monitoring and evaluations and responding to issues as they emerge. Furthermore, high uncertainty in the outcomes for the covered species means that budgets for monitoring and adaptive management must be developed with uncertainty in mind.

Disconnect between uncertainty and BDCP conclusions

Frequently, explicit modeling is reduced to small portions of conceptual models. When a range of potential outcomes may result from uncertainties in multiple conditions, only the most beneficial outcome is considered when coming up with a conclusion or summary. Some of these are discussed in other sections of this report. One example can be found in Appendix 5.F. When considering the impacts of some of the conservation measures, for example, Conservation Measure 13, removal of *Egeria* is discussed with multiple potential effects (Appendix 5.F, p. 5.F-48 and following), some

beneficial, such as removing habitat for predators of covered fish, while others may exacerbate populations problems for covered fish, such as cascading effects through the food chain of the loss of some invertebrates that feed on *Egeria*, shifts in aquatic web linkages, and the rapid replacement of *Egeria* by other invasive submerged aquatic vegetation. Nonetheless, these uncertainties are simply ignored when it comes to conclusions, where it is determined that only the beneficial results of control invasive aquatic vegetation will result from the BDCP (pp. 5.F-48-49). To be fair, occasionally the poorer results dominate conclusions; for example, *Microcystis* may increase due to management activities inside and outside the region but these conclusions fail to emerge in the discussion of the aquatic food webs within Chapter 5.

The discussion of the aquatic food webs is based on a good conceptual model, but the dynamics of the food web are ignored and only a single component, phytoplankton productivity, is modeled as a result of restoration efforts in the relatively near- and far-term. Detrital contributions could also enhance food webs, but are not considered in any detail. Phytoplankton productivity is unrealistically modeled, and assumed to essentially be consumed along linkages that connect directly to covered fish. Chapter 5 does mention invasive bivalves, but fails to incorporate their potential as direct competitors for plankton within the food web, even though that potential is discussed. In other words, the BDCP is inconsistent in how models and analyses handle uncertainty and model assumptions, making it difficult to complete assessment.

Restoration

Because this is discussed in other sections, we will only mention that there is great uncertainty associated with the restoration of the wide range of ecosystems slated for restoration. Many of these systems have a poor record of achieving restoration, especially in short-to-moderate time periods. This range of ecosystems also varies considerably in the degree of difficulty of restoring functions. Nonetheless, the outcomes for conservation measures and their interaction and effectiveness are glossed over and uncertainties are not apparent in conclusions and summary discussions. For example, wetland restoration will require considerable input of sediment in the short-term to meet the outcomes described in the BDCP. Yet Chapter 5 models tidal wetland restoration with a constant concentration of suspended sediment, even though the document discusses the fact that sediment has been declining over the past decades, and further that the operations of the north Delta pumps may remove 8-9% more. In other words, there is considerable inconsistency between a discussion of uncertainty and how uncertainty is incorporated into the conclusions.

Similarly, restoration of many of the terrestrial habitats for other covered species also involves considerable uncertainty, especially as to the rate at which function will return that will be recognized by covered species. Consequently uncertainty of the occupancy targets for terrestrial species are not addressed. In all cases, a single value of number of acres that will be occupied is provided. No estimates of the uncertainty of achieving stated restoration goals nor uncertainty of the proportion of the restored habitat that will be occupied are included.

North Delta Diversion

In addition, the validity of the primary assumption that there will be no entrainment of fish at the north Delta diversion (NDD) should be evaluated. In reality, there will be

some fish lost at the transfer point; therefore, the empirical relationship would be altered including this additional transfer point.

Water Clarity and Suspended Sediments

Section 5.3-24 (lines 31-38) correctly identifies a low level of certainty around changes in water clarity but does not include the potential positive or negative implications for changes in water clarity.

Suspended sediment is one of two key components driving the development of tidal wetlands in the Delta, especially under sea level projections, yet Delta inflow has been experiencing a decline in suspended sediment and operations of the NDD may remove 8-9% more. BDCP indicates there may not be sufficient sediment for marsh restoration (Chap. 5, p. 109).

The NDD operations should factor in suspended sediment into the operational criteria. Adaptive management should consider the possibility operating the NDD such that the first flush, which contains a large sediment load, is not exported.

5. How well does the Effects Analysis describe how conflicting model results and analyses in the technical appendices are interpreted?

Summary

The Effects Analysis covers a multitude of topics. Each panelist gave input into Question 5 based on their areas of expertise.

Hydrodynamics

Hydrodynamic models are sensitive to how the open water regions are represented and how they are connected to the adjacent channels. Because the panel was not provided the bathymetric configuration of the Restoration Opportunity Areas or the order in which the Restoration Opportunity Areas were established, it is not feasible to evaluate the sensitivity of the models to the placement of the Restoration Opportunity Areas. DSM2 (1-D) and RMA/TRIM (mult-D) hydrodynamic models represent Restoration Opportunity Areas is differently. This could be a significant source of error, especially when Delta Cross Channel gates configuration is open.

Life cycle models: winter Chinook salmon

No formal comparison of output from the OBAN and IOS models was provided, either on an absolute scale or relative scale. It should be acknowledged that adult escapement differs between models by a factor of 5. Through-Delta survival projects were also fractionally different between models. In neither case was an explanation for the discrepancy provided. The relative ranking of the different BDCP scenarios (Table 5.G-2) between models should be provided in the report, and certainly should be assessed, in part, based on the degree of consistency in predictions of the BDCP scenario ranks between models.

Salmonids: Delta Passage Model

For salmonids, the Delta Passage Model Salvage Estimates and the Salvage Density methods produced reasonably consistent estimates. Variance calculations need to be corrected. There appear to be analytical errors in expressing uncertainty.

Salmonids: Temperature Model

The text is not clear how the models predict these changes associated with the BDCP during egg incubation, if the BDCP has no effect on upstream conditions, as reported in sections of Chapter 5. In spite of these conflicting results, Figure 5.5.4-1 shows that there would be zero effect on eggs in the Sacramento River with moderate to high certainty in this conclusion. This evaluation needs clarification and should be consistent with the Appendix.

Terrestrial Species

Suitable habitat for each species in the Plan Area was based on expert opinion and therefore there are no model results to interpret. The plan adequately addresses conflicting estimates of the number of sandhill cranes that may be killed by collisions with powerlines.

Recommendations

Covered fish

- A direct comparison of the output from competing models should be presented.
- Clarify confusing and conflicting text related to salmon models.
- Explanation for the large discrepancies in predictions in adult returns (i.e., factor of 5) should be provided and possible consequences to Effects Analysis. Use of relative effects does not eliminate systematic biases of models.

Hydrodynamics

- Identify which Restoration Opportunity Areas are represented differently between the DSM2 and the RMA/TRIM models, especially in the Mokelumne system, which is sensitive to Delta Cross Channel operations.
- Publications from that CASCaDE (http://cascade.wr.usgs.gov/index.shtm) would be resources to guide the evaluation of propagation errors in the BDCP Effects Analysis.

Comments

Life-cycle models

When discussing IOS and OBAN life cycle modeling results, the Effects Analysis stated:

> "*The results of both models suggest future climate change effects would dominate changes in adult winter-run Chinook salmon escapement in the future, which is of appreciable concern for the species. Factoring in climate change, relatively small differences in upstream conditions between the BDCP LLT scenarios and EBC2_LLT resulted in greater adult escapement under HOS_LLT or lower adult escapement under ESO_LLT and LOS_LLT. These results reflect what appears to be appreciable model sensitivity to relatively small changes in estimated upstream conditions because, as noted above, the BDCP does not change Shasta Reservoir and upper Sacramento River operating criteria, so that changes in upstream areas derived from modeling, be they positive or negative, may not be fully reflective of the nature of actual changes that could occur.*" (pg. 5.5.3-45, lines 38-46)

The above statement about climate change impacts on Chinook abundance is clear and noteworthy, but the text below it is confusing and should be clarified (did the model receive inaccurate information for upstream conditions?).

Chinook salmon

For egg incubation of spring Chinook, Chapter 5 describes conflicting results (pg. 5.5.4-14). The text states, "Several models show no change in upstream condition as a result of BDCP". In the same paragraph, it states that SacEFT predicts a 12% reduction in egg incubation "condition" based on water temperature effects on egg survival. In contrast, the Reclamation Egg Mortality model predicts no effect due to the BDCP except in below normal water years (12% reduction in survival). SALMOD predicts negligible impacts of the BDCP on eggs, fry and smolt. The text concludes that the adverse impacts are related to high sensitivity of some models to small changes in upstream conditions. The text is not clear when describing how the models might predict these changes during egg incubation, if the BDCP has no effect on upstream conditions as reported in portions of Chapter 5. In spite of these conflicting results, Figure 5.5.4-1 shows that there would be zero effect on eggs in the Sacramento River with moderate to high certainty in this conclusion. This evaluation needs clarification.

- Habitat and flow modeling efforts in the Delta were not linked. As noted above, habitat suitability modeling indicates somewhat large habitat increases for foraging salmonids in response to restoration activities. However, these estimates of habitat did not account for reduced flows that would occur when juvenile salmonids are present in the Delta area, especially in wet years. In other words, will reduced BDCP flows affect access by juvenile salmonids to the habitat identified in Table 5.5.3-4, or do tidal fluctuations overwhelm river flows in all of these habitats?

Lack of consideration of propagation of errors or sensitivity analysis in linked models

A direct comparison of the output from competing models is rarely presented. Results from different models are rarely formally compared on either an absolute or a relative scale. When different models projections exist, the BDCP rarely attempts to explain why the discrepancies are occurring or describe the direction of the expected errors.

Uncertainty plus more uncertainty produces even more uncertainty. Uncertainty never averages or cancels uncertainty any more than noise plus additional noise produces less noise. The propagation of errors will not be a simple sum of uncertainties in most cases. One can use variance in stages formula

$$Var(\hat{\theta}) = E_2[Var_1(\hat{\theta}|2)] + Var_2[E_1(\hat{\theta}|2)]$$

to propagate errors over multiple processes or sequentially linked models and where 1 and 2 denote sources of error in estimating the parameter θ by $\hat{\theta}$. Levels of uncertainty have different credence depending on the importance of biological stressors or attributes. An assessment might have high uncertainty for all low-importance attributes and still have overall high certainty if all the important attributes carry with them high certainty. Conversely, the overall assessment would have low certainty if one or more high-importance attributes carry high uncertainty. Overall uncertainty will never be less than the highest level of uncertainty for the more important biological attribute being considered.

There are several different cases in the Effects Analysis where multiple models are linked together. Each model has inherent errors either due to assumptions made in the modeling or numerical method errors. One of the best examples of how to link models in the Delta system is the U.S. Geological Survey's CASCaDE project (http://cascade.wr.usgs.gov/index.shtm). Publications from that project would be resources to guide the evaluation of propagation errors in the BDCP Effects Analysis.

The assumptions made in hydrodynamic models TRIM/ RMA versus DSM2 or CALSIM2 result in a range of outcomes; their analysis is limited to only one set of ROA configurations

During the hydrodynamics presentation on 1/28, the calibration of the DSM2 (1-D) model compared to the TRIM/RMA (multi-d) models showed that the models agreed better when the Delta Cross Channel was closed than when the Delta Cross Channel was open. When the Delta Cross Channel is open, transport is influenced more by the circulation in the Mokelumne channels on the east side of the Delta.

The fact that the two models do not match well when the Delta Cross Channel is open indicates that the representation of Restoration Opportunity Areas is different between the 1-D and 2-D models. Hydrodynamic models are sensitive to how the open water regions are represented and how they are connected to the adjacent channels.

Because the panel was not provided the bathymetric configuration of the Restoration Opportunity Areas or the order in which the Restoration Opportunity Areas were established, it is not feasible to evaluate the sensitivity of the models to the placement of the Restoration Opportunity Areas.

6. How well does the Effects Analysis link to the adaptive management plan and associated monitoring programs?

Summary

While the adaptive management plan is considerably more developed in the BDCP Phase 3, it remains characterized as a silver bullet but without clear articulation about exactly how key assumptions will be vetted or uncertainties resolved to the point that the BDCP goals and objectives are more assured. The concept of adaptive management is appropriately described and allocated a prominent role in the implementation structure. However, as is increasingly documented, the commonly acknowledged process of adaptive management continues to be misunderstood and misapplied (Allen *et al.* 2011; Fontaine 2011; Westgate *et al.* 2013), often resulting in a loss of rigor and commitment in application. The consequence hasn't improved much since Walter's (1986) description of the adaptive management process as beginning:

"...*with the central tenet that management involves a continual learning process that cannot conveniently be separated into functions like research and ongoing regulatory activities, and probably never converges to a state of blissful equilibrium involving full knowledge and optimum productivity.*"

In the case of the uncertainties surrounding the assumptions and predictions of the BDCP, the Panel emphasizes that BDCP needs to recognize the risks of **not** institutionalizing an exceedingly rigorous adaptive management process in order to avoid ecological surprises that will be difficult or impossible to reverse once they have

established (Lindenmayer *et al.* 2010; Westgate *et al.* 2013). BDCP must make a commitment to the fundamental process, and specifically the required monitoring, not just the concept of adaptive management. As Murphy and Weiland (2014) counsel:

> *"...adaptive management that targets listed species represents a complex process that can be resource intensive, including in its demand for guidance from research, monitoring, and modeling, therefore requiring substantial technical and institutional capacity. That considered, adaptive management has a great potential to improve the effectiveness and efficacy of resource management actions provided it is properly implemented."*

In the final assessment of the Effects Analysis, the Panel found the cautionary conclusion of Olden *et al.* (2014) about large-scale flow experiments to be particularly germane:

> "*...managers and policy makers must embrace both the scientific uncertainty and surprise learning opportunities that inevitably arise from these experiments, and not purposely ignore uncertainty to avoid complicating their message to stakeholders, only to later invoke this issue when flow experiments fail to deliver expected ecological or social outcomes.*"

Recommendations

- The Effects Analysis effectively communicates the important principles and implementation stages of adaptive management, but the specific process whereby adaptive management would be utilized to ensure BDCP meets its goals and objectives by rigorous adaptive management need to be described in much more detail. There needs to be a more obvious commitment to active adaptive management.
- There is explicit linkage between key uncertainties underlying the assumptions of the Effects Analysis and the monitoring and research that need to address them through adaptive management. However, many of the critically uncertain ecosystem processes, population responses, etc. that are identified as adaptive management targets are delegated to research, rather than monitoring. Any metric upon which decisions about the expected or predicted performance of a management measure will be made should be a foundational monitoring metric, not a focus of research, which is often vulnerable to competing priorities.
- To facilitate an active adaptive management plan that has some chance of ensuring the beneficial result of BDCP conservation measures, each and every key uncertainty should be "fleshed out" into implementable adaptive management "experiments" where the following are specifically described: (1) a conceptual model, or components of an existing model, that characterizes the uncertainty and what it influences; (2) assessment of the relationship between the uncertainty and the BDCP goals and objectives; (3) sensitivity of the proposed implementation to the uncertainty; (4) success criteria, monitoring metrics, baseline levels, thresholds and trigger points that will identify whether or when the performance of the conservation measure is deviating significantly from the anticipated target or prediction; (5) alternative hypotheses and how they affect the original conceptual model; and, adaptation of the (6) implementation action or (7) adaptation of the goals and objectives.

- Linkages between scientific development of the Effects Analysis and adaptive management should continue, if not expand, with implementation of the BDCP. At the minimum, consider the necessity to guarantee independent science review at the interface between the Adaptive Management Team and the Implementation Office, to ensure close to real time tracking of adaptive management experiments and decisions.

Comments

Perhaps the largest challenge to achieving the stated goals and objectives of the BDCP is how many of these critical uncertainties can be addressed by adaptive management given the baseline and the required monitoring? For example, some of the key uncertainties identified in the Effects Analysis (Appendix 3.D), often associated with conservation measures 4, 5, 7, and 11, include:

- The ability of the restored habitat to meet the objectives and expected outcomes, including the time it takes to meet the biological objectives. (Can this be addressed by both magnitude and siting of restoration action?)
- The risk that the restored habitat will be colonized by invasive species such as nonnative submerged vegetation, nonnative predatory fish, and/or clams. (Hardly uncertain, but controllable?)
- The change in magnitude of predation mortality on covered fish. (Doesn't this require an existing reliable estimated of predation mortality?)
- Food web responses to habitat restoration actions on both a local and a regional scale.
- The risk of adverse effects resulting from unsuitable changes in water quality and exposure to toxic contaminants. (How much can be modeled?)
- The proportion of the covered species population that actively inhabit restored habitats and the change in growth rate, survival, abundance, life-history strategies, and population dynamics. (A very difficult baseline to quantify!)

The Effects Analysis provided explicit associations of such key uncertainties with each conservation measure and linked these to "potential research actions" (BDCP, Table 3.D-3).

The context of a "phased approach to serve as a large-scale experimental program" in adaptive management context implies conceptual models, baselines and thresholds?

Linkages between scientific development of the Effects Analysis and adaptive management should continue, if not expand, with implementation of the BDCP. In particular, it will be important to ensure that there is direct science input to the adaptive management process, and preferably an independent science body that has no conflict of interest in interpreting and adapting conservation measures. In the proposed implementation structure, the Science Manager chairs the Adaptive Management Team and coordinates with the Delta Science Program, and the Delta Independent Science Board may also be consulted about *"...matters relating to these monitoring activities and research efforts."* (Chap. 7-25, pp. 7-25). However, the Delta Independent Science Board is not engaged to the extent that they could deal with extensive monitoring and research results and adaptive management decisions in real time. We would doubt that the adaptive management process would be efficient, timely and evaluated without an

independent scientific advisory body that reports to the Adaptive Management Team, Science Manager, Program Manager and the Delta Science Program.

Review of Specific Analyses

7. Are the analyses related to the north Delta diversion facilities appropriate and does the Effects Analysis reasonably describe the results? In particular:

   Q. Was existing empirical information such as Perry *et al.* 2010 and Newman 2003 incorporated appropriately into the modeling? Where model runs required extrapolation beyond existing data ranges, were assumptions and interpretations appropriate?

   Summary

The empirical information in Perry (2010) and Newman (2003) must be guardedly and cautiously applied in the modeling in future cases when north Delta diversion is operational. These empirical relationships are based on the best available information regarding current physical and operational configuration of the Delta. We assessed the validity of four model assumptions. The panel concluded: 1) the assumption of a 3-day moving average to characterize flow on the Sacramento below Georgiana Slough is not valid in the new configuration, 2) exporting water at the north Delta diversion facilities will change circulation patterns at the important north Delta channel junctions (i.e. Steamboat, Sutter, Delta Cross Channel, Georgiana), 3) an additional transfer point out of the Sacramento at the north Delta diversion will alter the empirical relationship, and 4) there are issues with original assumptions in Newman (2003). The concerns raised above, at best, add additional uncertainty to the conclusion drawn by BDCP. At worst, these concerns may result in systematic biases in the model projections. The direction of the net effect of these biases is unknown.

   Recommendations

- Consult with Russell Perry and Ken Newman on their perspectives regarding the applicability of their models to the Effects Assessment.
- Perform more hydrographic modeling below the anticipated north Delta diversion to determine whether the nature of the outflow will violate assumptions or parameterizations of the Perry (2010) model and alter model output.
- Additive simulations should be performed varying the parameterization and possible structure of the relationships with Perry (2010) and Newman (2003) to determine robustness of the model results to changes in Sacramento River outflow under the BDCP.

   Comments

The empirical relationships, derived in Perry (2010) and Newman (2003), are based on the best available information regarding current physical and operational configuration of the Delta. For these relationships to be useful, they also need to describe the Delta under BDCP. To assess the validity of these relationships, we must examine how the system will change with the addition of the north Delta diversion. There are four primary

sets of questions to address: 1) Will the system continue to have a "quasi-steady state" condition or the will the timescale of flow variance change? Is a 3-day moving average to characterize flow on the Sacramento below Georgiana Slough a legitimate assumption?, 2) Will the circulation patterns change at the important channel junctions (i.e., Steamboat, Sutter, Delta Cross Channel, Georgiana) as a result of north Delta diversion operations?, 3) Will the north Delta diversion be another transfer point out of the Sacramento river migration corridor?, and 4) Are the assumptions used in the original analysis valid?

Will the system continue to have a "quasi-steady state" condition or will the timescale of flow variance change as the result of north Delta diversion operations?

In the current configuration of the system, the north Delta is in a quasi-steady state. In general, flows on the Sacramento at Freeport change slowly over time (i.e., on the order of days). The only operation that can dramatically alter circulation patterns is the opening or closing of the Delta Cross Channel gates. The position of this gate is not frequently changed. And, when changed, the system reaches a different quasi-steady state condition after about a day. A visual example of this step change is found in Perry (2010, Fig. 3). Therefore, the assumption of a three-day moving average to characterize flow on the Sacramento below Georgiana Slough seems reasonable for the current configuration (flow and operations) of the North Delta.

When the north Delta diversion facilities become operational, the North Delta will no longer be in a quasi-steady state condition. The flows will behave more like what is currently observed in the South Delta as the pumping will not be continuous throughout the day. And, pump volume will also change at least daily. The timescale of flow variance will change more rapidly over time (i.e., on the order of hours). Therefore, the three-day moving average flow assumption is not valid in the new configuration with the north Delta diversion.

Will the circulation patterns change at the important channel junctions (i.e., Steamboat, Sutter, Delta Cross Channel, and Georgiana) as a result of north Delta diversion operations?

We know that opening and closing the Delta Cross Channel changes the circulation patterns in the north Delta. Exporting water at the north Delta diversion facilities will also change circulation patterns at the important channel junctions (i.e., Steamboat, Sutter, Delta Cross Channel, Georgiana). The DSM2-Hydro simulations that were used for the analysis of this issue in section 5C.5.3.5 are capable of outputting data even on a 15 minute time step. This model resolution should be able to quantify these differences. If the circulation patterns change, the proportion of fish distributed to each downstream channel will be altered as well. Therefore, the empirical relationship created for the current configuration of the Delta is not valid for the future configuration.

Will the north Delta diversion be another transfer point out of the Sacramento migration corridor?

Throughout the analysis in 5C.5.3.5, there is an assumption of zero entrainment of as a result of 100% effective diversion screens. However, the north Delta diversion will be pumping water. Therefore, empirical relationship between the flow at Sacramento below

Georgiana and the number of fish present will be different from the current empirical relationship using the current (no north Delta diversion) configuration.

In addition, the validity of the primary assumption that there will be no entrainment of fish at the north Delta diversion should be evaluated. In reality, there will be some fish lost at the transfer point, therefore, the empirical relationship would be altered including this additional transfer point.

Are the assumptions used in the original analysis valid?

Newman (2003), Table 2 presents a summary of the covariates used in his modeling. There are two columns, mean and sample standard deviation. In this table, he reports a mean value for Delta Cross Channel gates of 0.61 with a sample standard deviation of 0.49. The Delta Cross Channel gate signal is a binary signal. It should be either open (1) or closed (0). Under no circumstances should that variable be reported as something other than 0 or 1. This analysis should have been broken into two time periods: gate open and gate closed conditions. This table raises a significant concern that the author did not have a basic understanding of how the Delta Cross Channel gate changes flow patterns (and migration patterns) in the Delta.

The concerns raised above, at best, add additional uncertainty to the conclusion drawn by the Plan. At worst, these concerns may result in systematic biases in the model projections. The direction of the net effect of these biases is unknown.

Q. Does the analysis of the frequency of reverse flows at Georgiana Slough accurately characterize changes in hydrodynamics due to changes in river stage, sea level rise, and Delta habitat restoration?

Modified question based on 1/29/2014 meeting discussion: Will the operation of the north Delta diversion change the circulation patterns around the Sacramento junctions with the Delta Cross Channel and Georgiana Slough such that fish (particularly migrating fish) have a higher likelihood of being diverted into the interior of the Delta via Georgiana Slough or the Delta Cross Channel due to tidal flood/ebb flows in this region?

Summary

We know, based on long-term field observations and hydrodynamic modeling, that the transition point from uni-directional flow and bi-directional flow at the tidal timescale occurs somewhere between Sacramento River above the Delta Cross Channel (RSAC128) and Sacramento River below Georgiana (RSAC123) for the current configuration and operations of the Delta. The operation of the north Delta diversion facility will reduce the amount of freshwater flow in the region of the Delta Cross Channel and Georgiana junctions. Hydrodynamic modeling will likely show that transition point between uni-directional and bi-directional flow will move upstream as a result of north Delta diversion operations. This transition location is also a function of whether the Delta Cross Channel is open or closed. If bi-directional flow occurs more frequently near the Sacramento junctions with the Delta Cross Channel and Georgiana Slough, fish will have a higher likelihood of being diverted into the interior of the Delta via Georgiana Slough or the Delta Cross Channel.

Recommendations

The DSM2 simulations should be re-run for the ELT and LLT simulations with bathymetry that does not include the Restoration Opportunity Areas but driven with ELT or LLT river flow and tidal stage boundary conditions and operations. These simulations would clearly show how north Delta diversion operations change circulation patterns near Georgiana Slough and the Delta Cross Channel.

Comments

During the Effects Analysis Panel presentation on 1/29/2014, one of the Panel members (N. Monsen) asked for clarification of Question 7b. Based on that discussion, we concluded that the main questions that the Fish Agencies would like to see the panel address were:

> *"Will the operation of the north Delta diversion change the circulation patterns around the Sacramento junctions with the Delta Cross Channel and Georgiana Slough such that fish (particularly migrating fish) have a higher likelihood of being diverted into the interior of the Delta via Georgiana Slough or the Delta Cross channel due to tidal flood/ebb flows in this region?*
>
> *Will this change in flow regime as a result of north Delta diversion operations result in fish encountering this junction multiple times rather than just once, thus increasing the probability of the fish being diverted into the interior Delta?"*

It should be noted that these rephrased questions are very different than what the analysis in Sections 5C.4.3.2.6 and Section 5C.5.3.8.1 of the Effects Analysis addressed. The following suggest an approach to answer the modified question and comment on the analysis in Sections 5C.4.3.2.6 and Section 5C.5.3.8.1.

Part A: Suggested approach to address the modified 7b question

For this discussion, please refer to the Draft Environmental Impact Report/Environmental Impact Statement Appendix 5A that has examples of observed tidal stage and flow time series data from three key locations along the Sacramento River (Appendix C of this document).

The Sacramento River throughout the Delta has a tidal signal for both stage and flow. The Sacramento observation station at Freeport (RSAC155), above the proposed north Delta diversion intakes, has a tidal flow signal (Appendix 5A-D1, p. 128). At Freeport, both the tidal and tidally-averaged flow is always uni-directional downstream. Therefore, a neutrally-buoyant particle going with the flow at this location will always be traveling downstream, although the velocity at which it moves is dependent on the phase of the tides.

In the current bathymetric configuration and operations of the Delta Cross Channel (no north Delta diversion facilities), the observation station on the Sacramento above the Delta Cross Channel (RSAC128, Appendix 5A-D1, p. 129) also has downstream uni-directional flow both for the tidal and the tidally-averaged timescale. However, the flow signal on the Sacramento below Georgiana Slough (RSAC123, Appendix 5A-D1, p. 130) has reversing tidal flows. Therefore, even though the tidally-averaged flow at RSAC123 is downstream. A particle moving with the velocity field in the region of RSAC123 will flow both upstream and downstream. Therefore, the tidal excursion or range that a neutrally-buoyant particle will move upstream and downstream, at

RSAC123 is important to determine how many times the particle will encounter junctions (such as Georgiana and Delta Cross Channel).

The Sacramento River above the Delta Cross Channel (RSAC128) and the Sacramento River below Georgiana (RSAC123) are only 5 river km apart and yet the flow signals at these stations are very different. These flow signals are distinctly different because there are two junctions, the Delta Cross Channel and Georgiana Slough, between these measurement stations where a portion of the water is diverted towards the Central Delta. The flow signal at RSAC123 also changes depending on whether the Delta Cross Channel is open or closed.

Therefore, we know, based on long-term field observations and hydrodynamic modeling, that the transition point between uni-directional flow and bi-directional flow at the tidal timescale occurs somewhere between RSAC123 and RSAC128 for the current configuration and operations of the Delta.

To determine how the north Delta diversion operations will change circulation patterns around the Delta Cross Channel and Georgiana Slough, the DSM2 model can be used to determine the location along the Sacramento where the flow transitions from unidirectional and bi-directional tidal flows. This transition location will also be a function of whether the Delta Cross Channel is open or closed. It is also useful to determine the extent of tidal excursion to determine whether particles would encounter either the Delta Cross Channel junction or the Georgiana Slough junction multiple times.

The operation of the north Delta diversion facility will reduce the amount of freshwater flow in the region of the Delta Cross Channel and Georgiana junctions. Modeling will likely show that transition point between unidirectional and bi-directional flow will be moved upstream. This transition point may be even as far upstream as RSAC128 (Sacramento above DCC).

Part B: Comments related to the analysis in Sections 5C.4.3.2.6 and 5C.5.3.8.1

The approach taken for the analysis in Sections 5C.4.3.2.6 and 5C.5.3.8.1 focused only on the exchange between the Sacramento River with Georgiana Slough. The approach of analyzing flow direction every 15 minutes was a reasonable approach given the original 7b question. However, the analysis did not attempt to also look at the exchange through the Delta Cross Channel, which should be done for the modified 7b question.

The bigger issue with this particular analysis is the assumed Delta bathymetry used for the ELT and the LLT simulations. For both the ELT and LLT simulations, Restoration Opportunity Areas are included in the bathymetry. The tidal field is significantly changed by the inclusion of these Restoration Opportunity Areas. Note that these Restoration Opportunity Areas are only one possible configuration. As of this BDCP draft, the final locations of the Restoration Opportunity Areas, the order of construction the Restoration Opportunity Areas, and the bathymetric connections between the Restoration Opportunity Areas and the adjacent channels have not been established.

In the BDCP conclusion for this analysis states:

> *"Ongoing research is investigating link is between the distribution of energy dissipation and the distribution of tidal prism within the context of Plan Area restoration and other factors (DeGeorge pers. comm.). … it is unknown whether the presently limiting conveyance capacity of a number of Delta channels for tidal*

flows may become enlarged by scouring in response to Plan Area changes in geometry resulting from habitat restoration. These factors may have consequences for the hydrodynamics at the Sacramento River-Georgiana Slough divergence and other locations." (5C.53-331, lines 22-29)

This conclusion indicates that the present hydrodynamic modeling does not separate the effects of the north Delta diversion from the preliminary Restoration Opportunity Areas configuration in the ELT and LLT simulations.

One of the best reasons to use hydrodynamic modeling as an analysis tool is that models have the capability of isolating individual effects. The DSM2 simulations should be re-run for the ELT and LLT simulations with bathymetry that does not include the Restoration Opportunity Areas but does have the ELT or LLT river flow and tidal stage boundary conditions and operations. These simulations would clearly show how north Delta diversion operations change circulation patterns near Georgiana Slough and the Delta Cross Channel.

8. How should the effects of changes in Feather River flows on fish spawning and rearing be characterized? In particular, how should the trade-off between higher spring flows and lower summer flows be interpreted? Does the analysis adequately capture the expected benefits of CM 2, Yolo Bypass Fishery Enhancement?

Summary

Chapter 5 correctly recognized that flow/habitat relationships are necessary for evaluating changes in Feather River flow and temperature on salmonids. However, relationships between flow and habitat were not presented in Chapter 5, therefore it was not possible for the Panel to evaluate changes in spawning and rearing habitat. Most salmonids reportedly inhabit the low flow channel which will reportedly experience little change. BDCP effects relate primarily to the fraction of salmonid populations inhabiting the high flow channel plus fish exposure to the high flow reach during upstream and downstream migrations.

Chapter 5 provides a reasonable discussion of the approximate benefits of increasing flow into Yolo Bypass and allowing more juvenile salmon, especially foragers, to utilize this rearing habitat. Potential adverse effects on migrating adults should be monitored.

Recommendations

- Develop flow/habitat relationships for salmonids in the Feather River high flow channel, approximate the proportion of the population that uses this habitat, and correct inconsistencies in the text and summary figure.
- The Yolo Bypass evaluation should recognize that natural origin Chinook salmon have a higher fraction of foraging type juveniles compared with migrant Chinook produced in hatcheries. Natural origin juveniles would likely benefit more than hatchery fish.

Comments

Feather River

Salmon and Steelhead. Chapter 5 provided a summary of beneficial and adverse effects of Feather River flows on juvenile and spawning spring Chinook salmon. The analysis was based on expected changes in monthly flows in the low and high flow channels and associated changes in water temperature. The text recognizes that salmon habitat area and quality are important (see introductory paragraph), but the evaluation did not attempt to convert predicted flow and temperature scenarios to habitat units for steelhead and Chinook salmon. Lack of habitat data for each species reduces the certainty of the anticipated effects, except when flows and temperature are expected to experience little change, as in the low flow channel. Key to this analysis is the reportedly high use by salmonids of the low flow channel relative to the high flow channel, given that the low flow channel is expected to experience relatively little change.

The text states that juvenile spring Chinook salmon may be present in the Feather River from November through June. Chapter 5 also concludes that juvenile migration would not be affected by BDCP flows, which are higher in spring and lower in summer in the high flow channel during BDCP operations. Why is juvenile migration not affected by higher spring flows and lower summer flows? To what extent is rearing habitat in the high flow channel affected by higher flows and to what extent are juveniles using this habitat? There is no mention of the actual temperature experienced by the fish in the Feather River.

It is not clear how the low positive effect with moderate certainty (Figure 5.5.4-1) was derived, given that there was no presentation on flow/habitat relationships, which were discussed as being key to the analysis. Chapter 5 states that real-time operations could be used to minimize adverse effects in the Feather River, but there is no mention of whether this will be done and what the criteria might be to protect salmon. The Chapter 5 description of Feather River effects on salmonids did not incorporate information related to exceedance of minimum flows that was discussed in Appendix 5C.5.2.

For steelhead, the analysis and text involving Feather River flows are somewhat more conclusive. A key statement is that the vast majority of steelhead reportedly spawn and rear in the low flow channel which would receive little effect from the BDCP (what percentage of steelhead rear in the high flow channel?). Adult and juvenile steelhead may experience somewhat higher flows during migration, but there is no judgment of whether this is beneficial or not. The text also states that summer flows in the high flow channel would be reduced by 50%, a period that includes year-round rearing of steelhead. The Panel notes that steelhead prefer higher velocities than other salmonids, but changes in the amount of habitat in relation to velocity was not presented. The text concludes with moderate certainty that there would be a low negative effect in the Feather River (the text should clearly identify that it is the rearing stage in the high flow channel that is affected). However, Figure 5.5.6-1 shows zero effect on rearing steelhead and low positive effect on migration. The results in this figure are not consistent with the text.

Yolo Bypass

Chapter 5 provides a reasonable discussion of the approximate benefits of increasing flow into Yolo Bypass and allowing more juvenile salmon, especially foragers, to utilize this rearing habitat. Reported data indicate only ~12% of the juvenile population would utilize the habitat. For spring Chinook salmon, the analysis assumed 80% of the juveniles were migrant rather than foraging Chinook. These values apparently included hatchery spring Chinook salmon which are mostly migrants and less likely to utilize rearing habitat and benefit from Yolo Bypass compared with wild Chinook salmon that are more likely to be foragers that benefit from the Yolo Bypass. Yolo Bypass is more likely to benefit wild Chinook (to the extent that they are "foragers") than hatchery Chinook salmon, and it would be worth discussing this in Chapter 5.

Potential adverse effects of Yolo Bypass on juveniles, such as stranding, were described. Potentially adverse temperature effects or predation affects (if predators are attracted to the Bypass) were not described, but BDCP authors stated at the January meeting that temperature and predator attraction are not likely to pose a problem within Yolo Bypass. Adult salmonids could be adversely affected in Yolo Bypass, as discussed in Chapter 5; these fish should be monitored to ensure safe migration.

9. Does the analysis adequately describe the predation and other screen-related effects of the proposed north Delta diversion structures? Is the application of the observed mortality rate at the fish screen of the Glenn-Colusa Irrigation District (GCID) an appropriate assumption for expected mortality at the proposed BDCP north Delta intakes? Are there other studies on salmonid survival at positive barrier fish screens that would be appropriate to apply?

Summary

Chapter 5 concluded that there is a low negative impact related to contact and impingement of salmonids with the north Delta diversion screens, but the technical appendix states that this effect could not be evaluated. Regarding predation, the Panel believes that there is uncertainty about the extent to which juvenile salmon and predators will aggregate near the intakes, and this is an issue that must be monitored. Positive barrier fish screens are widely used throughout the Pacific Northwest to protect juvenile salmonids from entrainment into water diversions, and this information should be readily available to the BDCP team.

Recommendations

- Correct inconsistency in conclusions in Chapter 5 and the Appendix regarding impingement.
- Monitor predator aggregation and predation rates at north Delta intakes.
- Conduct literature search on positive barrier fish screens, which are widely used.

Comments

Screen contact and impingement

The Effects Analysis stated in regard to fish contact and impingements at the north Delta intakes:

"It is concluded with moderate certainty that there will be a low negative change to the north Delta intakes attribute to foraging and migrating juvenile salmonids as a result of contact and impingement at the north Delta diversions".

A reasonable summary of information leading to this conclusion was presented, although more information on relative abundances of foraging Chinook (smaller & more susceptible fish) versus migrant Chinook could have been presented. It was stated that monitoring would occur during operation as a means to ensure low adverse effects. This monitoring is important because debris build-up might alter contact and impingement rates. However, Appendix 5.B: Entrainment stated:

"Because of the lack of an established relationship between passage time, screen contact rate and injury or mortality, it is not possible to conclude with certainty what the effects of the north Delta intakes may be on juvenile Chinook salmon or indeed on juvenile steelhead…".

Therefore, information presented in Chapter 5 on injuries related to the north delta intakes was inconsistent with information presented in the supporting Appendix. This inconsistency needs to be corrected.

Predation at north delta intakes. The Effects Analysis presents some findings that indicate mortality of salmonids associated with predation is uncertain at the north delta intakes and that monitoring and adaptive management would address this issue. The use of monitoring and adaptive management to address the predation issue is important, and implementation of these activities is key to minimizing predation risk. The Panel believes that there is uncertainty about the extent to which juvenile salmon and predators will aggregate near the intakes.

One of the predation analyses relied upon information collected in relation to salmon losses at the Glenn Colusa diversion and screen. Application of the Glenn Colusa analysis to the north delta intake suggested a cumulative loss of 12% of the juvenile winter-run Chinook salmon at the north Delta intake, a value that is high for a relatively short reach of river. Relatively few details about the Glenn Colusa predation study were presented in Chapter 5 or in the supporting appendix (5F: Biological stressors), therefore the Review Panel cannot directly address the question above on this issue. Nevertheless, the Glenn Colusa study seems to indicate that predators may aggregate near fish screens and consume many salmonids. The study at Glenn Colusa highlights the need to monitor fish predation at the north Delta intakes.

Positive barrier fish screens are widely used throughout the Pacific Northwest to protect juvenile salmonids from entrainment into water diversions, and fish screening criteria are widely applied. The BDCP team could access relevant documents on the web. However, regarding predation at the north intake, salmon and predator behavior in response to flow and habitat conditions along the screen intakes will likely be the key determinants of salmon mortality at the intakes. This information must be gathered during project implementation.

10. Does the Effects Analysis provide a complete and reasonable interpretation of the results of physical models as they relate to upstream spawning and rearing habitat conditions, particularly upstream water temperatures and flows resulting from proposed BDCP operations?

Summary

A valid approach was used to calculate daily flow and daily temperatures in the upstream locations. However, the presentation of the temperature results and the synthesis of the results should be improved to aid understanding. The Fish Agencies should also refine the types of analysis they need to best show the temperature impact on fish as the result of BDCP actions. Currently, the temperature analysis includes: 1) a comparison of *mean monthly* temperatures categorized by water year type, 2) exceedances of water temperature thresholds for the different fish species calculated for each month and categorized by water year type, and 3) the number of years where the exceedance occurred categorized by the level of concern (Table 5C.4-4, pgs. 5C4-19, example Table 5C.5.2-42, pgs. 5C5.2-79).

Recommendations

- Question 10 is one of the topics in the Effects Analysis where the data is presented in individual species and life stage sections. It is very hard to synthesize the results in this format.
- To help the reader understand what locations, which species, what life stages are most likely to be impacted by temperature as a result of upstream reservoir operations in response to north Delta diversion requirements, a synthesis section in the main Effect Analysis Chapter 5 should be included. This synthesis should address the summary of the problem presented in Section 5C.4 (5C.4-16 lines 26-32).
- Most charts in this section are hard to visually synthesize the temperature data. Color coding the charts would help guide the reader. Table 5C.5.2-197 (pg. 5C.5.2-364) is a good example of how to improve chart readability.
- Table 5C.5.2-32 (p. 5.C.5.2-79) show compares the level of exceedance for the different scenarios. This table is not effective at communicating that the level of exceedance is shifting between different categories. For example, less "orange" classifications may mean that there are more "red" classifications. It would be helpful to re-visit how this information is presented.
- Another potential key statistic that could be extracted from the model data is the number of *consecutive* days in which water temperature is greater than the threshold level.

Comments

Approach to calculating upstream flows and water temperatures:

The CALSIM II watershed model was used to specify the monthly flows in each of the upstream rivers. These monthly results were then "downscaled" to daily values based on the historical records at three historical locations in the watershed. These flows are used as inputs into the Sacramento River Water Quality Model (SRWQM) or the Reclamation Temperature model, depending on the location. This downscaling

approach seems to be reasonable approach to estimate flows. The temperature models used are specific to this region and have been used in other applications.

The temperature analysis included: 1) a comparison of *mean* monthly temperatures categorized by water year type; 2) exceedances of water temperature thresholds for the different fish species calculated for each month and categorized by water year type; and, 3) the number of years where the exceedance occurred categorized by the level of concern (Table 5C.4-4, pgs. 5C4-19, example Table 5C.5.2-42, pgs. 5C5.2-79).

Analysis and synthesis of the Temperature modeling:

Question 10 is one of the topics in the Effects Analysis where the way the data is presented makes it very hard to synthesize the results. The topic of temperature was evaluated in the Upstream Habitat Results Section 5C.5.2 (548 pages long) for each species and life stage. In many cases the description of the results were very repetitive and did not explain how the results differed from other species.

To help the reader understand what locations, which species, what life stages are most likely to be impacted by temperature as a result of upstream reservoir operations in response to north Delta diversion requirements, a synthesis section in the main Effect Analysis Chapter 5 should be included. The current summary of upstream temperature (Table 5.3-5, p. 5.3-21) is too general to be useful. It is not a sufficient synthesis of the information contained in Section 5C.5.2. This synthesis should address the summary of the problem presented in Section 5C.4 (5C.4-16 lines 26-32).

11. Does the Effects Analysis use a reasonable method for "normalizing" results from the salvage-density method to the population level for salmonid species?

Summary

The normalization approach seems to simply adjust entrainment values based on relative population size over the years of observation so that entrainment values relative to water export may be more comparable from year to year. The normalization should be used for qualitative purposes but not for modeling purposes, because it will mask some of the variation and uncertainty. This standardization has utility for the purpose of calculating entrainment per volume of exported water, but it provides only a partial view of the pumping effect on fish populations. The percent of the populations entrained is more important. This value has more relevance to Effects Analysis on the population. It also appears the variance calculations for salvage abundance and entrainment index are being calculated incorrectly.

Recommendations

- Calculation of salvage density and entrainment need to be revisited and the variance calculations corrected. Current variance calculations for salvage density are underestimating actual variance and uncertainty.

Comments

The salvage-density method was developed to provide an index to entrainment that reflects the volume of export, taking into account fish species abundance. The method assumes a linear relationship between entrainment and export flows. There is some

evidence this assumption of linearity may not be correct over the total range of conditions (Kimmerer 2008).

An estimate of total salvage abundance (S_i) for year i is estimated by the product

$$\hat{S}_i = \widehat{D}_i \cdot V_i$$

where

$\widehat{D}_i$ = estimate of fish salvages per volume of water export,

V_i = volume of water export.

The estimate of salvage loss is then "normalized" for an average population size of the fish according to the formula

$$\tilde{S}_i = \left(\frac{S_i}{N_i}\right)\overline{N}$$

where

N_i = fish abundance for the ith year,

$\overline{N}$ = average fish abundance over the years of inference.

Ideally, the fish abundance values should be based on the same population as the fish being salvaged. For example, winter-run Chinook where normalization is based on juvenile production estimates. In the case of fall and late fall-run and spring-run Chinook salmon, the normalization is based on adult run size and in the case of longfin smelt, a trawl index. For each of these latter cases, there is the additional assumption that juvenile abundance is proportional to either adult abundance or the trawl index, i.e.,

$$N_i = cA_i\ V_i$$

or

$$N_i = cT_i\ V_i$$

where

A_i = adult abundance in year i,

T_i = trawl index in year i, and

V_i = water volume in year i.

The normalized values, $\tilde{S}_i$, can be used in indices of annual salvage numbers but should not be used in subsequent simulations or the calculations of interval estimates. The normalization process has dampened the variability among annual values such that any subsequent variance calculations will underestimate the actual magnitude of the uncertainty (i.e., confidence interval [CI] width).

The entrainment index (E_i) is calculated

$$E_i = \frac{\hat{S}_i}{V_i}$$

per Section 5.B.5.4.3. It is unclear whether the actual salvage abundance $(\hat{S}_i)$ estimate or the normalized value $(\tilde{S}_i)$ is used in these calculations.

The variance calculations for the entrainment index (Section 5.B.5.4.3, lines 8–17) appear to be wrong. Based on the description, the average index value is calculated by taking the entrainment density for all relevant water years $(D_i, i = 1, \cdots, n)$ multiplying

these values by alternative water volumes from CALSIM $(V_j, j = 1, \cdots, m)$, then averaging over all nm. The variance is based on the empirical variance using the nm values, i.e.,

$$\widehat{\text{Var}}\left(\hat{\bar{S}}\right) = \frac{s^2_{S_{ij}}}{nm},$$

per the plan, and where the S_{ij} are all possible values over n and m, then

$$E\left(\frac{s^2_{S_{ij}}}{nm}\right) = \frac{\bar{V}^2\sigma_D^2}{nm} + \frac{\bar{D}^2\sigma_V^2}{nm} + \frac{\sigma_V^2\sigma_D^2}{nm}.$$

However, based on the stratified nature of the calculations, the correct variance has the form

$$\text{Var}\left(\hat{\bar{S}}\right) = \frac{\bar{V}^2\sigma_D^2}{n} + \frac{\bar{D}^2\sigma_V^2}{nm} + \frac{\sigma_V^2\sigma_D^2}{nm}$$

where

$\bar{V}$ = average water volume,

σ_V^2 = variance in water volume values,

$\bar{D}$ = average density,

σ_D^2 = variance in density values.

The report variance is too small.

The variance of the total salvage estimate also appears to be wrong (pages 5.B-65 and 66). The calculation of total salvage (S) was based on the description to be:

$$S = \widehat{\text{density}} \cdot \text{Volume}$$

where the estimator of density was based on a linear regression of log salvage density vs. day of inundations. The report then states that the confidence intervals were then computed using the 95% confidence levels of the estimates of the regression." This calculation, as described, is wrong. The calculations should be based on the variance estimate for the back-transformed estimate of density from the regression, i.e.,

$$\text{Var}(\hat{S}) = \text{Var}(\widehat{\text{density}} \cdot \text{Volume})$$

$$= \text{Volume}^2\ \text{Var}\left(e^{\hat{y}}\right)$$

$$\doteq \text{Volume}^2\ \text{Var}\ (\hat{y})\left(e^{\hat{y}}\right)^2$$

where $y = \ln(\text{density}) = \alpha + \beta x$.

See Appendix D for appropriate variance calculations for the salvage model.

12. Are the assumptions of the analysis of aquatic habitat restoration food web effects appropriate for covered fish species? Are the conclusions and net effects appropriate?

Summary

The BDCP develops a robust conceptual model of aquatic food webs and the diverse linkages that may impact the net production of food for Covered Fish. Yet the BDCP contains a number of assumptions, some of which are inappropriate, others of which

contain considerable uncertainty. Uncertainties are mentioned, but no effort was made to include whether conservation efforts reach only a portion of the goals of biological objectives. Thus the analysis of effects further assumes only the most beneficial potential results in any calculations, but doesn't incorporate other possibilities. Other processes of food webs in aquatic habitats are described but remain unanalyzed, some of which may enhance, while others of which would inhibit their biological objectives. While the overall conceptual model is adequate, integration and synthesis is lacking. Consequently the conclusions and net effects are not appropriate given the gaps in analyses and the uncertainties.

Recommendations

- Model the potential flow of energy through the pelagic food web – baseline information
- Assume a variety of primary production flows to covered species due to competitors or environmental issues – to what extent might their optimistic scenarios vary from equally potential realities
- Assume shifts in composition of plankton from favorable to unfavorable species (with respect to covered species) – even with potentially higher productivity by plankton, what happens if energy flows into other pathways other than nearly immediately into the covered species
- Incorporate a detrital energy flow – this might shift energy flow back toward covered species
- The direction of restoration in these systems that would support phytoplankton is not simple and linear, adaptive management would need to be an aggressive component of the BDCP with authority to take immediate actions, regardless of what those might be

Comments

The conceptual model of the food web appears to contain all the significant compartments required for an adequate assessment of the impact of the BDCP. The BDCP contains a number of conservation efforts that have the potential to provide considerable enhancement of the populations of covered fish. These include increasing habitat, providing a diversity of habitat conditions that may enhance different life history stages, as well as allowing for potential increases in food web services for covered species. However, other than estimates made for phytoplankton production, no other assessments are made. First we review some of the assumptions inherent in the BDCP consideration of food webs.

An overarching assumption is that Conservation Measures have rapid and positive impacts. With respect to food webs, wetland and aquatic systems restoration are assumed to be effectively restored and functional immediately or in a short time frame and meet the biological objectives of the BDCP. This result is based on a number of additional assumptions, all of which contain considerable uncertainty. Similarly, while potentially negative impacts on the success of restoration are considered in passing, e.g., invasive bivalves, none of their potential effects are incorporated into their analyses or conclusions. The simplest effects perspective of the BDCP is that it edits out all potential outcomes except for the most favorable one.

Restoration of natural ecosystems, however, is difficult and fraught with great uncertainties and some systems that are assumed to have a positive influence on covered species are particularly difficult. The contingency of ecological communities means they will not automatically assemble in some predictable manner (Parker 1997). Chapter 5 contains even less information this time concerning details about timing and sequencing required to evaluate potential impacts. Understanding the sequences is also critical because they have major influences (Drake 1990, 1991; Hobbs and Cramer 2008). For example, the BDCP implies a consistent increase in restoration acreage through time, but without strong management intervention prior to opening of new wetland or shallow aquatic habitat, submerged aquatic invasive species such as bivalves, *Egeria*, or other newly detected species may expand rapidly into the new tidal habitat. The result would be a much larger management problem without the food web benefits proposed by the BDCP.

The assumption of rapid positive food web benefits from restoration of aquatic habitat is a potential benefit, but the degree of benefit, its timing, and even whether benefits will accrue is uncertain. Restoration even may be on a pathway to achieving desired biological objectives, but the time frame may be considerable and beyond the 50-year period of the BDCP. Similarly, changing the order of different conservation measures may push ecological systems onto different trajectories. Usually these cannot be predicted, and requires an integrated monitoring and adaptive management with considerable authority and manpower. Restoration rarely achieves immediate conservation or biodiversity goals (Hobbs and Cramer 2008, Hobbs *et al.* 2011). While tidal water as a process can be achieved by opening dikes, restoration of biological function is actually quite difficult with respect to ecosystem processes beyond tidal flux and especially with respect to ecological equivalency to comparable natural wetlands (Kentula 1996; Simenstad and Thom 1996; Zedler and Callaway 1999; Lockwood and Pimm 1999). More recent studies substantiate these evaluations (Burgin 2008; BenDoer *et al.* 2009; Moilanen *et al.* 2009).

The BDCP further ignores critical data that should have been incorporated into trajectories concerning the restoration of wetland and associated aquatic habitat. This is a crucial piece because the restoration that is planned is critical key to increasing suitable habitat and food web productivity. The issue is sediment supply for these restorations. The BDCP assumes a constant sediment concentration for the time period of the plan (Appendix 5.E, pp. 43-44: turbidity held constant in models and interpretations), yet they indicate that sediment concentration has been declining over the past 50 years (p. 109) and that the BDCP conservation measures will further reduce the sediment supply by an additional 8-9%. While in their discussion of sediment supply, they also conclude that declining sediment concentration and the impact of CM1 will mean much lower sediment supply, these issues have no impact on the BDCP analysis and inference. Yet the loss of sediment supply creates great uncertainties in the rate and potential for restoration of these habitats, while only the most optimal circumstances are modeled or estimated.

Similarly, the BDCP uses a simple depth-productivity model to quantify how habitat restoration may impact primary production (Figure 5.E.4-85, Relationship between Phytoplankton Growth Rate and Depth, in Appendix 5.E, Habitat Restoration). This assumes the relationship between phytoplankton growth rate and depth developed by

Lopez *et al.* (2006) is accurate. The analysis focused solely on the relationship between phytoplankton and depth, while recognizing that other factors may influence phytoplankton production in particular locations (p. 121).

Ironically, the literature they rely on, Lopez *et al.* (2006) and Lucas and Johnson (2012), indicate that biomass and production of phytoplankton in the Delta do not fit this simple model expectations. A major limitation of the depth-productivity model is the impact bivalve grazing on available net production. Net phytoplankton production (in excess of potential grazing) peaked at different depths and at much lower rates depending on overall habitat depth and water residence time. Assumptions of phytoplankton production and their conversion to zooplankton and invertebrates as food sources for covered species in aquatic systems consequently lack realism.

A third assumption involves the production of food for covered fish. Food produced in the restoration areas is assumed to directly benefit covered fish and indirectly by export. The restoration of these areas are predicted to create better habitat and food for juvenile Chinook salmon, splittail, sturgeon, delta smelt, and longfin smelt. Two issues arise from this assumption, one is their analysis of phytoplankton production and the second is that the analysis never includes potential competitors.

In contrast to their assumption, they cite literature that models the impact of introduced clams and their rate of filtering of phytoplankton and other aquatic organisms. These models suggest 1) that the depth-productivity model they used is completely inaccurate in the context of invasive clams and 2) remind us that while the potential impact of clams are mentioned as an uncertainty, only the most optimal scenario without clams is used for conclusions about the short and long-term benefits of the BDCP.

Beyond the analysis of assumptions, the other compartments of the food web are not incorporated into their analyses. For example, the potential for detritus as a major source of food web production was reviewed at some point and mentioned during the discussion of food webs. However, no incorporation or estimation of potential detritus production was made, nor was the detrital web discussed any further. Ironically, this could be a significant and positive impact on covered species.

Similarly, the role of SAV and emergent vegetation were not assessed although they were mentioned. The issue of competitors was not assessed. No incorporation was made of anthropogenic nitrogen influences on phytoplankton community composition (for example increasing the proportion of *Microcystis*). While the BDCP generally has a review of most of these compartments that they illustrate in the conceptual model, no quantitative models, nor estimates derived from the literature review were developed to allow a variety of scenarios that might indicate the potential robustness of the impacts of the conservation measures. Thus, some quantitative detail on one or a few compartments, complete with large tables showing all the numbers produced, lacks significant meaning when other compartments are merely discussed. The overall impression is that these compartments live in conceptual isolation, lacking the integration of multiple and linked processes/interactions together into a synthesis. Consequently the BDCP analyses are ambiguous and conclusions and estimates of net effects overestimate the net positive impacts of conservation measures.

13. Is the analysis of food web benefits to longfin smelt from habitat restoration appropriate? How well do the analyses link intended food web improvements to improvement in the longfin smelt spring Delta outflow/recruitment relationship?

Summary

While the Effects Analysis develops an appropriate logic train suggesting that restoration actions (e.g., CM4) would result in the production and export of increased longfin smelt "food", this objective is constrained by considerable uncertainty (acknowledged as only "Partial" assessment) because the data is lacking to quantitatively estimate the relationship between longfin smelt production and what might be exported from tidal wetland restoration and converted to food web linkages to the smelt. Although there are good, synthetic conceptual models developed for the Bay-Delta longfin smelt population encapsulated in the Effects Analysis (e.g., Baxter *et al.* 2010; Rosenfield 2010), this uncertainty is further constrained by the lack of a life-history model that would elucidate the role of prey composition and abundance in population dynamics. Delta smelt are principally planktivorous, feeding on copepods, cladocerans and mysids in the Bay-Delta (Moyle 2002; Feyrer *et al.* 2003; Hobbs *et al.* 2006). A potentially significant change in the viability of food web support of longfin smelt by the shift from the native *Eurytemora affinis* to non-indigenous species such as *Pseudodiaptomus forbesi* and *Sinocalanus doerri* is implicated in declining availability of natural prey for longfin smelt. However, these changes were also confounded by flow diversions and restriction of the mixing zone and potential increased entrainment into water diversions and the increased predation of the overbite clam *Potomocorbula amurensis* on mysids and other zooplankton prey after its introduction in 1986 (Alpine and Cloern 1992; Kimmerer 2002).

Recommendations

- Strengthen the documented data and other evidence supporting the presumption that export of detrital matter would specifically contribute to food web linkages supporting longfin smelt.

Comments

While there is viable evidence that poor survival and growth are a major cause of longfin smelt decline (Bennett and Moyle 1996; Sommer *et al.* 2007), the mechanism and magnitude of increased production of desired longfin smelt prey contributed by restoring tidal natural communities and other proposed BDCP restoration actions is still highly uncertain (see response, above, to Question 12). As discussed elsewhere, the contribution of restoring shallow water tidal wetlands to net phytoplankton production and increased plankton abundance available to longfin smelt is basically hypothetical because of the uncertainties of primary consumption within the restoring ecosystems, especially by non-indigenous clams, and whether these systems would be sources or sinks for any increased production. The Effects Analysis does acknowledge that tidal wetland restoration is also likely to export detrital organic matter, as well as macroinvertebrates, but the potential contribution of these food web sources to longfin

smelt production is equally uncertain without more explicit and quantitative linkages to the longfin smelt prey potentially involved, such as mysids.

From that standpoint of linking food web benefits to the longfin smelt spring Delta outflow/recruitment relationship, the Effect Analysis does provide a reasonable rationale for smelt post-larvae and juveniles to benefit from exported production from the Suisun Marsh ROA, albeit with the same uncertainty associated with the utility of that exported production. Current understanding of juvenile longfin smelt occupancy of the Suisun Bay and West Delta subregions during March through June, before moving further into San Francisco Bay proper, suggests that linking the outflow/recruitment relationship to the management of spring (March-May) Delta outflow (Chap. 2, Section 2.4.1.4.4 Decision Trees) could be a management strategy.

14. How well does the analysis address population-level effects of the BDCP on white sturgeon?

Summary

The analysis does an excellent job of summarizing what is currently known about the life history and ecology of white sturgeon (southern distinct population segment) using the most recent analyses and peer-reviewed publications. In addition, the conclusions regarding the level of certainty about the effects of the different conservation measures on white sturgeon, based the expert panel convened in August 2013, are thoroughly discussed in the text and well summarized in Figure 5.5.8-2.

Estimating the effects of the BDCP on white sturgeon population levels is very difficult because of: 1) the lack of a thorough understanding of the effects of flow regimes on downstream migration and year class recruitment; 2) considerable uncertainty about white sturgeon sensitivity to water quality and whether current water quality conditions constitute negative impacts; (3) a poor understanding of the role of intertidal and subtidal habitat on food availability for migrating juveniles; and 4) little information about factors influencing growth and survival of adults in San Francisco Bay and the ocean. Given these limitations, the Effects Analysis does an adequate job of using existing information to predict the effect of the various conservation measures on white sturgeon.

Recommendations

- Implement measures to improve estimates (reduce uncertainty) of adult survival and population size of white sturgeon in the Delta.
- Undertake research studies to identify the reason(s) for the observed association between high flows and high recruitment.
- Initiate studies to understand the links (or lack thereof) between water quality and intertidal and subtidal habitat on growth and survival of 1) migrating juveniles and 2) adults.

Comments

The life history of white sturgeon, high adult survival and fecundity in combination with episodic recruitment in high water years, suggests that the multiple approach to conservation measures should promote increased adult survival and ensuring high

recruitment when conditions are favorable. We agree with the conclusions of the Effects Analysis that reduction of illegal harvest (CM 17) and reduction of entrainment at the Fremont weir (CM 2) are both highly likely to have a positive effect on adult survival. Similarly, we agree that the restoration of tidal wetlands under CM4 are very likely to provide significantly increased rearing habitat and epibenthic and benthic food resources. Perhaps more than the pelagic covered species, white sturgeon could also derive significant benefits from enhanced and exported detrital organic matter from tidal wetland restoration because much, if not most, of their natural (and unnatural given the non-indigenous clams contributions to their diets) prey on mudflats and in adjacent channels are detritivores.

Quantitatively estimating the effects of these conservation measures on adult survival will require more rigorous, focused sampling efforts. The large confidence intervals associated with recent estimates of adult survival will make it nearly impossible to document effects of the conservation measures. The effects of water diversion and changes in flow regimes on white sturgeon recruitment are much more difficult to predict and will require a more thorough understanding of the mechanisms behind the correlation between recruitment and flow volume.

Adequacy of Technical Appendices

Appendix 5.B—Entrainment

Summary

Section 5.B.4.1 (p. 5.B-11 lines 18-23) has the most important statement of the entire appendix. This conclusion that should be the first conclusion in the executive summary:

"Under the ESO (Evaluated Starting Operations), in the wetter water years (wet and above-normal water years…), most of the combined total exports would come from the new north Delta facility and exports from the south Delta facility would be lower than existing biological conditions … The use of the north Delta pumps would be lower in the dryer years with most pumping going from the south Delta pumps in dry and critical water year… Less use of the north Delta pumps in drier water years reflects requirements to maintain adequate bypass flows at the north Delta diversions." (5.B-11, lines 18-23)

This conclusion is the basis of most of the entrainment analysis in Appendix 5.B for the South Delta facilities. There may be different approaches to come up with the regression between export rate and salvage, but the simplistic conclusion is that when the pump operations are lower, so is the entrainment of fish. However, in the dry and critical years, entrainment at the South Delta facilities will be higher because the north Delta facilities' operations will be limited.

The next question to ask, therefore, is how often we will be under dry or critical year conditions. Will California have more frequent dry water years, resulting in fewer times when the north Delta diversion facilities can be operated?

Recommendations

- The conclusion stated above in the summary Section 5.B.4.1 (p. 5.B-11 lines 18-23) should be the first conclusion in the Appendix 5.B executive summary and should be included in Chapter 5.

- The Climate Change (Appendix 5.A) portion of the Effects Analysis needs to address the question for frequency of dry/critical water years and relate it back Appendix 5B.
- The documentation of the DSM2 and particle tracking model (PTM) model in this appendix should be greatly expanded to provide clarity in their approach.

Comments

Section 5.B.4.1 (p. 5.B-11 lines 18-23) has the most important statement of the entire appendix. This conclusion that should be the first conclusion in the executive summary:

"Under the ESO (Evaluated Starting Operations), in the wetter water years (wet and above-normal water years…), most of the combined total exports would come from the new north Delta facility and exports from the south Delta facility would be lower than existing biological conditions … The use of the north Delta pumps would be lower in the dryer years with most pumping going from the south Delta pumps in dry and critical water year… Less use of the north Delta pumps in drier water years reflects requirements to maintain adequate bypass flows at the north Delta diversions." (p. 5.B-11, lines 18-23)

This conclusion is the basis of most of the entrainment analysis in Appendix 5.B for the South Delta facilities. There may be different approaches to come up with the regression between export rate and salvage, but the simplistic conclusion is that when the pump operations are lower, so is the entrainment of fish. However, in the dry and critical years, entrainment at the South Delta facilities will be higher because the north Delta facilities operation will be limited.

The next question to ask, therefore, is how often we will be under dry or critical year conditions. Are we going to have more frequent drier water years, resulting in fewer times when the north Delta diversion facilities can be operated? The Climate Change (Appendix 5.A) portion of the Effects Analysis needs to address this question and relate it back to this Appendix.

In this appendix, the first conclusion stated is: "The BDCP would substantially change the amount and pattern of water exports from the south Delta SWP/CVP facilities, which generally would be expected to lower the number of fish of all species entrained relative to existing biological conditions." (Appendix 5.B, p. 5.B-iii, lines 38-40)

We agree that the south Delta export patterns will change substantially, especially in wet and above normal years. However, it is also important to look at how the flow patterns will also change in the north Delta. This is an equally important piece of evaluation that should be included in the entrainment analysis. The use of the DSM2 PTM is a first attempt at this type of analysis. However, the documentation of the DSM2 PTM model in this appendix should be greatly expanded to provide clarity in their approach. Some of this documentation may already be in Appendix 5.C, however, the present documentation is not sufficient to allow Appendix 5.B to act as a stand-alone document.

Appendix 5.C—Flow, Passage, Salinity, and Turbidity

Summary

Appendix 5.C has been a catch-all appendix ever since Phase 1 of this Effects Analysis review. Unlike the Entrainment or Contaminants appendices, this appendix does not have an individual issue that it is trying to address. This appendix is 2,636 pages long and spans a laundry list of topics including flows in river, salmon migration through the Delta, Delta Cross Channel and Georgiana Slough circulation, non-physical barriers, temperature modeling, water clarity, turbidity, invasive species, nutrients, dissolved oxygen, and algae. This appendix should have been divided into multiple appendices in previous iterations of the BDCP document. At this point, the division of the appendix will likely never happen. As a result, this is a very difficult appendix to review. In general, the Panel read through portions of this appendix to answer specific questions for the main charge questions for Chapter 5.

Recommendations

- Most Appendix 5.C recommendations are included in the Chapter 5 questions.
- Guiding operational rules in place for the current configuration of the Delta, such as E/I ratios, need to be reviewed to see if they still make sense for the combined system.
- The calculation of transport time scales should be done with relation to a particular question being addressed rather than calculated as a bulk parameter.
- Improve the synthesis of results in Section 5C.5.3.1: Passage, Movement, and Migration Results, Flow Summary.
- Water clarity and suspended sediment should have been in an appendix all its own rather than being buried in Part 6 of Appendix 5.C.

Comments

Baseline operations (Section 5C.2.2)

The Effects Analysis used two different baseline conditions, one that was consistent with the USGFWS BiOp RPA actions (EBC2) and one in which the USFWS RPA (Fall X2 action) was not included (EBC1). The panel will not comment the details of the baseline operations that were used to represent current conditions because this level of detail is beyond the area of expertise of the panel. We defer this issue to public comments by interested stakeholders, state and federal agency personnel that have more understanding of these details.

Proposed operations, Maximum Allowable Export Rules (Section5C.2.2.2.1)

Before the north Delta diversion facility is operational, the operating criteria for both the North and South facilities need to be established. Guiding operational rules in place for the current configuration of the Delta, such as E/I ratios, need to be reviewed to see if they still make sense for the combined system. For instance:

"For the BDCP cases, the [Export/Import] E/I ratio was assumed to apply only to south Delta exports; the north Delta intake diversions were assumed to exempt form E/I rule because the north Delta diversions are controlled by the bypass flow rules. The south Delta pumping was limited by the E/I calculated with the inflow minus the north Delta

diversions; this would allow slightly higher total exports during periods when Sacramento River flows are high and north Delta diversion are high." (p. 5C.2-3, lines 41-42; p. 5C.2-4 lines 1-3)

Residence Time (Section 5C.4.4.7)

The residence times calculated using 38 particle release sites using the DSM2 PTM model is of limited use. The calculation of transport time scales should be done with relation to a particular question being addressed. For example, how long will water reside in a specific Restoration Opportunity Area and how does that transport timescale compare to other important timescales, such as phytoplankton growth rates, contaminant reaction time, etc.

The Delta is a very diverse mosaic of regions. Each sub-section of the Delta has unique characteristics. Transport timescales in each sub-region is a function of operations (such as the operation of the Delta Cross Channel and the placement of temporary barriers, flooding in the Yolo Bypass), bathymetry, and connectivity to adjacent regions. Transport timescales calculated in sub-regions rather than full Delta "average" residence time will give much more detailed information about changes in circulation patterns as a result of alterations to the system as a result changes in operations and additions of restoration opportunity areas.

Passage, Movement, and Migration Results, Flow Summary (Section 5C.5.3.1, Pages 5C.5.3-1 through 5C.5.3-64)

Please improve the synthesis of results in this section. These pages contain only charts with no dialogue or graphs to aid the reader. This section likely contains very important information about how the circulation changes in the Delta will change as a result of the Conservation Measures at key locations throughout the Delta.

Attachment 5C.D (Water Clarity-Suspended Sediment Concentration and Turbidity) (5C.D-1 through 5C.D-64)

Water clarity and suspended sediment should have been in an appendix all its own rather than being buried in Part 6 of Appendix 5.C. This is a topic is as important as Entrainment and Contaminants. This section is a good resource to read for background on issues related to sediment transport in the Delta.

Appendix 5.D—Contaminants

Summary

Currently, the contaminants section of Chapter 5 comprises 1 ½ pages of a 745 page document with most of the information related to contaminant effects contained in a single table. There are many caveats to consider with contaminants and this topic should get more attention within Chapter 5. Appendix 5D has a very well written introduction that lays out the key issues related to both mercury and selenium in the Delta. This introduction should be included in Chapter 5 where it will be read and considered. This list of potential contaminants seems reasonable and the conceptual model for contaminants (Fig 5D.3-1) is well developed. The growing list of contaminants of emerging concern is a clear sign that additional contaminants may need consideration in the future.

The Executive Summary of Appendix 5.D (p. 5.D-i, lines 24 -29) states that quantitative analyses were applied where available but were not sufficient to fully examine the potential for contaminant effects. This statement is important for characterizing the level for which potential contaminant effects can be assessed, however this is not part of the bulleted summary within the Executive Summary (p. 5.D.ii, lines 35-42).

The Contaminants Appendix is limited to direct contaminant effects on covered species even though it is recognized that both direct and indirect contaminant effects must be considered (p. 5.2.3, lines 5-7). The Effects Analysis authors indicate that indirect contaminant effects are handled within Appendix 5.F: Biological Stressors on Covered Fish. Given the degree to which indirect contaminant effects are presently covered in Appendix 5.F this is not satisfactory. A Phase II Panel recommendation was to incorporate grey literature where needed in the contaminants section, especially for indirect contaminant effects. These recommendations were not taken and stand from the original review.

The separation of direct and indirect contaminant effects lead to strange splits in organization, including for *Microcystis* which is included as a "contaminant" in the contaminant conceptual model but is not part of the discussion in Appendix 5.D: Contaminants. Rather, *Microcystis* is considered in Appendix 5.F.

Both Conservation Measure 15: Methylmercury Management (pp. 4-257) and AMM27 Selenium Management (p. 5.D-37, line 18) should be evaluated by contaminants experts to determine if these approaches will be acceptable for mitigation. The modeling of Methylmercury effects are highly uncertain due in large part to site-specific characteristics that cannot be modeled at present.

Recommendations

- Provide more information with Chapter 5: Effects Analysis rather than relying heavily on Appendix 5.D: Contaminants.
- Include both indirect and direct contaminant effects within Contaminants Appendix (Phase II recommendation).
- Methylmercury Management and Selenium Management should be evaluated by contaminants experts.
- Incorporate grey literature where needed (especially herbicide application for control of Invasive Aquatic Species).
- Provide clear statements within Chapter 5 and the Executive Summary of Appendix 5.D about the high level of uncertainty associated with contaminant effects as a result of site-specific details that cannot be modeled without explicit information about the location and connectivity of ROAs.

Comments

The Contaminants Appendix is limited to direct effects of contaminants on covered species despite the recognition (Chap. 5, pg. 5.2-3, lines 5-7) that that both direct and indirect contaminant effects must be considered. Appendix 5.D states that with the exception of herbicides used to control Aquatic Vegetation, the BDCP does not add any contaminants to the Plan Area. Nonetheless, as stated (Chapter 5, page 5.3-26, lines 29-30) BDCP activities will alter freshwater flow and alter water residence times at various locations in the Delta. These changes can result in major changes in how

contaminants interact with the Delta ecosystem by changing the local concentration of a given contaminant or duration of exposure. For these reasons, restricting the analysis to direct effects on covered species is inadequate.

The inherent challenges in navigating a document of this size could be overcome by placing all of the contaminant effects under the Appendix entitled "Contaminants". This was a recommendation made during the Phase 2 review. Indirect effects are handled elsewhere in the Effects Analysis (Appendix 5.F: Biological Stressors on Covered Fish) however at present discussion of potential indirect contaminant effects are not sufficient in scope, detail, or characterization of uncertainty. Ammonia (NH3) / ammonium (NH4) effects, as written in Appendix 5.D, appear to consider indirect effects of ammonia/ium which is inconsistent with the authors' intent for Appendix 5.D.

Appendix 5.D has a very well written introduction that lays out the key issues related to both mercury and selenium in the Delta. The analysis was very careful to separate out the effects of Conservation Measure 1 (north Delta diversion facilities) from the effects of Conservation Measure 2 (Establishment of ROAs). In general, the environmental effects related to constructing ROAs are a bigger concern for contaminants than the north Delta diversion. However, in the case of selenium, changing the pumping operation location in conjunction with the establishment of ROAs in the South Delta has a potential significant effect. Changing to the north Delta diversions shifts the primary source of water in the South Delta to San Joaquin derived water rather than Sacramento source water under certain conditions.

It is recognized that Methylmercury concentrations would continue to exceed criteria under the BDCP and restoration actions are likely to increase production, mobilization and bioavailability of Methylmercury (5.D-24, lines 41-44). There is considerable uncertainty related to Methylmercury production resulting from BDCP activities. This is due in large part to site-specific information needed to construct reasonable models and trophic interactions from various sources are not easily modeled (5.D-22, lines 11-17)

DSM2 is a one-dimensional model that represents open water areas as well-mixed, continuously stirred tank reactors. In addition, the location of the ROAs and how these areas are connected to the adjacent channels is unknown.

Currently, dissolved Se in the San Joaquin is an order of magnitude higher than in the Sacramento River. (Monsen *et al.* 2007) Therefore, even if the proportion of San Joaquin discharge relative to the Sacramento River is low, the increase in Se concentration could still be significant. This conclusion should be reviewed. There is much uncertainty in the DSM2 results, especially for residence times in the newly established open water regions.

Section 5.D.43 (lines 8-10) on the impact of restoration on ammonium suggest that restoration will not have an impact on NH4 concentrations – This is overly simplistic as tidal wetlands are known to be important in nitrogen biogeochemistry, acting as a source via sediment re-mineralization (Cornwell *et al.* 2014) or clam excretion (Kleckner 2009) or as a sink via organic matter production or coupled nitrification – denitrifcation (Cornwell *et al.* 2014).

Conservation Measure 13: Invasive Aquatic Vegetation Control is discussed in Section 5.F-6. There is little consideration of the potential effects on lower trophic levels (algal primary producer) due to herbicide applications. This issue is raised in a single bullet on

page 5.F-130 Line 24-25. While the literature is not well developed for the SFE there is at least some indication that herbicide applications are detrimental to photosynthetic organisms (phytoplankton). This should be addressed as a possible effect with implications for adaptive management.

Appendix 5.F—Biological Stressors on Covered Fish

Summary

Appendix 5.F examines the effects of 10 conservation measures on four key biological stressors: invasive aquatic vegetation (IAV), predation, invasive mollusks, and *Microcystis*. Effects of these actions on fishes was largely based on professional opinion while utilizing available information. While intentions of these actions is good, the outcome for fishes is uncertain, indicating the need to monitor and adapt. Key issues include expansion of invasive clams that consume phytoplankton, more favorable conditions for *Mycrocystis and harmful algal blooms,* and continuous effort needed to control invasive aquatic vegetation and predator abundances.

Recommendations

- Page 5.F-107, last paragraph, first sentence, and Executive Summary: The 1% to 12.8% range in predation effects due to the north Delta diversion is a mixture of population-level and localized effects and should not be treated as measuring the same quantity. That range estimate is deceptive and technically incorrect.
- Monitor progress and maintain efforts to control invasive species than impact covered fishes.

Comments

Biological stressors can result from "competition, herbivory, predation, parasitism, toxins and disease." The objective of the conservation measures is to reduce the negative effects of key biological stressors on covered fish species. Appendix F examines the effects of 10 conservation measures on four key biological stressors: invasive aquatic vegetation (IAV), predation, invasive mollusks, and *Microcystis*. This review is designed around the four biological stressors and the prospects for change under the BDCP plan.

Invasive Aquatic Vegetation (IAV). The plan states controlling IAV is expected to reduce densities of largemouth bass but could enhance open water conditions favorable to striped bass. The control of IAV should increase turbidity which should be beneficial to foraging by juvenile fish and reduce predation. Brazilian waterweed (*Egeria densa*) and water hyacinth (*Eichhornia crassipes)* are the two most abundant IAV in the Delta. The CM13 proposes to treat approximately 1,700–3,400 acres of *Egeria* per year in and near restored habitat. Currently, *Egeria* is increasing at a rate of approximately 15% per year. Efforts will need to be sustained and focused to be effective.

Assessments of the benefits of IAV control were based on "scientific literature," consultations with local experts, and conceptual models of key processes, habitat, and covered fish species. There is also practical experience to draw from. At Franks Tract, *Egeria* control was 47% effective (5.F-40), while Delta-wide *Egeria* continues to expand at about 15%/year. Annual treatment of 1500 acres/year would be expected to maintain the status quo.

Figure 5.F.5-3 projects it would take approximately 10 years to eradicate *Egeria* under a high treatment scenario and a 20% annual expansion rate. Some of this benefit may be offset by the fact that habitat restoration under the Plan would also create susceptible *Egeria* habitat. Water hyacinth control, on the other hand, appears to be already successful.

Predation. Predation control is to be locally focused on predator hotspots. Ten spots have been specified, along with the new north Delta water diversion facilities and nonphysical barriers. It is unclear how effective these localized remodels will be because the predators being controlled (i.e., largemouth bass and striped bass) are moderately to highly mobile.

For the north Delta diversion facilities, two approaches were used to estimate predation-related effects: bioenergetics modeling and fixed estimate of 5% predation loss at each of three intakes screens. The Executive Summary states predation losses at north Delta intakes should be from less than 1% to 12.8%. However, this range is contradicted by the simple fixed estimate model: Assuming three intakes each with a 5% independent rate of loss, then the overall rate is $1 - (1 - 0.05)^3 = 0.1426$ or 14.26%. The bioenergetics model was considered the Plan's best approach to assessing predation near the intakes. However, the fourth assumption of this model (p. 5.F-15) states predation was assumed to be proportional to the prey's relative abundance. This is in contrast with most energetics models that assume consumption has a lower threshold dependent on the predator's physiology and size. Predation is then proportional to predator abundance. The analysis also apparently ignores smaller size prey (assumption 6, p. 5.F-16). This analysis was also based on guesstimates of expected predator abundance at the future north Delta intake facilities. The model also assumes all prey are at equal risk, regardless of their location in the channel.

Using the bioenergetics models to express the effects of predation at the north Delta intakes as a percentage of total juvenile predation can be misleading (p. 5.F-75). Localized predation rates are more useful and can be compared to the 5% design specifications. Alternatively, the effect of predation at the intakes could be expressed in terms of proportional change in through-delta survival. Under the fixed predation loss method, it is unclear how proportions of 11.7%, 12.1%, and 12.8% for various fish stocks are estimated (p. 5.F-77) when a simple model based on independent intake events estimates $(1 - (1 - 0.05)^3 \times 100\% = 14.26\%$.

The predator removal program at the north Delta intakes and elsewhere is projected to remove 8,840 striped bass annually. The net effect is a project reduction in 13,320 juvenile salmonids being consumed. The Plan does not estimate the fraction of striped bass removal in the delta (i.e., another measure of relative reduction in predation). The Plan states it is uncertain how long such a removal effort could be sustained, and that predator removal treatments are likely short lived.

The effects of habitat restoration on predator control are uncertain. Effects on turbidity, flow, etc., may be much localized. In addition, it is unclear whether restoration actions will benefit prey, predators, or both.

Invasive Mollusks. The overbite clam (*Potamocorbula amurensis*) currently dominates the brackish transition zone of the delta estuary. Its presence has dramatically altered the zooplankton community. It can filter the entire water column once a day in delta

channels. The decline in phytoplankton has been subsequently correlated with declines in copepods and mysid shrimp, a food source of the delta smelt and longfin smelt. The overbite clam has a salinity range of tolerance that could be affected by the Plan's water operations. There is expected to be "generally little difference (25%) in average suitable habitat for the clam between EBC2 scenarios and ESO scenarios . . . ." However, there is risk of *Potamocorbula* expansion:

> "*For ESO without Fall X2 (modeled as ALT1_ELT and ALT1_LLT), the area of suitable abiotic habitat for Potamocorbula would increase 7 to 9% in wet water-year types compared with the EBC1 baseline, but would be little different for all other water-year types. Suitable abiotic habitat for clams would increase in wet and above normal water-year types by about 18 to 28% in early long-term compared with EBC2 baselines (EBC2, EBC2_ELT) and increase 11 to 30% in late long-term.*" (Appendix 5.f, page 5.F-117, lines 7-11)

Restoration actions to produce more shallow water habitat may not have a net positive effect. While shallow water habitat produce phytoplankton, the presence of *Corbicula* may result in a phytoplankton sink (p. 5.F-121). One of the few management options is to manipulate salinity which is a function, in part, of river flow. The water withdrawals from the north Delta Diversion should not help the situation. Decision whether to implement the Fall X2 will affect the area of notable colonization by *Potamocorbula*.

Mycrocystis. *Microcystis* blooms can have an adverse effect on phytoplankton, zooplankton, and fish. Factors associated with blooms include high water temperature, high water transparency, low flows, high nutrient concentration, and high nitrogen/phosphorus (N/P) ratios. Runoff from land use contributes to these favorable conditions. *Microcystis* affects fish populations through declines in food sources, mortality, and reduced fecundity. Water operations that reduce flow and increase water residence time may promote *Microcystis*. Shallow water habitat reduction may also promote *Microcystis*. Actions that increase water velocity and turbidity are helpful in controlling *Microcystis* blooms. ESO_ELT and LOS_ELT scenarios are projected to increase average water residence time (Table 5.F.8-2), which would have a detrimental effect in trying to control *Myrcocystis*. Submerged aquatic vegetation (SAV) control may produce water conditions unfavorable to *Microcystis*. Climate warming may be a significant driver in *Microcystis* trends in the future.

Appendix 5.G—Fish Life Cycle Models

Summary

It is not clear to the Panel why life cycle models were not developed specifically for the evaluation of the BDCP. The Panel previously identified a number of expectations for the life cycle model appendix, which had yet to be released. The Panel also recognized that these expectations might not be achieved, and noted that the inability to achieve these expectations would indicate higher uncertainty in the ability of the BDCP to achieve the biological goals and objectives.

Recommendations

- Provide more detailed description of the 14 different scenarios modeled (Table 5.G-2) than shown on p. 5.G-17. For instance, specify what are the low- and high-flow operations specified in scenarios HOS and LOS.
- Check survival estimates. The 94-98% or 96-98% survival values (inconsistent text, p. 5.6-42 and Table 5.G-3) between ocean entry and age 2 seem very high. Rechisky *et al.* (2009), for instance, found early ocean survival of yearling Chinook salmon smolts from the Columbia River to be as low as 0.28 within the first month. Rechisky *et al.* (2012) reported early ocean survival of yearling Chinook salmon smolts to range from 0.04–0.29.
- Clarify what information and how the information from Michel (2010) and Perry *et al.* (2013) were incorporated in the IOS models (page 5.G-44).
- Perform a sensitivity analysis at to generate confidence intervals at the north delta intakes using mortality values at existing structures (Perry 2010) (p. 5.G-46). The 95% survival value used in simulations of the north Delta intake is an engineering specification.
- Consider describing extinction rates. OBAN – Adult Escapement (pp. 5.G-51 to 5.G-61). Examination of plots (Figure 5.G-15, p. 5.G-19) suggests extinction rates for winter-run Chinook salmon would be very high for all long-term (LLT) scenarios and not insignificant for short-term (ELT) scenarios.
- Compare model output as described below. Escapement values for OBAN (Tables 5.G-8 and 5.G-12) and IOS (Table 5.G-24) models differ by roughly a factor of 5. No formal comparison of the model projections from the IOS and OBAN models was presented. A ranking of model output for median adult escapement of the two models shows reasonable agreement (see Table 1 below). The two models flip the number 1 and 2 ranks of scenarios EBC1 and EBC2. The largest discrepancy was in scenario HOS-LLT with alternative rankings of 5 and 8. Such a table should be included in the report, along with an analogous comparison of through-Delta survival. A comparison of scenarios ranks is in keeping with the sentiment that only the relative output of the models be considered.

Table 1 Relative ranking of alternative model scenarios for medial adult escapement based on the IOS and OBAN models (1 = highest, 10 = lowest).

	EBC 1	EBC 2	EBC2 -ELT	EBC2 -LLT	ESO- ELT	ESO- LLT	HOS- ELT	HOS -LLT	LOS- ELT	LOST -LLT
IOS	1	2	3	7	6	10	4	5	8	9
OBAN	2	1	3	7	4	9	5	8	6	10

- Define ES0 95 ELT. Sensitivity analysis (p. 5.G-79) refers to a model (i.e., ES0 95 ELT) not defined in Table 5.G-2 at the beginning of the Appendix.
- Evaluate and compare sensitivity of populations to a broader range in mortality at the north delta intakes and passage through the Delta. A 5% mortality at the north Delta intake is projected to cause a 58 to 61% reduction in adult escapement (i.e., EBC2- ELT or EBC2-LLT vs. ESO-95-ELT or ESO-95-LLT). This is a huge effect

that would have to be mitigated by other BCDP conservation actions. Presently, 5% entrainment is based on engineering specifications and is lower than at other intake facilities (Perry 2010). These results are also in sharp contrast when through-Delta mortality was increased by 5% and escapement changed by only 0 to 4.6% in the OBAN model. Additional analyses ***must*** be done over a wider range of mortality values, 1% to 10%, to assess how bad the intake problem could be and how well must the intake function. In addition, the discrepancy between the effects of the 5% north Delta intake mortality and the 5% through-Delta mortality needs to be reconciled. It is unclear why these sensitivity results noted in the Conclusion (5.G.4) were not reconciled. They appear to be an important finding of the life cycle analysis.

Comments

A total of 17 candidate life cycle models were considered for use in the Effects Analysis (seven Chinook, eight smelt, one splittail, and one steelhead model). Appendix 5.G reviewed a number of life history models in the Central Valley, but concluded that only two of the Chinook models (i.e., Interactive object-oriented simulation [IOS] model and *Oncorhynchus* Bayesian analysis [OBAN]) were applicable to the BDCP. The OBAN model for winter Chinook involved factors such as water temperature in the Sacramento River (Bend Bridge), exports at the south Delta pumps, days of flow in Yolo Bypass, Delta Cross Channel operation, striped bass (predator) abundance, ocean harvest and ocean upwelling. None of the smelt models were selected, despite the fact that four models (state-space, multivariate autoregression, Bayesian change point, and smolt survival regression) met their five selection criteria. Given the relative importance of the delta smelt, it is unclear how none of the models met the criteria of best available science. It is also unclear, given the important of BDCP, why the plan did not invest in independent model developed tailored to its objectives or invest in modifying one or more of the existing models to better meet the objectives of the plan. The IOS and OBAN models were used to assess effects only on winter-run Chinook salmon.

Under the BDCP, the ISO and OBAN models were used to simulate the projected effects of:

a. Benefits of CM 2 Yolo Bypass Fisheries Enhancement
b. Benefits of SM 15 Nonphysical Barriers (assumed 67% diversion away from Georgiana Slough)
c. Detrimental effects of juvenile entrainment at north Delta intakes (assumed 5% mortality)

No other BDCP conservation measures were considered. How the benefits of Yolo Bypass Fisheries Enhancement were modeled is unclear.

The OBAN model "cannot account for north Delta exports" and "does not include any Delta flow-based covariates other than export (EXPT) and Yolo Bypass inundation (YOLO) and, therefore, cannot account for any potential changes in survival below the north Delta diversions, e.g., because of changes in water velocity" (p. 5.G-32). Consequently, the effect of lower flows due to water withdrawal or slower water velocities and subsequent increased smolt predation were not incorporated in the OBAN modeling. Appendix 5.G goes on to state that because of these modeling limitations, all performance measures should be compared on a relative basis.

However, ratios of model output (i.e., relative differences) will not eliminate biases due to structural defects in the model under alternative scenarios.

The IOS model also assumed "survival and travel times during River Migration are independent of flow" (p. 5.G-44). However, the IOS model does model the effects of flow and route selection and water exports on smolt survival in the Delta (p. 5.G-33). Such assumptions are very important because water withdrawals will affect flows which, in turn, are known to affect the travel time and survival of salmon smolts.

Calibration of the models was limited by available data which, in turn, can limit the range in valid model response. Nevertheless, model descriptions are generally adequate as a whole. Primary model outputs considered median through-Delta survival and annual escapement. In population assessments of endangered or listed species, it is common to include 50-year or 100-year extinction rates. Increasing median escapement has limited value if a salmon population continues to have an unexceptionally high probability of extinction in the future. The simulations should also be summarized in terms of extinction rates under the 14 different operational/environmental scenarios (Table 5.G-2).

The appendix does not include a formal comparison of model output for OBAN and IOS, either on an absolute scale or relative scale. It should be acknowledged that adult escapement differs between models by a weighting factor of 5. More importantly, the relative ranking of the different BDCP scenarios (Table 5.G.-2) between models should be included in Appendix 5.G. Certainty should be assessed, in part, based on the degree of consistency in model predictions.

Appendix 5.J—Effects on Natural Communities, Wildlife, and Plants

Summary

In general, the Panel felt that the information in Appendix 5.J was clearly presented in the tables and figures. Because so much of the information in the appendix depends on the accuracy of the GIS database, the authors should provide a reference or preferably a link to a description of the database and an analysis of its accuracy. As discussed in other sections of our review, providing a single value for the number of acres of habitat that will be occupied by each species is scientifically questionable.

Recommendations

- The description of the methods used to arrive at the number of acres of restored habitat that will be occupied needs to be revised.
- Consider including a range of values (minimum and maximum) of potential occupied habitat rather than a single value.

Comments

Appendix 5.J is divided into five sections each of which addresses a different conservation issue related to natural communities. Our comments on some sections are rather brief and some questions are not relevant to a section so we have included our

comments on each section under each question. If there are no comments on a section under a particular question, we felt there was no need to address it.

a. How well are the proposed analytical tools defined, discussed and integrated?

Construction-Related Nitrogen Deposition on BDCP Natural Communities

The analysis of construction-related nitrogen deposition is thorough and sufficient. It is clear that the amount of nitrogen produced by construction-related activities of the BDCP will be negligible relative to the amount that is currently being contributed by the surrounding urban and agricultural areas.

Natural Community Restoration and Protection Contributing to Covered Species Conservation

The estimates of the current distribution of natural vegetation types in the Plan Area depend on the accuracy of the GIS database that used for the analysis. Provide a citation for the database and a brief discussion of the error associated with the different community types. In addition, the description of the approach that was used to estimate the amount of habitat for each species (pp. 5J.B-1 and 5J.B-2) is poorly worded and needs revising. The description should state that the details of the approaches used to develop the species-specific habitat models are provided in the species accounts in Appendix 2A.

Analysis of Potential Bird Collisions at Proposed BDCP Powerlines

The authors did an excellent job of integrating spatially explicit information about roost and foraging sites in the Plan Area to estimate the number of potential encounters with power lines and combining this with information in the scientific literature on mortality estimates from each encounter.

Indirect Effects of the Construction of the BDCP Conveyance Facility on Sandhill Crane

The authors considered all of the important indirect effects of the construction on sandhill cranes in the Plan Area. The analytical tools they used were appropriate for the analyses. Most of the estimates of indirect effects came from studies in other regions but that is unavoidable because no detailed studies have been conducted in the Plan Area.

Estimation of BDCP Impact on Giant Garter Snake Summer Foraging Habitat (Acreage of Rice) in the Yolo Bypass

This section is a simple accounting of the number of acres that are planted to rice within the Yolo bypass that may be removed when the bypass is inundated. Rice fields are used as foraging habitat by giant garter snakes and therefore could result in a loss of this habitat for the snake in the Plan Area. By intersecting the maximum amount of rice that was planted in area with the inundation level that results in the maximum amount of rice removed, the analysis provides an estimate of the maximum amount of potential foraging habitat that will be removed. We feel this approach is adequate to address this very specific question.

b. How clear and reasonable is the scale of analysis?

Natural Community Restoration and Protection Contributing to Covered Species Conservation

The scale of vegetation distribution information (1 acre, from Appendix 2A) is reasonable for most species. Although some wildlife species may use habitat patches that are < 1 acre, it is unlikely that those patches contribute significantly to the amount of suitable habitat in the Plan Area.

c. How well were the Panel's earlier comments addressed and applied in the technical appendices/analyses?

Natural Community Restoration and Protection Contributing to Covered Species Conservation

Earlier comments were addressed to some degree. The previous version of this appendix did not have any text at the beginning describing the methods that were used to arrive at the numbers presented in the tables. The description, however, needs to be edited and should specify that the assumptions behind the approaches used when developing habitat models can be found in Appendix 2A.

The other sections of this appendix were not previously reviewed.

d. How well did the technical appendix evaluate the effects of potential BDCP conservation measures on the specified variable(s)?

Natural Community Restoration and Protection Contributing to Covered Species Conservation

As discussed in our review of Chapter 5, the estimate of the amount of habitat that will be occupied by a species following restoration is questionable. The number of acres of suitable habitat that are temporarily or permanently removed and restored are clearly conveyed in the tables in Appendix 5.J. But, the approach used in Appendix 5.J assumes that the proportion of the appropriate habitat that is within the current range of the species in the Plan Area is an appropriate estimate of the proportion of suitable habitat that will be occupied when habitat restoration measures are completed. However, if habitat restoration does not occur within the potential range of the species in the Plan Area, none of it will be occupied. The best way to address this is to set specific goals for habitat restoration within the potential range of the species in the Plan Area and to identify occupancy thresholds.

e. Were the conclusions drawn from the results accurate and did these conclusions appropriately consider uncertainty, including chained statistical uncertainties?

Natural Community Restoration and Protection Contributing to Covered Species Conservation

As discussed in our review of Chapter 5, uncertainty was not considered when estimating the number of acres of restored habitat that a species would occupy following restoration.

f. Were appropriate models used in the technical appendices? If model results conflicted, was this clearly stated and was the conflict appropriately addressed?

Analysis of Potential Bird Collisions at Proposed BDCP Powerlines

The authors considered all 12 bird species that are covered by the BDCP when addressing collision risk. They concluded, and we concur, that the only species that may suffer significant mortality from BDCP-related power lines in the areas is the sandhill crane. The authors used the highest estimate of the probability of mortality due to power line collisions from the published literature when making their computations. In addition, their estimates of the number of potential encounters between cranes and power lines were based on spatially explicit data from the BDCP region. We feel their estimate of potential crane mortality from new power lines that will be constructed is appropriate based on the information available from the site and the literature. We also feel that the estimates of the reduction in crane mortality due to placing bird diverters on existing lines are appropriate. We emphasize, however, that crane mortality from power line collisions should be closely monitored in the Plan Area and additional bird diverters should be put in place if targets for overall reduction in crane collisions are not achieved.

g. How well are the models and analyses described, interpreted and summarized?

Analysis of Potential Bird Collisions at Proposed BDCP Powerlines. The results of their analyses are well described and are well summarized in Tables 2-7 of Appendix 5.J.C. Their estimates of the mitigation from marking power lines are also well described and summarized in section 5.0 of Appendix 5.J.C.

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Appendices

Appendix A—BDCP Effects Analysis Scientific Review Panel members biographies

Nancy Monsen – Delta Hydrodynamics, Stanford University

Dr. Monsen's research has focused on multi-dimensional hydrodynamic modeling of the Sacramento-San Joaquin Delta for twenty years. Her PhD research was based on the TRIM3D hydrodynamic model. She also has consulting experience with the DELFT3d hydrodynamic model. She is currently Visiting Scholar in the Environmental Fluid Mechanics Laboratory, part of the Civil and Environmental Engineering Department, at Stanford University. Over the prior two years, Dr. Monsen worked as a Stanford Research Associate on a Delta Science program funded research project to develop a multi-dimensional hydrodynamic model of the Sacramento-San Joaquin Delta using Stanford's SUNTANS model. Prior to working at Stanford, she worked for ESA PWA (formerly Philip Williams and Associates) for a year and a half and at the U.S. Geological Survey (Menlo Park, National Research Program) for ten years. Dr. Monsen earned her doctorate in Civil and Environmental Engineering at Stanford University in 2001.

Greg Ruggerone – Anadromous Fish

Dr. Ruggerone has investigated population dynamics, ecology, and management of Pacific salmon in Alaska and the Pacific Northwest since 1979. He was the Project Leader of the Alaska Salmon Program, University of Washington, from the mid-1980s to early 1990s where he was responsible for conducting and guiding research at the Chignik and Bristol Bay field stations. Most of his research involves factors that affect survival of salmon in freshwater and marine habitats, including climate shifts, habitat degradation, predator-prey interactions, and hatchery/wild salmon interactions. He is currently a member of the Columbia River Independent Scientific Advisory Board and the Independent Scientific Review Panel. He recently served as the fish ecologist on the Secretary of Interior review of dam removal on the Klamath River.
(http://www.nrccorp.com/staff/staff_ruggerone.htm).

Charles (Si) Simenstad – Pelagic/Native Fish

Charles ("Si") Simenstad, Research Professor at the University of Washington's School of Aquatic and Fishery Science (SAFS), is an estuarine and coastal marine ecologist and coordinator of the Wetland Ecosystem Team (WET). Si has studied the organization and function of estuarine and coastal marine ecosystems throughout Puget Sound, Washington, Oregon and California, and Alaska for over forty years. Much of this research has focused on the functional role of estuarine and coastal habitats to support juvenile Pacific salmon and other biotic communities, and the associated ecological processes and community dynamics that are responsible for enhancing their production and life history diversity. Recent research has integrated such ecosystem interactions with applied issues such as restoration of estuarine and coastal wetland ecosystems, and ecological approaches to evaluating the success of coastal wetland restoration from ecosystem to landscape scales. He is presently Co-Editor in Chief of

Estuaries and Coasts, on the Editorial Board of *San Francisco Estuary and Watershed Science*, volume co-editor for the "Treatise on Estuarine and Coastal Science", a standing member of the Scientific Advisory Group (SAG) of the Interagency Ecological Program (IEP) in the San Francisco Bay-Delta, and was recently appointed to Environmental Advisory Board to the Chie of Engineers, US Army Corps of Engineers; (http://fish.washington.edu/people/simenstd/).

John Skalski – Fishery population dynamics and modeling

Dr. Skalski is a Professor of Biological Statistics in the School of Aquatic & Fishery Sciences, College of the Environment, at the University of Washington. He is also an adjunct professor in Quantitative Ecology and Resource Management and Wildlife Sciences, and an instructor in the Center for Quantitative Sciences. His expertise is in sampling theory, parameter estimation, mark-recapture theory, and population dynamics. His research focuses on the development of sampling methodology, field designs, and statistical tests for human-induced and natural effects on organismic and ecological systems. He is the statistician in charge of survival compliance testing at all 13 major hydroprojects in the Snake-Columbia River system. He has authored or coauthored over 100 technical reports on salmonid survival studies and over 40 peer-reviewed articles on tagging studies. Dr. Skalski is a member of the American Statistical Association, The Wildlife Society, and the American Fisheries Society. He is also a Certified Wildlife Biologist through The Wildlife Society.

Alex Parker – Aquatic Ecology/Food Webs

Alex Parker is an Assistant Professor of Oceanography at the California Maritime Academy, CSU and a Research Associate at the Romberg Tiburon Center, San Francisco State University. His Ph.D. work (College of Marine Studies, University of Delaware) focused on microbial biogeochemistry in the Delaware Estuary, a highly modified estuary on the US East Coast. Dr. Parker was a CALFED Post-Doctoral Science Fellow. His work in the San Francisco Estuary includes the study of pelagic phytoplankton rate processes, wetland primary producers, the dynamics of heterotopic bacteria and the carbon and nitrogen physiology of cyanobacteria in the SFE Delta. Additionally, Dr. Parker has carried out research in coastal and equatorial upwelling areas as well as polar environments.

Tom Parker, Plant Communities

Thomas Parker is Professor of Ecology and Evolution at San Francisco State University who studies the ecology and evolution of plant communities, focusing on their dynamics. Current research includes the effects of climate change on tidal wetlands of the San Francisco Bay-Delta, and the ecology and evolution of *Arctostaphylos* species in chaparral and other communities (http://bio.sfsu.edu/people/v-thomas).

T. Luke George, Terrestrial Ecology

Dr. George has been a faculty member in the Department of Wildlife at Humboldt State University since 1991. He specializes in the design, implementation, and analysis of demographic, population monitoring, and habitat selection studies of terrestrial vertebrates. His recent work has focused on estimating demographic parameters and

modeling habit selection of threatened and at risk species including the San Clemente sage sparrow, northern spotted owl, greater sage grouse, and tricolored blackbird. Dr. George assisted with the development of a population viability analysis (PVA) of the San Clemente sage sparrow and has served as an advisor on PVAs of Western snowy plovers and San Clemente loggerhead shrikes. He has conducted research on habitat selection and space use of Steller's jays and common ravens in Redwood National and State Parks and has advised state and federal agencies on strategies to reduce nest predation by corvids on marbled murrelets, Western snowy plovers, and other threatened and endangered species in California.

Appendix B—Charge to the Delta Science Program Independent Review Panel for the BDCP Effects Analysis Review, Phase 3 (dated 2/12/2014)

The Panel will be charged with assessing the scientific soundness of Chapter 5: Effects Analysis and the associated technical appendices. The Panel will make recommendations for how these might be improved with respect to achieving their stated goals. Specific attention will be given to the following questions:

Chapter 5: Effects Analysis

General Questions

1. How well does the Effects Analysis meet its expected goals?
2. How complete is the Effects Analysis; how clearly are the methods described?
3. Is the Effects Analysis reasonable and scientifically defensible? How clearly are the net effects results conveyed in the text, figures and tables?
4. How well is uncertainty addressed? How could communication of uncertainty be improved?
5. How well does the Effects Analysis describe how conflicting model results and analyses in the technical appendices are interpreted?
6. How well does the Effects Analysis link to the adaptive management plan and associated monitoring programs?

Review of Specific Analyses

7. Are the analyses related to the north Delta diversion facilities appropriate and does the effects analysis reasonably describe the results? In particular:

- Was existing empirical information such as Perry *et al.* 2010 and Newman 2003 incorporated appropriately into the modeling? Where model runs required extrapolation beyond existing data ranges, were assumptions and interpretations appropriate?
    - Does the analysis of the frequency of reverse flows at Georgiana Slough accurately characterize changes in hydrodynamics due to changes in river stage, sea level rise, and Delta habitat restoration?

8. How should the effects of changes in Feather River flows on fish spawning and rearing be characterized? In particular, how should the trade-off between higher spring flows and lower summer flows be interpreted? Does the analysis adequately capture the expected benefits of CM 2, Yolo Bypass Fishery Enhancement?
9. Does the analysis adequately describe the predation and other screen-related effects of the proposed north Delta diversion structures? Is the application of the observed mortality rate at the fish screen of the Glenn-Colusa Irrigation District (GCID) an appropriate

assumption for expected mortality at the proposed BDCP north Delta intakes? Are there other studies on salmonid survival at positive barrier fish screens that would be appropriate to apply?

10. Does the effects analysis provide a complete and reasonable interpretation of the results of physical models as they relate to upstream spawning and rearing habitat conditions, particularly upstream water temperatures and flows resulting from proposed BDCP operations?
11. Does the effects analysis use a reasonable method for "normalizing" results from the salvage-density method to the population level for salmonid species?
12. Are the assumptions of the analysis of aquatic habitat restoration food web effects appropriate for covered fish species? Are the conclusions and net effects appropriate?
13. Is the analysis of food web benefits to longfin smelt from habitat restoration appropriate? How well do the analyses link intended food web improvements to improvement in the longfin smelt spring Delta outflow/recruitment relationship?
14. How well does the analysis address population-level effects of the BDCP on white sturgeon?

Technical Appendices

For each Chapter 5 technical appendix:

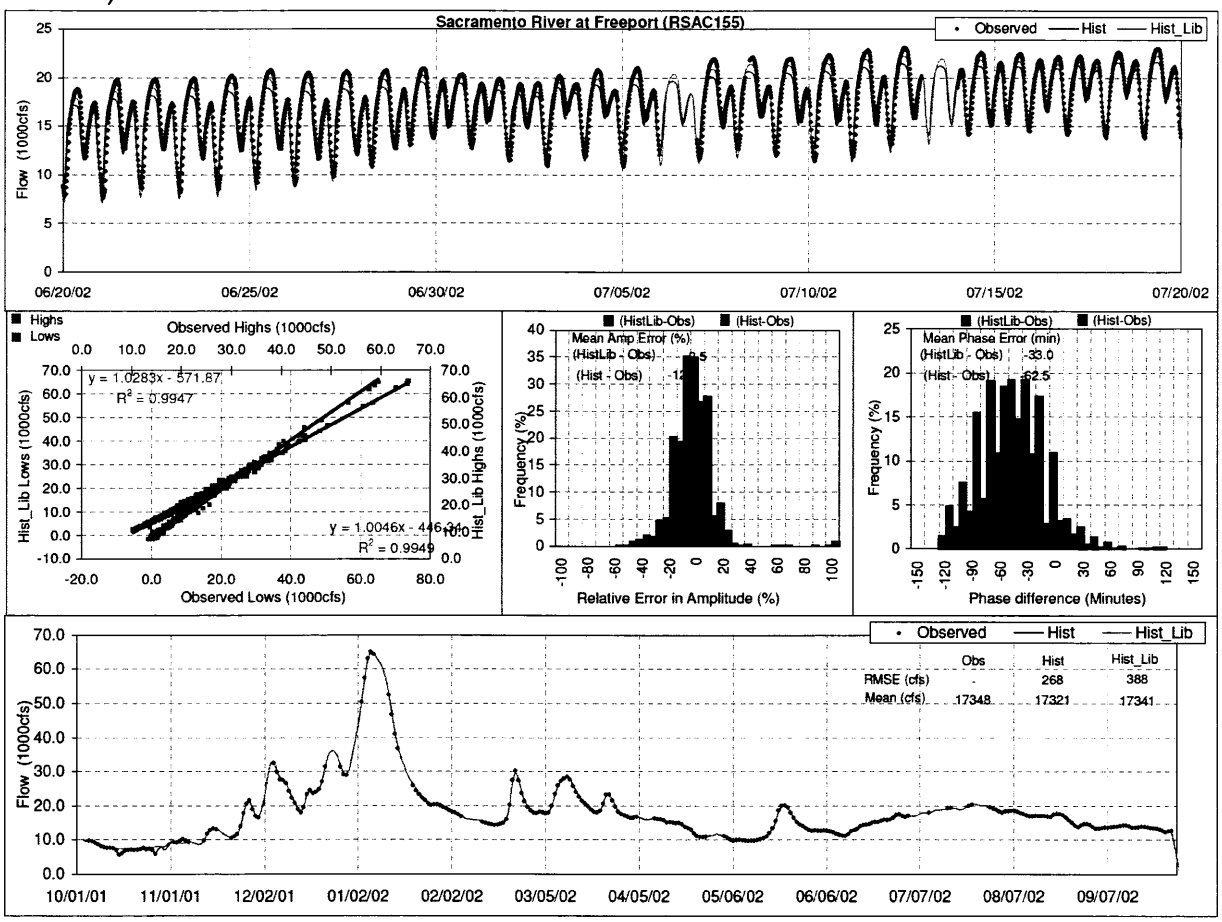
Approach and Analysis

a. How well are the proposed analytical tools defined, discussed and integrated?
b. How clear and reasonable is the scale of analysis?
c. How well were the panel's earlier comments addressed and applied in the technical appendices/analyses?
d. How well did the technical appendix evaluate the effects of potential BDCP conservation measures on the specified variable(s)?
e. Were the conclusions drawn from the results accurate and did these conclusions appropriately consider uncertainty, including chained statistical uncertainties?

Models

f. Were appropriate models used in the technical appendices? If model results conflicted, was this clearly stated and was the conflict appropriately addressed?
g. How well are the models and analyses described, interpreted and summarized?

Appendix C—Observed tidal stage and flow time series data from three key locations along the Sacramento River (from BDCP Appendix 5A-D1, pp. 128-129)



Appendix D—Variance Calculations Associated with Salvage Model

Estimator of average salvage:

$$\hat{\bar{S}} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{m} D_i V_j}{nm} \qquad (1)$$

Then, the variance of this average salvage value is as follows:

$$\mathrm{Var}\left(\hat{\bar{S}}\right) = \mathrm{Var}\left[\frac{\sum_{i=1}^{n}\sum_{j=1}^{m} D_i V_j}{nm}\right]$$

$$= \mathrm{Var}_n\left[E_m\left[\frac{\sum_{i=1}^{n}\sum_{j=1}^{n} D_i V_{ij}}{nm}\middle| n\right]\right] + E_n\left[\mathrm{Var}_m\left[\frac{\sum_{i=1}^{n}\sum_{j=1}^{n} D_i V_{ij}}{nm}\middle| n\right]\right]$$

$$= \mathrm{Var}_m\left[\frac{\sum_{i=1}^{n} D_i \bar{\bar{V}}}{n}\right] + E_m\left[\frac{\sum_{j=1}^{m} \bar{D}_i^2 \sigma_i^2}{n^2 m}\right]$$

$$= \frac{\bar{V}^2\sigma_D^2}{n} + \frac{\sigma_V^2}{m} E\left[\frac{\sum_{i=1}^{n} \bar{D}_i^2}{n^2}\right]$$

$$= \frac{\bar{V}^2\sigma_D^2}{n} + \frac{\sigma_V^2}{m} \cdot \frac{\left(\sigma_{D_i}^2 + \bar{D}^2\right)}{n}$$

$$= \frac{\bar{V}^2\sigma_D^2}{n} + \frac{\bar{D}^2\sigma_V^2}{mn} + \frac{\sigma_V^2\sigma_D^2}{m}. \qquad (2)$$

However, if the variance of $\hat{\bar{S}}$ is calculated based on the empirical variance of the nm values, the variance has the expected value as follows:

$$E\left(\frac{s_{S_{ij}}^2}{nm}\right) = \frac{E\left(s_{ij}^2\right)}{nm} = \frac{\mathrm{Var}(S_{ij})}{nm}$$

$$\frac{\mathrm{Var}(\hat{S}_{ij})}{nm} = \frac{1}{nm}\left\{\mathrm{Var}_n\left[E_m(S_{ij}|n)\right] + E_n\left[\mathrm{Var}_m(S_{ij}|n)\right]\right\}$$

$$= \frac{1}{nm}\left\{\mathrm{Var}_n\left[E_m(D_i V_{ij}|n)\right] + E_n\left[\mathrm{Var}_m(D_i V_{ij}|n)\right]\right\}$$

$$= \frac{1}{nm}\left\{Var_n[D_i\bar{V}] + E_n\left[D_i^2\sigma_{V_{ij}}^2\right]\right\}$$

$$= \frac{1}{nm}\left\{\bar{V}^2\sigma_D^2 + \sigma_V^2 \cdot E[D_i^2]\right\}$$

$$= \frac{1}{nm}\left\{\bar{V}^2\sigma_D^2 + \sigma_V^2 \cdot E[\sigma_D^2 + \bar{D}^2]\right\}$$

$$= \frac{\bar{V}^2\sigma_D^2}{nm} + \frac{\bar{D}^2\sigma_V^2}{nm} + \frac{\sigma_V^2\cdot\sigma_D^2}{nm} \qquad (3)$$

Note variance as calculated (3) is smaller than the correct variance (2). The first term of Equation (3) is inappropriately divided by m. Hence, CI width and uncertainty will be underestimated.

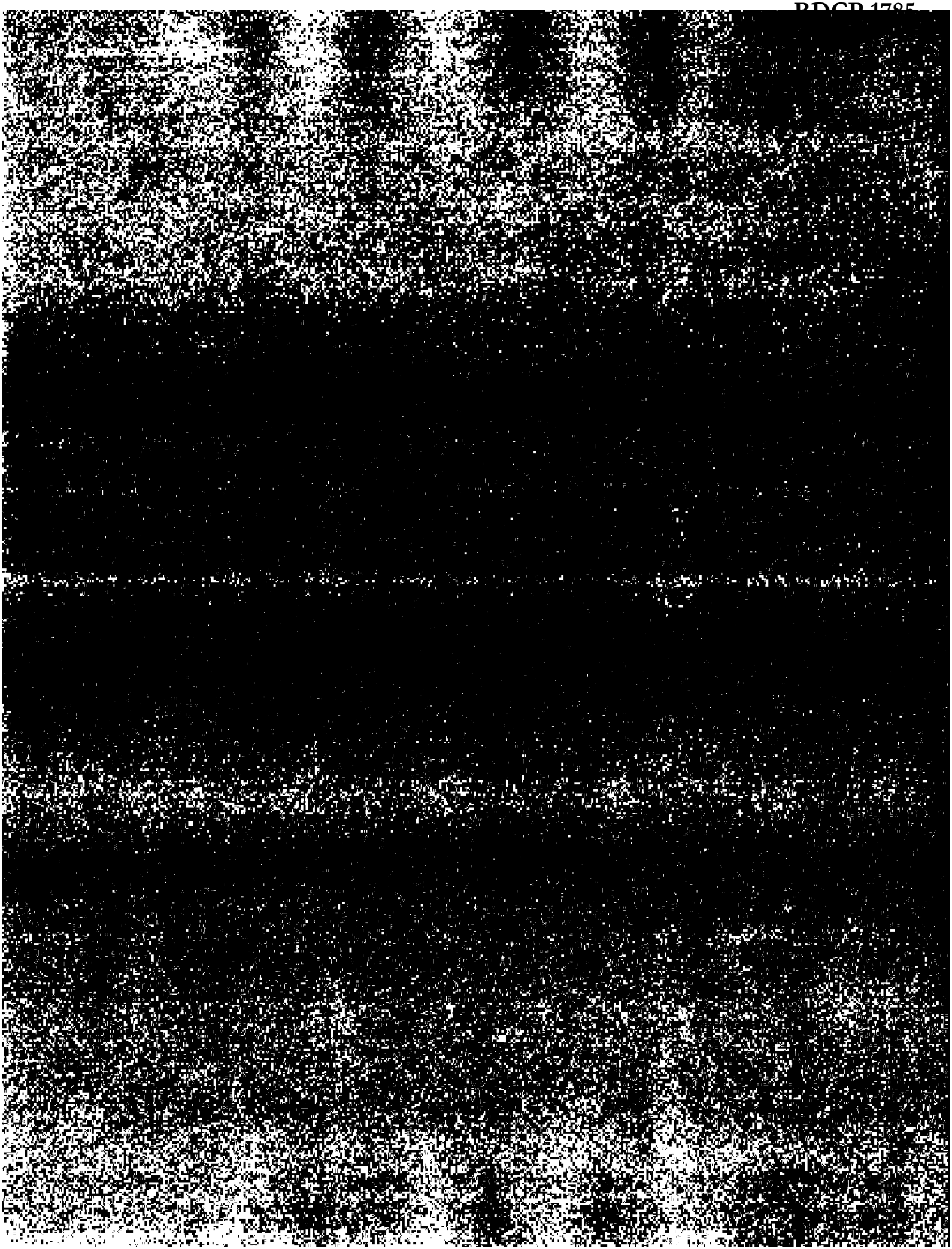


EXHIBIT C

BDCP Blog

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Correcting Stubborn Myths

December 12, 2013

By Karla Nemeth, California Natural Resources Agency

In light of the importance of the Bay Delta Conservation Plan (BDCP) to most Californians, we thought it time to address some of the stubborn "urban myths" that are being perpetuated about the BDCP. We encourage Californians to get involved with understanding the proposed plan and investigate the details for themselves.

Good water policy in California requires an open discussion of facts. It also requires a good faith acknowledgment that "final" answers aren't, by definition, to be found in "draft" documents. Public draft documents open up the process for review and constructive comments. Hopefully by correcting some more persistent myths, we will clear the way for a meaningful exchange of ideas during the public review process, set to begin on December 13, 2013.

Myth 1: *No one knows how much water will be exported under the Bay Delta Conservation Plan*. **The BDCP would provide approximately 10% more or 10% less than the average annual amount diverted by the federal and state water projects over the last 20 years** (see related video clip "How Much Water?" here). For even more detailed analysis, please see Chapter 9. The main goal is to modernize a 50-year-old water system that leaves Californians vulnerable to water shortages from court-mandated decisions, earthquakes and other natural disasters.

Myth 2: *This is a water grab for Southern California and San Joaquin Valley farmers.* **The BDCP is designed to secure existing supplies of clean, affordable, and reliable water to 25 million people** from the Silicon Valley to San Diego, the farmers who grow crops on 3 million acres of farmland, and the whole of the California economy.

Myth 3: *The BDCP will destroy the Delta's environment.* The current system is not working for the environment or for California's water users. The pumps in the south Delta tend to pull channel flows backwards, killing two out of three fish in the area. **The new system would divert water from the north Delta when fish are migrating near the south Delta pumps and would use state-of-the art fish screens. Additionally, over 100,000 acres of wetlands and tidal marsh would be protected or restored** to improve conditions for wildlife and the natural environment.

Myth 4: *No one knows how much it will cost or who will pay for the BDCP.* **The state and federal water contractors who receive water from the Central Valley Project and the State Water Project would pay for infrastructure construction and mitigation.** The Metropolitan Water District of Southern

California has estimated that this will result in an additional cost to its ratepayers of approximately $5-6 per household per month over a 10- year time frame. Most of the habitat restoration and ecosystem improvements that provide a tangible benefit to the entire state would be borne by state and federal taxpayers

Myth 5: *There is no cost-benefit analysis and no evaluation of alternative options.* **There is a cost-benefit analysis and an evaluation of alternative options.** The BDCP Chapter 9: Alternatives to Take tests different alternatives, in part to determine if alternatives would be economically feasible. Appendix 9A provides a detailed evaluation of the benefits of the proposed project to participating water agencies. A Statewide Economic Impact Study looks at the economic impacts of the BDCP on various interest groups, including Delta farmers, commercial fishing interests, recreational Delta interests, and others.

Myth 6: *No one knows how the BDCP operations will be governed.* **Section 3.4.1.4 of the Draft Plan states that operation of the new and existing water conveyance facilities would be managed to specific criteria,** and that flow criteria would be applied month by month based on water year type, and would always include a required amount of Sacramento River flow before water could be diverted.

Myth 7: *There is no clear science being used for the Bay Delta Conservation Plan.* Fishery scientists acknowledge areas of debate and uncertainty regarding the best ways to sustain Delta fish. **The BDCP deals with this scientific uncertainty by creating a rigorous Decision Tree (See Chapter 3, Section 3.4.1.4.4) process for scientists to evaluate and refine operational criteria in a structured, transparent, and collaborative way.**

Myth 8: *The BDCP process has not been transparent or open to the public.* The BDCP was developed with input from state and federal agencies and independent scientists after more than 600 public meetings and stakeholder briefings. **All of the more than 3,000 documents are posted online in an unprecedented commitment to public access and government transparency.** In 2011, a working draft BDCP was released. In 2012, administrative drafts of the BDCP and Environmental Impact Report/Environmental Impact Statement were released. Since then, the proposed project was significantly revised in response to stakeholder involvement.

The public review drafts of the Bay Delta Conservation Plan and the Environmental Impact Report/Environmental Impact Statement are scheduled for release to the public on December 13, 2013. This begins a 120 public comment period. We encourage more Californians to get involved with understanding the proposed plan by visiting http://www.baydeltaconservationplan.com.

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Correcting Stubborn Myths Part II

January 10, 2014

By Karla Nemeth, California Natural Resources Agency

. **Myth:** The BDCP doesn't include financing costs or debt service payments over the 50-year term of the project.

Fact: Ultimately, before final decisions are made about whether to proceed with the BDCP (Plan), financing costs for the project will be known and part of the public discussion. Right now, BDCP is focusing on capital, operations, and maintenance costs to determine the long-term benefits of securing this water supply source and restoring the Delta's ecosystem. The financial planning included in the public draft BDCP is a proposal that the state and federal agencies will evaluate to determine whether funding would be available to implement the Plan.

Eventually, the public water agencies that benefit from the plan will need to determine detailed financing plans that include debt service for consideration by their elected board members at public meetings. The primary cost of debt financing is the transaction costs of selling bonds. For large projects, these costs tend to average less than 1 percent of the face value of the debt. When purchases are financed by debt, like mortgages or car payments, some are tempted to calculate the total cost of the purchase by simply adding up the stream of debt payments over the life of the loan. This is a mistaken way to think about capital costs. Debt financing spreads out the costs of projects over time, adding interest costs to the repayment of principal. Counteracting this effect is the time value of money, or the rate at which consumers compare money available now to money available at some later date. If the interest rate used to discount the value of money available in the future is close to the interest rate on debt, then these two effects cancel out.

. **Myth:** Major public works projects always far exceed initial cost estimates.

Fact: Cost overruns are a risk inherent in all infrastructure projects large and small. The BDCP's cost estimates have been prepared with consideration for that risk, among others, and contain appropriate contingencies and conservative cost assumptions. For example, the budget for BDCP conveyance facilities (Conservation Measure 1) includes a 37 percent contingency. As project elements are further designed, their costs will be refined. The estimated costs of the BDCP are summarized in Chapter 8, Implementation Costs and Funding Sources.

The BDCP water facilities and portions of habitat restoration would be funded by state and federal water contractors whose ratepayers (businesses and residents) receive water from the Delta. The history of water contractors funding large water infrastructure projects of the scale of the BDCP provides evidence that funding the BDCP is feasible.

. **Myth:** The water exporters don't want to pay for the conservation measures they need to get the project permitted, so they are expecting taxpayers to fund them with a water bond.

Fact: The BDCP is required to mitigate its impacts in compliance with the federal Endangered Species Act (ESA). The BDCP is also required to provide for the conservation and management of its native species covered by the plan to comply with the state Natural Community Conservation Planning Act (NCCPA). The BDCP conservation strategy is designed to meet both laws.

State and federal water contractors will pay a share of the costs for 11 out of 22 conservation measures, as well as mitigation for the effects of water facility construction that are intended to improve conditions for covered species. (See BDCP Chapter 8, Table 8-41 for state and federal water contractor mitigation funding estimates).

Public funding would pay for the conservation measures or portions thereof that will produce statewide public benefits, as described and quantified in the Draft Statewide Economic Impact Report. These measures include habitat restoration, protection, enhancement and management, species and ecosystem monitoring and research, and program administration. These actions have a wide variety of public benefits, including benefits to the overall ecosystem, recreation, greenhouse gas reductions, and others (see BDCP Chapter 8, section 8.3.5.1 and Table 8-46).

Public funding would come from a variety of sources, including the water bond slated to go before voters in November 2014. This water bond is projected to fund $1.5 billion of BDCP costs, or 6.1 percent of the total costs of the plan. Under the plan, habitat restoration would occur during the first 40 years of the 50-year permit term. Funding for the first 10 years of restoration can come from a variety of sources, including the participating state and federal water contractors, federal appropriations, state and federal grants, and the water bond. If the water bond doesn't pass in 2014, restoration would still occur using other funding sources.

. **Myth:** The BDCP cannot guarantee reliable water supplies.

Fact: Any project that relies upon naturally variable precipitation will be forced to contend with supply fluctuations. That is true for the State Water Project (SWP) today and will continue to be true with or without the BDCP. What the BDCP can do is improve our ability to make the most of the water that is available through operational flexibility that would enhance our ability to move water and protect species while reducing the risk of natural disasters and climate change.

The BDCP estimates average water supplies of 4.7 million acre-feet to 5.6 million acre-feet in a year (one acre-foot is about as much water as two California households use each year). This is about the same average amount of water exported through the Delta right now. Water operations would vary depending on the hydrologic conditions (e.g., water year type, actual Sacramento River flows, fish presence), but would always include a required level of Sacramento River flow passing the intakes before water could be diverted. Under all conditions, operational criteria require gradual ramping up of diversions and do not interfere with major river flows. Analysis of the water supply reliability benefits and estimated annual water deliveries of BDCP are included in BDCP Chapter 9. The full range of operational criteria by water year type can be found in Chapter 3: Conservation Strategy, Section 3.4 and the corresponding appendices/tables of the public Draft BDCP.

. **Myth:** The BDCP fails to analyze possible effects on San Francisco Bay.

Fact: The BDCP does indeed analyze the effects of the project on San Francisco Bay and other water bodies downstream of the Delta.

Analyses found that because there are no project diversions downstream of the Delta, the only effects of the project on the San Francisco Bay Area would be indirect and related to flow. According to the Department of Water Resources' Delta Atlas, average tidal flow through the Golden Gate Bridge is 2,300,000 cubic feet per second (cfs) and average tidal flow at Chipps Island is 170,000 cfs. The maximum amount that BDCP would change flows downstream of the north Delta diversions is 9,000 cfs (and most of the time it would be much less). Therefore, at most, BDCP diversions represent only 5 percent of the flows at Chipps Island or less than 0.4 percent of tidal flows at the Golden Gate Bridge. Effects within San Francisco Bay would be within this range, diminishing greatly away from the Delta. Because these changes in flow are so small compared to the tidal range within the Bay, the plan concludes that there would be no effect of BDCP on the San Francisco Bay ecosystem or its native species.

- **Myth:** The agricultural contractors in the San Joaquin Valley will get about two-thirds of the water, but they can't afford the extra costs, so urban ratepayers will be expected to pay for most of the BDCP.

  Fact: A central premise underpinning the BDCP is the idea that the beneficiaries of the project should pay for the project. The goal of water supply reliability is important to both agricultural and urban water users. Every public water agency involved in pursuing the BDCP is managed by a board of elected or appointed members who have a fiduciary responsibility to the public. These board members must make business decisions that are in the best interest of their ratepayers, and they are held accountable for those decisions at public board meetings open to their ratepayers and in public elections for their positions.

  Water reliability goals apply to agricultural uses as well as urban and municipal. The BDCP Environmental Impact Report/Environmental Impact Statement (EIR/EIS) provides information relevant to this issue (see Response to Reduced Water Supply, Appendix 5B of the BDCP EIR/EIS, Demand Management, Appendix 1C of the EIR/EIS and Chapter 30 Growth Inducement and Other Indirect Effects).

- **Myth:** The project will take 9 to 10 years to build, during which time the contractors will be expected to pay for water they aren't getting.

  Fact: The state and federal water contractors are funding the BDCP water facilities with the understanding that inaction would fail to meet the needs of California businesses, homes, and farms. The BDCP proponents are committed to the 10-year construction schedule in order ensure reliable water supplies for the 25 million Californians who will depend on it after construction is completed.

  If it is approved, the proposed project will be financed in much the same way that today's State Water Project capital facilities were funded. Current State Water Project contractors' water supply charges include both fixed costs (e.g. financed capital expenditures) that must be paid irrespective of how much water is delivered and variable costs (e.g. power) that vary in proportion to the amount of water delivered.

- **Myth:** The Brown Administration wants to build the tunnels before the conservation measures are all in place, and they won't know until after they begin to operate them whether the tunnels will actually be better for endangered species.

  Fact: The BDCP conservation measures include actions to improve flow conditions, increase aquatic food production, restore habitat for covered species, and reduce the adverse effects of many biological and physical stressors on those species. All mitigation for the direct effects of the tunnels will be in place prior to the operation of the new water facility. A substantial portion of the conservation will also be in place by this time. The rest of the conservation strategy will be implemented over the remaining 40 years of the 50-year plan.

The agencies that have spent the past 7 years developing the BDCP recognize that uncertainty exists regarding the understanding of the Delta ecosystem and the likely outcomes of implementing the conservation measures. It is possible that some of the conservation measures will not achieve their expected outcomes, while others will produce better results than expected. As a component of the conservation strategy, the adaptive management and monitoring program has been designed to use new information and insight gained during the course of BDCP implementation to develop and potentially implement alternative strategies to achieve the biological goals and objectives. The adaptive management process describes how changes to the conservation measures may be made in order to improve the effectiveness of the BDCP over time. An Adaptive Management Team will be established and will have primary responsibility for administration of the adaptive management and monitoring program. It will also have primary responsibility for the development of performance measures, effectiveness monitoring and research plans; soliciting independent scientific review; and developing proposals to modify a conservation measure. The recommendations of the Adaptive Management Team will help ensure that the BDCP is implemented consistent with the Endangered Species Act and the Natural Community Conservation Planning Act permit issuance criteria.

- **Myth:** The BDCP will take the Delta's largest supply of fresh water and make it unavailable to fish, other species, and people.

  Fact: The proposed water delivery facilities would only be permitted to operate in compliance with predetermined regulatory protections, including river water levels and flow, based upon how much water is actually available in the system, the presence of threatened fish species, and water quality. Water operations would vary depending on the hydrologic conditions (e.g., water year type, actual Sacramento River flows, fish presence), but would always include a required level of Sacramento River flow passing the intakes before water could be diverted. Under all conditions, operational criteria require gradual ramping up of diversions and do not interfere with major river flows. The BDCP anticipates that annual water diversions from the Delta would be within 10 percent of the historic, 20-year average.

- **Myth:** The BDCP will take most of the Delta agricultural land out of cultivation, with no guarantee that habitat creation will work the way it is described in the Plan.

  Fact: Based on preliminary programmatic analyses used for the purpose of developing Chapter 3, Conservation Strategy of the BDCP and Chapter 12, Terrestrial Biological Resources of the BDCP EIR/S, approximately 40,000 acres of important farmland (out of out of approximately 591,000 acres of agricultural land in the study area) may be permanently impacted by the BDCP habitat restoration efforts implemented during the next 50 years. Further environmental analysis on site-specific restoration projects will assess these impacts in more detail.

  The BDCP recognizes the scientific uncertainty about whether implementing habitat restoration will result in the desired biological improvements to the Delta's native species. As a component of the conservation strategy, the BDCP includes an adaptive management and monitoring program to incorporate new scientific information during the Plan's implementation. The adaptive management program will develop and implement alternative strategies as needed to achieve the biological goals and objectives. Additional information on the process for developing the BDCP conservation measures and an implementation schedule can be found in Chapter 6 of the BDCP, Chapter 31 of the BDCP EIR/EIS, and Appendix 3G of the BDCP EIR/EIS.

- **Myth:** The BDCP will implement new diversion points/fish screens in the north Delta to avoid fixing the problems at the existing south Delta facilities.

Fact: The BDCP proposes to move the primary point of diversion to the north Delta to reduce the impact of project operations on Delta flows and reduce reliance on the south Delta facilities. DWR is developing the designs for the North Delta intakes in consultation with state and federal fish and wildlife agencies, which will include physical barriers and modern fish-screening standards. Fish screen criteria is described in the Intake Location Analysis, Appendix 3F of the BDCP EIR/EIS.

The current location of the south Delta point of diversion is a cul-de-sac-like environment where fish can accumulate and become easy prey for other fish and birds, regardless of the fish screening technology. The Department of Water Resources (DWR) and California Department of Fish and Wildlife (CDFW) believe that the health of native Delta fisheries is better served by a water delivery system in the north Delta with modern fish screens, combined with reduced pumping from south Delta channels. In addition to being technically advanced, the proposed north Delta screens will allow fish to pass by and continue on their migratory journey.

. **Myth:** The draft environmental documents for BDCP identify hundreds of adverse impacts, including 48 that are called "significant and unavoidable," which means that the water contractors paying for the project won't be expected to fix or mitigate them.

Fact: Temporary construction impacts include noise, visual, and transportation, among others. The construction-related impacts are detailed in individual resource area chapters in the Draft EIR/EIS.

The BDCP's significant and unavoidable impacts are not "unmitigated." In many cases, significant and unavoidable simply means that the lead agencies cannot be certain that the proposed mitigation will succeed in mitigating an impact to a level below significance. For example, several of the traffic mitigation measures are contingent on reaching agreements with local transportation agencies to make the necessary improvements to mitigate for significant impacts. Because these agreements require that agencies other than DWR take specific actions, it is not certain that these agencies will be able to enter into mitigation agreements and make such improvements prior to an impact occurring. In these cases where subsequent agreements must be reached with third parties, impacts are deemed significant and unavoidable.

In addition to mitigation measures, BDCP contains measures called environmental commitments (outlined in Appendix 3B of the BDCP EIR/EIS) that describe additional plans and processes that are designed to minimize project impacts. For example, Chapter 19, Transportation includes a traffic study of the Plan area impacts from construction. To minimize traffic impacts, best management practices will be implemented (see BDCP EIR/EIS Appendix 3B, Environmental Commitments). Similarly, noise impacts are minimized and mitigated as described in Chapter 23 and water quality impacts are addressed in Chapter 8 of the EIR/EIS.

. **Myth:** Marinas will be dry-docked and navigation will be restricted as water elevations are lowered, first for construction and later for operation of the project.

Fact: Chapter 15 of the EIR/EIS details impacts to recreation during construction. No marinas were identified as impacted (i.e. dry-docked). Water elevations are not expected to change in a significant way as a result of either construction or operation of the proposed project. Temporary recreational impacts include noise, visual, and the implementation of slow boat zones due to construction of intakes, siphons, and barge unloading facilities, which will cause some impacts to high-speed recreation near the construction sites. All boating navigation will be mitigated to allow for boat passage. During operation of the BDCP water facilities, the head of Old River operable barrier will include a boat lock to provide passage for boaters.

In the long-term, the BDCP is expected to enhance recreational opportunities in the Delta. The environmental commitments (see Appendix 3b of the EIR/EIS) for recreation include possible improvements to existing

recreational facilities, a barge management plan, and broader best management practices that will reduce impacts to recreational boating.

. **Myth:** Recreational and commercial fishing will suffer from reduced flows and reduced water quality in the Delta and the Bay.

Fact: Recreation is identified as a covered activity in the BDCP. The BDCP includes actions to enhance recreational boating opportunities by implementing "other commitments" that enhance Delta recreation facilities (see Appendix 3B of the EIR/EIS) and implementing mitigation measures regarding recreational coordination, notification, safety considerations, and alternate recreational routes.

The BDCP would be permitted to operate only with regulatory protections, including river water levels and flow, which would be determined based upon how much water is actually available in the system, the presence of threatened fish species, and water quality standards. Water operations would vary depending on the hydrologic conditions (e.g., water year type, actual Sacramento River flows, fish presence), but would always include a required level of Sacramento River flow passing the intakes before water could be diverted.

. **Myth:** The BDCP does not meet the 2009 Delta Reform Act goal of reduced reliance on the Delta.

Fact: The Delta Reform Act defines the "coequal goals" as providing a more reliable water supply and protecting, restoring, and enhancing the Delta ecosystem (Water Code Section 85054). Inherent in the coequal goals are eight objectives for managing water for environmental resources, including protecting the uniqueness of the Delta, improving water conveyance, and establishing a new governance structure (Water Code Section 85020). **The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency**. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

The BDCP EIR/EIS Appendix 1C, Demand Management describes the State's effort to work with local water agencies to improve regional water management and integration of resources consistent with this policy.

. **Myth:** The BDCP is out of money, and needs an additional $1.2 billion more for planning.

Fact: The cost of planning for the BDCP, including writing the plan, preliminary engineering and environmental review, has been conducted within the budget projected in 2009 and established in 2012. That budget, barring significant delays, will cover the cost to bring the project to the final EIR/EIS, which is anticipated for late 2014 at the earliest. The $1.2 billion is an expected expense and is included in the $14.5 billion design and construction estimate for the proposed water conveyance system. The figure includes money for project engineering and design and other preconstruction activities. The funding is not a cost overrun for planning or design.

. **Myth:** Preliminary engineering is only at about a 10% level and should be much further along.

Fact: The level of design that is required to support environmental analysis is not the same as that required to begin construction. The engineering conducted to date is that which has been necessary to support the environmental analysis and Plan development. Additional design and engineering work would be required following project approval before construction could commence.

. **Myth:** Spending money on the BDCP will mean that there won't be enough money to do other water projects, like desalination or recycling.

Fact: The BDCP serves as one part of California's overall water portfolio. The State Water Action Plan, released by the Brown administration in November, outlines a clear path for addressing California's overall water needs, including storage, desalination, water conservation, and regional self-sufficiency. The BDCP will not eliminate the opportunity for additional water projects. In fact, The Safe, Clean, and Reliable Drinking Water Supply Act of 2012 includes funding for a variety of activities – other than BDCP - that would improve the quality and reliability of California's water supply (for more information, see California Water Code section 79700).

Local public water agencies each manage their own diverse supply portfolio. Public water agencies are investing in the BDCP because their leaders see it as an affordable way to secure an existing water supply against future risk, including climate change and earthquakes. Like the State, they continue to be committed to developing other water supply methods that are appropriate for their local circumstances. California needs both the BDCP and investments in other regional and local projects to help cope with climate change and satisfy expected growth in demand.

. **Myth:** The BDCP will cause species extinction.

Fact: The BDCP is a Habitat Conservation Plan and Natural Community Conservation Plan, which are regulated by federal and state laws and meant to conserve threatened and endangered species. Made up of 22 individual conservation measures, the BDCP seeks to implement up to 145,000 acres of habitat restoration. Shaped by more than 200 biological goals and objectives, the plan intends to protect and promote the recovery for all 56 species it covers. In order for the state and federal fish and wildlife agencies to issue their endangered species permits, they must find that BDCP does not cause the extinction of any of the covered species and in fact contributes to the recovery of those species. More information on the net beneficial effects for covered species can be found in BDCP Chapter 5 (Effects Analysis).

. **Myth:** The BDCP tunnels are worthless.

Fact: The BDCP tunnels would secure reliable drinking supplies for 25 million Californians from the Bay Area to San Diego and water for 3 million acres of farmland for the next half century.

The BDCP is estimated to:

- Protect and save more than 1 million jobs, including 60,000 farm jobs
- Generate more than $84 billion in increased economic productivity over the life of its permit
- Protect $10 billion in farm output
- Protect against a $1 billion increase in consumer food costs.

The BDCP also represents the most comprehensive, science-based effort to date to restore the Delta ecosystem, protect 56 threatened or endangered species, and plan for climate change and natural disasters. More information on the BDCP economic benefits can be found in the Draft Statewide Economic Impact Report. More information on the BDCP benefits to the Delta ecosystem can be found in BDCP Chapter 3: Conservation Strategy. More information on BDCP's climate change adaptation can be found in BDCP Appendix 2C: Climate Change Implications and Assumptions and in the EIR/EIS Chapter 29: Climate Change.

. **Myth:** The BDCP will destroy salmon.

Fact: Today, approximately 95 percent of juvenile San Joaquin salmon and 60 percent of Sacramento River Chinook salmon do not survive their migration through the Delta. The existing Delta habitat relied on by salmon has been severely degraded, drawing in predators and limiting food supplies. The BDCP would contribute to salmon recovery by improving the health of the Delta ecosystem. This, in turn, will create conditions in the Delta that will foster a more resilient salmon population better suited to withstand adverse and unpredictable conditions in the future, such as climate change.

A recent UC Davis study in the Yolo bypass highlights the significant benefits to salmon by providing rearing habitat on floodplains. The BDCP conservation measures (especially Conservation Measure 2) specifically address salmon needs through the following measures:

- New water diversion points on the Sacramento River designed to effectively screen out young fish
- Increased production of food supplies
- More and better habitat
- Improved water quality
- Improved flows
- Reduced predation

Performance of the BDCP restoration actions will be guided by specific and measurable biological goals and objectives established for salmon, as well as the 55 additional species covered by the Plan.

. **Myth:** The Delta is a non-seismic region.

Fact: There are no records of an earthquake causing levee failure in the Sacramento-San Joaquin Delta, and long-time residents may never have felt an earthquake. But that does not mean the region is not seismically active. Roughly 160 years of experience with Delta levees is not enough time to truly understand seismic hazard, and the span of a person's life is essentially meaningless to the issue. Consider two recent events as an illustration:

- A magnitude 7 earthquake struck Haiti in January 2010, killing over 300,000 people. The previous large earthquake in the region occurred in 1770.
- The 2011 magnitude 9 Tohoku Earthquake generated strong shaking and a deadly tsunami that devastated Japan. The previous event of this size occurred in 869 AD.

Both of these earthquakes were preceded by similar events hundreds of years prior, long before any living person was born. To characterize seismic hazard based on the experiences of local residents or written history in a place as recently settled as California would be dangerous. Instead, scientists try to understand the hazard by characterizing earthquake faults that might shake a particular site, and then estimating the effects of various earthquake scenarios (i.e., ground shaking, tsunami).

Thorough seismic hazard analyses have been performed in the Delta by highly qualified scientists, and we know with certainty that the Delta has been strongly shaken in the past and will be strongly shaken in the future. We don't know precisely when strong shaking will occur again, but we know it will happen eventually and we can characterize the probability that a certain level of shaking will be exceeded in a particular year. We also know that earthquakes are rare events, and the lack of strong shaking during the existence of the man-made levees and the lifetimes of local residents is not surprising.

. **Myth:** Uncertainty about the seismic risk argues for doing nothing to address it.

Fact: Some would argue that because the seismic risk in the Delta is uncertain, there is no need to try to

mitigate such an event. Although the seismic hazard is uncertain, we can quantify that uncertainty to help guide decision-making. For example, according to the Delta Risk Management Strategy report published by the California Department of Water Resources in 2009, there is a one percent annual probability that ground shaking will exceed 0.15 g near the western edge of the Delta. This level of ground motion could induce liquefaction in Delta levees, thereby causing a breach. Not knowing when or where an earthquake will strike does not justify inaction.

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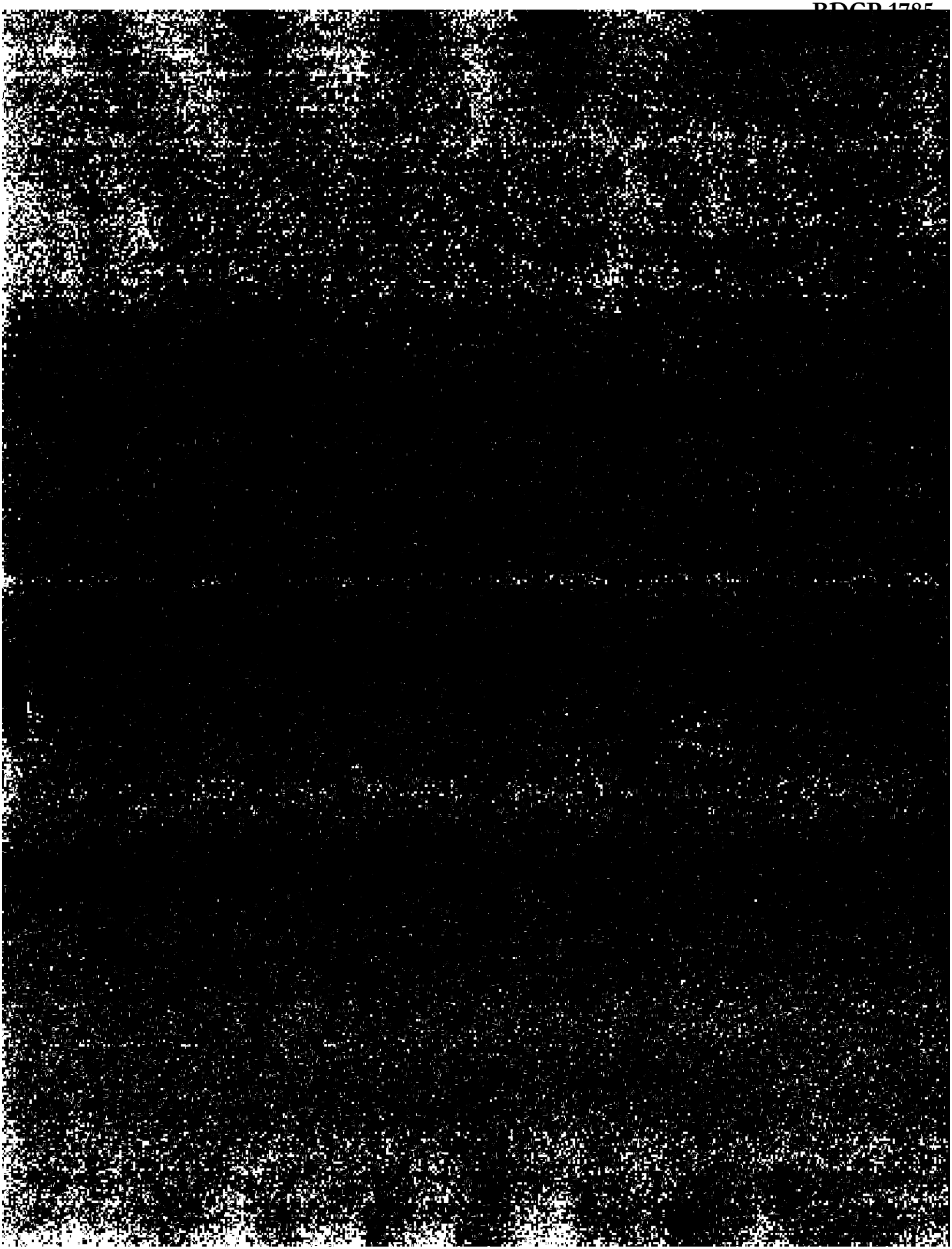

EXHIBIT D

ISB Report

May 2014

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May 15, 2014

To: Randy Fiorini, Chair
Delta Stewardship Council

Charlton Bonham, Director
California Department of Fish and Wildlife

From: Delta Independent Science Board

Subject: Review of the Draft EIR/EIS for the Bay Delta Conservation Plan

The Delta Reform Act of 2009 (§85320(c)) instructs the Delta Independent Science Board to review the Bay Delta Conservation Plan (BDCP) Draft Environmental Impact Report/Environmental Impact Statement (DEIR/DEIS) and to submit our comments to the Delta Stewardship Council and the California Department of Fish and Game. We have focused our review on the adequacy of the science and the validity of the conclusions drawn from that science. The accompanying document constitutes our legislatively mandated review.

We commend the preparers of the Draft BDCP documents for assembling and analyzing mountains of scientific information, and for exploring environmental impacts of many proposed BDCP actions. The preparers faced a bewildering array of regulatory requirements and economic, social, and political pressures.

We find, however, that the science in this BDCP effort falls short of what the project requires. We highlight our concerns in the attached report. The report, in turn, draws on our detailed responses to charge questions from the Delta Stewardship Council (Appendix A) and on our reviews of individual chapters in the DEIR/DEIS (Appendix B). Our concerns raise issues that, if not addressed, may undermine the contributions of BDCP to meeting the co-equal goals for the Delta.

cc:
California Natural Resources Agency
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Ren Lohoefener, Regional Director, Pacific Southwest Region

Review of the Draft BDCP EIR/EIS and Draft BDCP

Conducted by the

Delta Independent Science Board

May 15, 2014

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Summary of Major Concerns

Does the Bay Delta Conservation Plan (BDCP) Draft EIR/EIS (DEIR/DEIS) use the best available science in analyzing project alternatives and their effects? That is, do the analyses use science that is good enough, and use it well enough, for a project that is so large, complex, expensive, long-lasting, and important?

We find that the DEIR/DEIS currently falls short of meeting this "good enough" scientific standard. In particular:

1. Many of the impact assessments hinge on overly optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration.
2. The project is encumbered by uncertainties that are considered inconsistently and incompletely; modeling has not been used effectively to bracket a range of uncertainties or to explore how uncertainties may propagate.
3. The potential effects of climate change and sea-level rise on the implementation and outcomes of BDCP actions are not adequately evaluated.
4. Insufficient attention is given to linkages and interactions among species, landscapes, and the proposed actions themselves.
5. The analyses largely neglect the influences of downstream effects on San Francisco Bay, levee failures, and environmental effects of increased water availability for agriculture and its environmental impacts in the San Joaquin Valley and downstream.
6. Details of how adaptive management will be implemented are left to a future management team without explicit prior consideration of (a) situations where adaptive management may be inappropriate or impossible to use, (b) contingency plans in case things do not work as planned, or (c) specific thresholds for action.
7. Available tools of risk assessment and decision support have not been used to assess the individual and combined risks associated with BDCP actions.
8. The presentation, despite clear writing and an abundance of information and analyses, makes it difficult to compare alternatives and evaluate the critical underlying assumptions.

This overview expands on these major concerns, suggests possible improvements, and states our concurrence with the major points of a recent review of the BDCP Effects Analysis. More detail and specifics are provided in two appendices. Appendix A contains our responses to specific charge questions from the Delta Stewardship Council. Appendix B evaluates most of the individual resource chapters in the DEIR/DEIS.

Review Process and Approach

The Delta Reform Act of 2009 (§85320(c)) instructs the Delta Independent Science Board to review the Bay Delta Conservation Plan (BDCP) Draft Environmental Impact Report/Environmental Impact Statement (DEIR/DEIS) and to submit its comments to the Delta Stewardship Council and the California Department of Fish and Game. To meet this responsibility, we conducted interviews, held briefings, and spent hundreds of hours reviewing the chapters and appendices of the DEIR/DEIS. Our review focuses on the science in the DEIR/DEIS: how well the statements and conclusions are supported by current scientific information; how science is applied to proposed actions; how completely actions and their potential consequences have been assessed; and how science is communicated. To understand the content of the DEIR/DEIS, we found it necessary to extend our review to include chapters and appendices in the Draft BDCP. We reviewed files posted on December 9, 2013, at http://baydeltaconservationplan.com/PublicReview.aspx. We also considered comments on a preliminary draft of our review provided by the Department of Water Resources[1], for which we thank the Department staff.

Our review focuses on identifying problems so that they can be addressed. We view the BDCP as a rare opportunity to coordinate scientific approaches and strategic decisions regarding infrastructure and human resources, together with environmental, regulatory, institutional, and financial aspects of Delta management—all in the context of improving water-supply reliability and ecosystem health in the Delta. Our review has been influenced by the recognition of the importance of this unique opportunity, and also by an awareness that the BDCP may not yet mesh as well as it could with the broad goals of the Delta Plan.

Some Strengths of the Draft BDCP and DEIR/DEIS

Although many of our comments in this review draw attention to areas in which we find the BDCP documentation or analyses inadequate or incomplete, it is important to recognize at the outset that the Draft BDCP and DEIR/DEIS represent a massive undertaking. An astounding amount of information is presented, accompanied by an impressive array of analyses of a comprehensive range of proposed actions and their potential effects. The efforts of the many contributors to the documents and the underlying foundation should be recognized and appreciated.

We mention here several areas in which the BDCP efforts are particularly noteworthy:

- Background descriptions of the Delta environment, the CEQA and NEPA context, and projections of climate change and sea-level rise, among others, are detailed yet clear.
- The presentation of alternative water-conveyance designs (CM1) is comprehensive and evenly balanced.
- Many of the resource chapters are extensive and comprehensive, presenting an overwhelming amount of information and detail, while focusing on some of the most critical potential impacts.

[1] http://deltacouncil.ca.gov/sites/default/files/documents/files/ISB-Comment-Form-040114-final.pdf.

- Where impacts are anticipated, appropriate Mitigation Measures or Avoidance and Minimization Measures are often described.
- Although the set of models used is limited, the ones that are used are employed effectively.
- There is frequent reference to the important role that adaptive management and monitoring will play in implementing the actions and evaluating their effects; there is a clear intention to make adaptive management a centerpiece of the project.
- There are in-depth evaluations of individual species, particularly the use of full life-cycle models for two of the salmon.
- Climate change and sea-level rise are not only mentioned, but are incorporated into some of the analyses.

Major Concerns

We found several broad areas in the DEIR/DEIS (including referenced parts of the Draft BDCP) to be scientifically incomplete or insufficient. Addressing these deficiencies will strengthen the prospects for improving water reliability and ecosystem health in the Delta through the BDCP and enhance its integration into the Delta Plan.

1. *Expectations for the effectiveness of conservation actions are too optimistic.*— Throughout the DEIR/DEIS, the BDCP actions, as supplemented by Avoidance and Minimization Measures and Mitigation Measures, are assumed to produce the anticipated benefits when they are needed to offset any impacts of BDCP actions. In essence, it is often argued that Conservation Measures (CM) 2–22 will have sufficient positive benefits for covered species to counterbalance any negative impacts of water diversions and changes in flow caused by proposed alternatives (CM1).This is an implausible standard of perfection for such a complex problem and plan, as noted in our reviews of Chapters 11 and 12 (Appendix B). It would be better to begin with more realistic expectations that include contingency or back-up plans.

2. *Uncertainties are inconsistently and incompletely addressed.*— Project conclusions or comparisons among alternatives or the impacts of the Conservation Measures are encumbered by unaddressed uncertainties. Uncertainties accompany every action and consequence discussed in the DEIR/DEIS, ranging from the designations of habitats for individual species, to projections of entrainment, to modeling results used in the analyses. When combined, these uncertainties will be compounded and propagate. Although the Draft BDCP discusses some of these uncertainties, they are treated inconsistently in the DEIR/DEIS and are largely ignored in the Executive Summary. These concerns are elaborated in Appendix A under the heading 'Uncertainty,' and related concerns about treatment of assumptions can be found there under 'Sensitivity to assumptions, uncertainty, and conflicting data.' If the outcomes of an action are considered too uncertain or speculative, it is sometimes argued in the documents that this uncertainty is sufficient reason not to address the issue of uncertainty at all. This approach is apparently based on a strict and narrow reading of NEPA and CEQA guidelines, which "require lead agencies to assess the potential for environmental effects based on the best available

information and tools and avoid speculation".[2] Avoiding clear articulation of uncertainties is not the same as avoiding speculation. By inadequately addressing uncertainties, the documents may fail to prepare those charged with implementing the Plan to deal with surprises. Unaddressed, uncertainties can pose major and significant risks to the project as a whole and lead to false expectations from managers and stakeholders. If uncertainties are acknowledged, however, expectations of the outcomes and benefits of BDCP actions will be more realistic, enabling a more reasoned assessment of how the actions align with NEPA and CEQA standards.

Although each of the BDCP actions is accompanied by uncertainties, perhaps the most important relate to how and to what extent the uncertain benefits of the actions detailed in Conservation Measures 2-22 will counterbalance the more certain impacts of Conservation Measure 1. It is important to recognize that Conservation Measures 2-22 are likely to have values in their own rights and are worth implementing regardless of which alternative (if any) is eventually selected. It seems reasonable to us that these measures will likely have positive effects on the ecological health and water quality of the Delta. Whether those positive effects will be adequate to offset the negative impacts of Conservation Measure 1, as assumed in the DEIR/DEIS, is uncertain, in part because they are given only program- rather than project-level analysis. As we state in the review of Chapter 11 (Appendix B), these measures are hypotheses to be tested, or perhaps broadly defined adaptive-management experiments. They need to be treated as such.

3. *The potential effects of climate change and sea-level rise are underestimated.*—Future climate change and sea-level rise are perhaps the greatest sources of uncertainty affecting BDCP. The Draft BDCP and DEIR/DEIS describe how climate change and sea-level rise might influence communities, species, and some aspects of hydrology, and how the BDCP actions may enhance resiliency and adaptation to these effects. However, the speed, magnitude, and intermittent nature of these changes may alter the outcomes of BDCP actions from what is planned. The potential direct effects of climate change and sea-level rise on the effectiveness of actions, including operations involving new water conveyance facilities, are not adequately considered. We focus on these concerns in our review of Chapter 29 and in a marsh-accretion sidebar in the Chapter 12 review (Appendix B). Similar comments could be made about the treatments of other disrupting factors, such as floods, levee failures, earthquakes, or invasive species, any of which could profoundly alter the desired outcomes of BDCP actions.

   In their response to our preliminary draft review, the Department of Water Resources noted that "the scope of an EIR/EIS is to consider the effects of the project on the environment, and not the environment on the project".[3] If the effects of major environmental disruptions such as climate change, sea-level rise, levee breaches, floods, and the like are not considered, however, one must assume that the actions will have the stated outcomes. We believe this is dangerously unrealistic. CEQA requires impacts to be assessed "in order to provide decision makers enough information to make a reasoned

[2] http://deltacouncil.ca.gov/sites/default/files/documents/files/ISB-Comment-Form-040114-final.pdf, comment #4 and others.

[3] http://deltacouncil.ca.gov/sites/default/files/documents/files/ISB-Comment-Form-040114-final.pdf.

choice about the project and its alternatives".[4] Surely this choice should also include consideration of factors that may substantially alter the outcomes of the project.

4. *Confounding effects of linkages and interactions among species, landscapes, and the proposed actions themselves are insufficiently considered.*—The DEIR/DEIS acknowledges that the Delta is a complex, interacting system. In such systems, actions in one place or for one species will affect dynamics, both there and elsewhere, of the same or other species. Consequently, failure to meet the expectations of BDCP actions will have cascading effects. If the competitive or predatory effects of one species on another or the effects of habitat restoration in one place on upstream or downstream restoration projects are not fully considered, the effectiveness of actions may be compromised. Although some non-covered species are combined for analysis and some predation effects are considered, much of the DEIR/DEIS is focused on individual species, particular places, or specific actions that are considered in isolation from other species, places, or actions. In particular, potential predator-prey interactions and competition between covered and non-covered fish species are not fully recognized. By failing to treat the Delta as a fully functioning and integrated ecosystem, however, interactions that may enhance or undermine the effectiveness of BDCP actions may be overlooked. The potential consequences of such interactions should be described and evaluated, even if only in a qualitative way. Our reviews of Chapters 11 and 12 (Appendix B) provide additional details.

5. *Several important effects are neglected.*—Although the DEIR/DEIS and Plan deal comprehensively with a multitude of potential impacts, we note several effects for which the treatment does not measure up to their importance. Appendix A gives examples under 'Impacts selected for thorough analysis.'

   First, the geographic scope of the DEIR/DEIS was defined to exclude San Pablo Bay and San Francisco Bay. The consequences of BDCP actions undertaken within the Plan Area, however, will extend downstream to affect these bays. Changes in sedimentation in the Delta associated with BDCP actions, for example, will not be confined to the Delta. Likewise, changes within the bays (e.g., tidal wetland restorations) will affect tidal fluxes and salinity intrusion into the Delta. Many fish species also migrate into or through these areas.

   Second, although levees receive considerable attention in both documents (as befits their importance to what goes on in the Delta), the coverage is disconnected and incomplete. In particular, neither the consequences of levee failures on the effectiveness of BDCP actions nor the financial implications of demands for levee maintenance receives adequate attention. The assumption that most levee breaches will be repaired seems unrealistic.

   Third, the increased water reliability produced by BDCP (if successful) will particularly benefit the agricultural sector, and these economic benefits receive quantitative attention

[4] http://deltacouncil.ca.gov/sites/default/files/documents/files/ISB-Comment-Form-040114-final.pdf, comment #17.

in the Plan and DEIR/DEIS. However, there is no parallel discussion of possible environmental impacts that might arise as increased reliability affects which crops are planted, how fertilizers and pesticides are used, or how these changes might affect agricultural runoff and water quality.

All three of these examples reflect decisions about how to set boundaries for the BDCP impacts and analyses. San Pablo and San Francisco bays are not considered because they fall outside of the legal boundaries of the Delta. For both levee failures and the environmental impacts of increased water reliability for agriculture, the argument is made that the potential impacts are too speculative to be included in the analyses, so uncertainty (at some undefined level) has determined a boundary on what is or is not considered. We do not believe that the processes used to determine these boundaries have been made explicit, nor are the boundaries scientifically justified. We know that there is a high likelihood of future levee breaches and that farmers will adjust their crops and management in response to changing water availability. Although we may not be able to anticipate these changes in detail, to ignore them is to pretend that they won't happen. Sufficient information exists to construct and evaluate future scenarios. These potential effects merit more careful consideration.

6. *The adaptive management process is not fully developed.*—In keeping with its importance, adaptive management receives comprehensive discussion as the third and longest section in our response to the Delta Stewardship Council's charge questions (Appendix A). Adaptive management is the key to dealing with uncertainties and successfully implementing BDCP. The proposed organizational infrastructure to support adaptive management is well described in the Plan. Yet, although adaptive management is mentioned frequently in the DEIR/DEIS, details about how it will be designed and done are left to a future Adaptive Management Team. As a result, it is unclear how adaptive management will be integrated into the implementation of BDCP, whether the scientific skills needed to plan and oversee adaptive management will exist in the Implementation Office and on the Adaptive Management Team, and whether the capacity to conduct the monitoring and analysis needed for adaptive management will be available. Because conditions in the Delta and responses to BDCP actions may change quickly, the adaptive-management process must be nimble and flexible, yet the organizational structure may delay rather than expedite needed adjustments. Although the Draft BDCP has an extensive listing of performance measures linked to its Biological Goals and Objectives, the measures needed to evaluate actions and make adjustments are not addressed substantively in the DEIR/DEIS. Neither are there any indications of the criteria that might be used to establish "trigger points" at which adaptive management procedures would be initiated. This becomes particularly problematic if certain species are benefitting from actions and others are doing worse.

   Because BDCP actions will not likely play out as planned, it may be useful to view them as planned experiments or hypotheses to be tested. Consequently, it would be prudent to have contingency plans generally outlined *before* discovering that actions are not working as expected. Yet contingency plans are rarely mentioned in the documents we reviewed. We are not yet convinced that the process of actually doing adaptive

management (rather than creating an organizational infrastructure for it) has received the thoughtful development it requires, given its central role in implementing BDCP and ensuring that impacts and benefits balance. Consequently, we have substantial misgivings about how well the proposed adaptive management process, as proposed, will actually function as a key component of BDCP.

7. *Risks are not modeled or fully evaluated.*— There are risks with almost every action proposed as part of BDCP. These risks can interact and cascade, with potentially major consequences. Risk assessment and decision theory can be used to assign probabilities, uncertainties, and magnitudes to various risks. Such tools could help evaluate which aspects of BDCP are most vulnerable to high-consequence risks and aid in preparing contingency plans. We found no indications that the available scientific approaches to risk assessment were used to any great extent in the development of BDCP. Given the concerns over uncertainty and the proposed adaptive-management plan, it would be worthwhile to consider incorporating structured decision-making into the process. We provide some useful references in Appendix A in the section 'Tools for decision making.'

8. *Descriptions of the alternative conveyance structures, operations, and environmental impacts do not facilitate informative comparisons.*—A central purpose of an EIR/EIS is to clearly describe the alternative options—in this case, water-conveyance operations—and their relative impacts. In the DEIR/DEIS, each alternative is examined separately in great detail, in a consistent manner. However, because no overall framework is provided to draw together the specifics of the alternatives in a clear way, it is difficult to compare alternatives. Consequently, it is challenging to develop a rigorous assessment of the relative strengths and weaknesses of the alternatives, as we discuss in the section labeled 'Clarity' in Appendix A. Moreover, each alternative is influenced by the areas of concern we have noted above. Treating all alternatives in exactly the same way ignores the reality that these factors affect the alternatives and conclusions about their impacts in different ways, further confounding comparisons.

Relation to the Findings of the BDCP Effects Analysis Panel Review

In March 2014 the Delta Science Program released the final report of Phase 3 of an Independent Panel's review of Chapter 5 (Effects Analysis) of the Draft BDCP, dealing with the analysis of potential ecosystem effects of BDCP actions. This review was released after we had completed an interim draft of our findings. The Independent Panel's review was narrower and deeper than ours, dealing with a single (lengthy) chapter rather than the entire DEIR/DEIS and relevant parts of the Draft BDCP documents.

We have reviewed the report of the Independent Review Panel and concur with their findings. Here, we note several important areas of agreement in the reviews. In particular, the reviewed documents:

- Do not adequately convey the sources and effects of uncertainties. Although significant uncertainties were included in technical appendices of the Draft BDCP, they were not

adequately addressed in Chapter 5. In particular, the critical uncertainties associated with the presumed beneficial effects of tidal wetland restoration were not addressed;

- Do not include clear statements of critical assumptions underlying many of the proposed actions and their consequences;
- Characterize adaptive management as the default solution to unresolved issues and uncertainties, without a clear description of how adaptive management will actually be implemented or how it is tied to monitoring;
- Fail to recognize that habitat restoration is a lengthy process with uncertain results and timing;
- Present modeling results without thorough sensitivity analyses or consideration of a range of possible scenarios;
- Partition the Delta into separate pieces (e.g., covered species) without also considering linkages and the broader spatial and temporal dynamics of the Delta as a system;
- Use a flawed analysis to determine net effects. Although a semi-quantitative approach is used initially, the final analysis uses professional judgment to assess net effects. As such, it is a "working hypothesis," although this is not acknowledged throughout the document; and
- Present a massive amount of detailed information in a poorly organized and synthesized fashion with no clear and concise summaries, making it difficult to evaluate and compare the consequences of proposed BDCP implementation alternatives.

Improvements in the Scientific Framework of BDCP

We recognize that many people have put a tremendous effort into preparing the Draft BDCP and DEIR/DEIS, which contain a wealth of detail and many useful analyses of potential actions. Nonetheless, the documents, and the eventual implementation of BDCP (if approved) would benefit from a careful consideration of the major points made above and in the more detailed treatments in Appendices A and B. Here, we offer several specific suggestions for improving science-related treatments; we follow with suggestions for improving the presentation of information in the DEIR/DEIS.

1. *Develop adaptive institutional, regulatory, scientific, human resource, and financial capacities.*—The ability to adapt implementation to changing conditions is the most important need for BDCP. It is implausible to expect that the Delta's future will occur exactly as assumed in any DEIR/DEIS analyses. Without the institutional, regulatory, legal, scientific, human resource, and financial capacities to adapt, BDCP will be unable to achieve its stated objectives. Broadly collaborative yet decisive governance is essential. While it may be premature to establish a framework for collaboration before BDCP is underway, it is not too early to begin planning. At this time, there is little in the Draft BDCP or the DEIR/DEIS to suggest how the many individual agencies, each with narrow responsibilities and its own mandates and agendas, will be integrated to conduct the effective research, integrative monitoring, modeling, and adaptive management needed to implement BDCP. Experience with the Interagency Ecological Program (IEP), however, shows it can be done.

2. *Integrate BDCP science with the Delta Science Plan.*— The science for BDCP must be clearly linked to the many related scientific problems of managing the Delta, and this scientific capability must be widely perceived as being independent and transparent. Science that is fragmented and partitioned among entities and interests is open to advocacy, which is unlikely to improve conditions in the Delta and will ultimately work against long-term adaptation and the interests of the state and stakeholders. Most of the major science activities must be broadly collaborative. If Delta management is to be guided by science, then science will need to be integrated and effectively communicated. The "One Delta, One Science" foundation of the Delta Science Plan provides a detailed roadmap for achieving this integration. Care should be taken to ensure that the organization and implementation of research, data management, modeling, and monitoring as parts of BDCP are closely meshed with the Delta Science Plan.

3. *Initiate pilot restoration actions as soon as possible.*— Pilot restoration actions (and other projects to address critical uncertainties) should be initiated as soon as possible, within a scientific framework that will allow BDCP and others to test, refine, and improve the effectiveness of restoration. Some studies that are already underway can be incorporated into BDCP once (or if) it is permitted; other studies being planned could benefit by addressing needs identified in the Draft BDCP or DEIR/DEIS. Current and planned habitat restoration projects in the Delta should be aligned as much as possible with the priorities identified in BDCP and the Delta Plan. This approach can reduce uncertainty and costs over the duration of the project and advance the early application of adaptive management.

4. *Use risk-based decision analysis to gain useful insights.*— A risk-based decision analysis of alternatives that includes some major contingencies would provide a more rigorous basis for structuring the document and developing a preferred alternative(s) for BDCP. A risk-based decision framework could be used to explore how potential adjustments in, for example, the size and placement of habitat restorations or the capacity of the Delta conveyance facility might reflect opportunities or problems likely to arise in the future. Such analyses could explicitly incorporate uncertainty into the comparisons of alternatives, while assessing other decisions about BDCP actions. Several tools are available (see Appendix A); although these may not be perfectly suited to issues in the Delta, they do provide helpful ways of evaluating relative risks.

5. *Learn from the current drought.*—The current California drought presents a powerful example of the need for federal, state, and local agencies and stakeholders to collaborate in managing a complex and changing problem in the face of multiple objectives and stresses. In other words, adaptive management. There will be lessons about challenges and solutions; these lessons should be incorporated into the further development of the adaptive management process and organization in BDCP.

Improvements in the BDCP DEIR/DEIS Document to Enhance Understanding

An EIR/EIS is a major document intended to inform policy-makers and the public about the beneficial and detrimental consequences of alternative project actions, including a reasonable no-action alternative. The DEIR/DEIS provides an exhausting wealth of information about the Delta and the likely impacts of the proposed alternatives. However, this wealth of information and data is not organized in a way that can usefully inform difficult public and policy discussions. Some improvements for the final document are suggested below; additional details for individual chapters appear in Appendix B.

1. *Include meaningful summaries for each chapter.*— Each chapter should begin with a sharply focused summary of the main points, conclusions, and important unresolved issues and uncertainties. We specifically note that the "Highlights" document does not do this and cannot be thought of as a substitute for a scientific summary.

2. *Provide a clear and concise comparison of water-conveyance alternatives.*— The DEIR/DEIS is intended to guide the selection of alternatives based on performance and consequences. The Executive Summary should focus on guiding the reader through a concise presentation of the alternatives, describing the process of selecting a preferred alternative, and evaluating the relative impacts of alternatives on major Plan objectives and operations and on the physical, biological, sociological, and economic resources of the Delta.

3. *Clarify performance indicators.*— Inclusion of clearly defined performance indicators for BDCP actions and trigger points for adaptive management action in both the chapter texts and the Executive Summary would help to focus a discussion and comparison of alternatives and would greatly improve the usefulness of the document. Without understanding how performance will be assessed, it will be difficult to determine what qualifies as "success" (or "failure").

4. *Incorporate uncertainties into conclusions.*— Presentation and discussion of the results of major analyses should include some indication of the uncertainty of those results. For quantitative and model-based analyses, this could include likely upper and lower bounds as well as an average or central tendency. For other analyses, a qualitative assessment of relative uncertainty or confidence in the results would be useful. A discussion of the implications of these uncertainties on any conclusions or comparisons and possible actions to reduce uncertainty is necessary for managing expectations and building trust.

5. *Bolster and consolidate the support framework for adaptive management.*— As currently described (only in the Plan; there is no description in the DEIR/DEIS), the adaptive management process will be difficult to implement in terms of financial and scientific support, institutional authority, or regulatory flexibility. It is critical that the management, regulation, and science supporting adaptive management for BDCP be integrated within a larger framework for adaptive management for the Delta. The DEIR/DEIS would benefit from a concise discussion of how the approaches to adaptive

management described in the Draft BDCP, the Delta Plan, and the Delta Science Plan could be blended into an effective and comprehensible framework.

6. *Identify and list important assumptions in each chapter*— Although many assumptions may be covered in appendices, the most important assumptions and their implications should be specifically listed and discussed in the main chapter texts, especially where the results of analyses are presented. This is done in some instances, but the treatment of assumptions is inconsistent. The most critical assumptions should be highlighted, perhaps in chapter summaries.

7. *Consider appropriate time frames for permitting BDCP actions.*— There are many uncertainties in BDCP actions, their consequences, and the use of adaptive management to adjust practices when necessary. Consequently, it would be appropriate for permits to include explicit intermediate milestones and opportunities for interim evaluation and correction within the 50-year time period of BDCP.

8. *Spell out the details of programmatic Conservation Measures.*—Currently, CM1 (water conveyance alternatives) is treated at a project level in the DEIR/DEIS, whereas the other Conservation Measures are dealt with at a less detailed program level. Additional detail should be provided, specifying ranges of possibilities or approximate actions wherever possible. This will enhance evaluations of the effectiveness and consequences of the Conservation Measures and the ability of benefits in program-level measures (CM2-CM22) to counterbalance any negative effects of the project-level CM1.

APPENDIX A

Responses of the Delta Independent Science Board to charge questions provided by the Delta Stewardship Council

SUMMARY

This appendix addresses four groups of questions that were provided by Delta Stewardship Council staff to help us, the Delta Independent Science Board, frame our legislatively mandated review of the DEIR/DEIS of the Draft Bay Delta Conservation Plan (BDCP). The summary on this page reproduces, in italics, the headings under which the Council staff grouped the charge questions. Our responses include comments on related sections of the Draft BDCP.

Overall, we found extensive description and analysis of the proposed conveyance facilities and operations and of the associated habitat Conservation Measures. Our responses focus on causes for concern about the effectiveness of the proposed Conservation Measures.

Completeness, structure, and effectiveness of presentation—The analyses vary in the rigor of the science employed. They appear incomplete in deferring detailed assessment of habitat restoration; in mostly neglecting Delta levees, San Francisco Bay, and effects of fertilizers and pesticides in water-service areas; and in not applying formal tools of risk-based decision making. The presentation is short on analytical summaries that readers will need to make informed comparisons among the various alternatives. Such summaries are needed further for synthesis of findings that are presented repetitively or are scattered widely. Notably lacking are graphics that provide data-rich synthesis at a glance.

Approach, analysis, tools and modeling—Few of the many uncertainties in DEIR/DEIS are acknowledged in conclusions about impacts and mitigation actions. Assumptions are rarely listed fully and conspicuously.

Monitoring and adaptive management—The reviewed documents posit adaptive management of an uncertain future without examining plausible outcomes. The Draft BDCP presents adaptive management more as a notion than as a tested, problematic practice. We found no evaluation of adaptive management's prior use in the region or in analogous settings elsewhere, nor much consideration of the potentially confounding or constraining effects of biotic, abiotic, and societal factors or conflicting trends between species. The strategy presented hinges on trust in an Adaptive Management Team and in uncertain funding.

Statutory questions—In the Delta Reform Act of 2009, conditions for incorporating the BDCP into the Delta Plan include "comprehensive review and analysis" of effects related to freshwater flows, climate change, fish and aquatic resources, and water quality. Difficulties for the DEIR/DEIS in these areas include oversimplified modeling of water supply, neglect of ecosystem perspectives in impact assessments for fish and aquatic resources, reliance on hypothetical ecological benefits from restored tidal wetlands in assessment of those impacts, uncertain effects of climate change and sea-level rise on the proposed Conservation Measures, use of non-comparable data from different water-quality monitoring programs, and use of water-quality guidelines that may provide insufficient protection to ecosystems.

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REVIEW PROCESS AND SCOPE

California law directs the Delta Independent Science Board to review the DEIR/DEIS of the Bay Delta Conservation Plan (BDCP). The directive states simply, "The Delta Independent Science Board shall review the draft environmental impact report and submit its comments to the council and the Department of Fish and Game" (Sacramento - San Joaquin Delta Reform Act of 2009, §85320(c)).

Staff of the Delta Stewardship Council helped us define the scope of this mandated review by providing specific charge questions[1]. The Council staff arranged the questions under four headings:

- Completeness, structure, and effectiveness of presentation
- Approach, analysis, tools and modeling
- Monitoring and adaptive management
- Statutory questions

Our responses are grouped under these same four headings and address each of the questions in turn. Each question can be found quoted in full, in italics, beneath each of the headings below.

Most of the charge questions refer chiefly to material in the DEIR/DEIS. Some of our responses refer the reader to details in individual DEIR/DEIS chapter reviews, which can be found in Appendix B.

For some charge questions we also drew on material in the Draft BDCP itself. This is particularly the case for the questions on monitoring and adaptive management.[2].

The "Statutory questions" refer to §85320(b) of the Delta Reform Act. This section states conditions for incorporating the BDCP into the Delta Plan. Those conditions include "comprehensive review and analysis" of several of the topics considered in our comments below.

BDCP staff provided initial responses, dated March 7, 2014, to many of the points raised in a preliminary version of this appendix, on lines 24-52 of a "BDCP and EIR/EIS Review Document Comment Form"[3]. We refer to them as the Initial BDCP Responses.

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[1] http://deltacouncil.ca.gov/sites/default/files/documents/files/Item_6_Attach_1_7.pdf

[2] The section below on monitoring and adaptive management, beginning on page A-10, was written largely by Michael C. Healey, Professor Emeritus of Biological Oceanography at University of British Columbia, Lead Scientist of the Calfed Bay Delta Program in 2007-2008, and member of the Delta Independent Science Board in 2010-2012.

[3] http://deltacouncil.ca.gov/sites/default/files/documents/files/ISB-Comment-Form-040114-final.pdf

COMPLETENESS, STRUCTURE, AND EFFECTIVENESS OF PRESENTATION

Articulation of objectives and purpose

1. Are the project objectives and purpose clearly articulated, to enable the identification of a reasonable range of alternatives?

DEIR/DEIS Chapter 2 clearly articulates overall objectives and relates them to challenges to meeting the coequal goals. The statements of purpose address CEQA and NEPA requirements. Subsequent sections discuss ecosystems, water supply, and water quality. Supporting documents include primers on the Delta and water exported from it (Appendix 1A), potential risks from earthquakes and climate change (Appendix 3E), expected consequences of reducing exports to areas south of the Delta (Appendix 5B), and background on how the alternatives were developed (Plan, Appendix 3A).

Chapter 2 could frame water supplies more broadly to help show whether the range of alternative actions is "reasonable." For example, water exports from the Delta could be described as part of a portfolio of actions that include water conservation, reoperation, water markets, alternative conveyance, wastewater reuse, water storage, desalination, and regional self-sufficiency. Citation could be made to the Delta Plan (2013), the California Water Action Plan (2013), and "Scarcity: the challenges of water and environmental management in the Delta and beyond," in National Research Council (2012, p. 29-46), as well as the "portfolio-based proposal" in DEIR/DEIS Appendix 3.11.1.1.

Definition of alternatives

2. Are the alternatives clearly defined?

DEIR/DEIS Chapter 3 contains detailed descriptions of action alternatives, and the meaning of "no action" is clarified by information in Appendix 3D, "Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions." The "Highlights of the EIR/EIS brochure"[4] offers a generalized guide to the action alternatives.

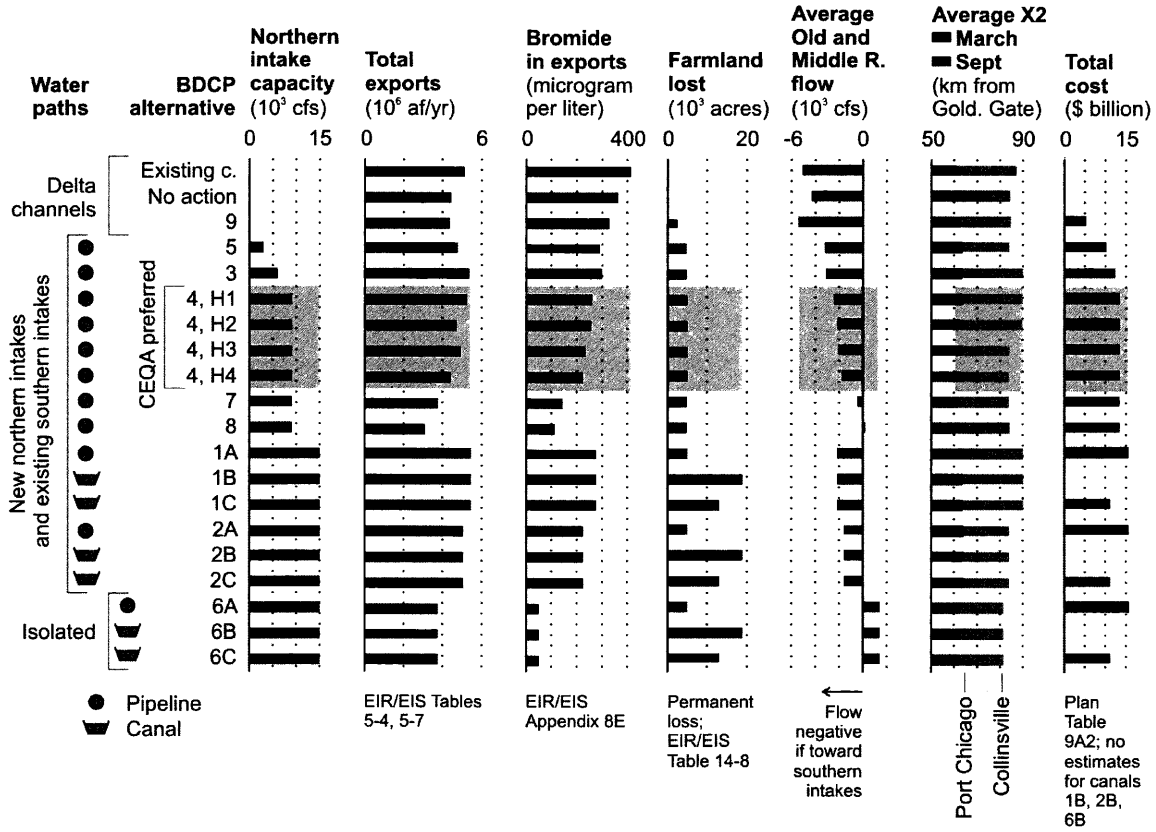
The DEIR/DEIS could identify the preferred CEQA alternative more clearly in several respects:

- How strongly preferred is Alternative 4 if the eventual project is not required to resemble it (Chapter 3, p. 3-4; Highlights Brochure sidebar, p. 7)?
- "As of this EIR/EIS, the federal Lead Agencies have not identified a Preferred Alternative for the purposes of NEPA" (p. 3-3). Please explain fully.
- The reasoning that led to the preference for Alternative 4 could be brought forward from Chapter 31. Section 31.3 is far more informative than are its more prominently placed alternatives: a brief explanation in Chapter 3 (p. 3-3), a summary of an announcement by state and federal officials (p. ES-22), and descriptions that emphasize the screening process developed and used (DEIR/DEIS Chapter 3 and Appendix 3A; Plan Appendix 3A and Chapter 9).

[4] Highlights+of+the+Draft+EIR-EIS+12-9-13.pdf, available at http://baydeltaconservationplan.com/PublicReview/PublicReviewDraftEIR-EIS.aspx

- The DEIR/DEIS blurs the most distinctive element of Alternative 4: the decision tree with four operational branches of Scenario H. The decisions are to be governed by research, but no plans for this research are presented (See Chapter 3 comments in Appendix B). In its description of alternatives, Chapter 3 defers first mention of any of the four operation plans by name until a footnote on page 3-67, and a table on page 3-208 defines them in obscure shorthand. The Highlights Brochure cites H1, H2, H3, and H4 (p. 20) but does so without defining them (p. 10).

The DEIR/DEIS needs focused summaries of the expected performance of alternatives. For readers keen on details, the report could provide comprehensive spreadsheets. All readers, especially decision-makers and the broader public, need graphics that provide informative summaries at a glance, and which are linked to detailed tabular comparisons, as in this diagram:



Range of alternatives

3. From a scientific perspective, does the EIR evaluate a reasonable range of potentially feasible alternatives that would reduce or eliminate significant impacts of the project and obtain most of the basic project objectives and purpose? If potentially feasible alternatives are not fully evaluated, is a clear rationale provided as to why not? Are there potentially feasible alternatives that would reduce or eliminate significant impacts of the project and obtain most of the basic project objectives that should have been considered (and either rejected or fully evaluated) but were not?

Please see the comment above on reducing California's reliance on water from the Delta and its tributaries (p. 4).

Detail of analyses

4. Are the alternatives studied in adequate detail to differentiate outcomes among the alternatives?

Overall, the DEIR/DEIS offers a level of detail that overwhelms more than it discerns. Much of this detail is unavoidable, given the large matrix of alternatives and impacts, the complexity of many of the scientific issues, and the associated uncertainties. The solution requires greater clarity in presentation (p. 7).

We extended the charge question on differentiating outcomes to include whether the analyses are thorough. We found the analyses less than thorough in three respects: they treat water-conveyance facilities more specifically than habitat restoration; they mostly neglect impacts on San Francisco Bay, Delta levees, and south-of-Delta agriculture; and they make little if any use of risk-based decision analysis.

Program vs. project

The DEIR/DEIS makes clear that concurrent actions receive different levels of analysis (p. ES-4 to ES-5; 1-13 to 1-14; 4-2). The concurrent actions include construction of new north Delta diversion and conveyance facilities (Conservation Measure 1) and "near-term" acquisition and restoration of natural communities (Conservation Measures 3-10) (DEIR/DEIS, p. 3-21; Draft BDCP, p. 6-3). Conservation Measure 1 receives both program-level and project-level assessment, whereas the other actions only receive program-level assessment, which is less rigorous by definition.

The DEIR/DEIS offers several explanations for the different levels of analysis: the BDCP is to be managed adaptively; few sites of ecosystem restoration have been selected; restoration is still "at a conceptual level" of design; and project-level analysis of habitat restoration is to be carried out as the restoration efforts progress (DEIR/DEIS p. 4-2). Still, the effects of recent marsh restorations in the Delta and Suisun Marsh could help test the benefits of habitat restoration that the DEIR/DEIS assumes in concluding that a net impact is beneficial under NEPA or a less than significant under CEQA (e.g., Chapter 11, p. 3023).

Impacts selected for thorough analysis

The impacts selected for analyses are described as "the direct and reasonably foreseeable indirect impacts associated with implementation of the BDCP alternatives" (Chapter 4, p. 4-10). However, the actual selections disregard:

Effects of altered Delta outflows on San Pablo Bay and San Francisco Bay. DEIR/DEIS section 4.2.1.2 dismisses impacts to San Francisco Bay with hardly any justification, as noted in our comments on Chapter 4 (Appendix B). The Initial BDCP Responses, in row 3, include the beginnings of what could be a helpful discussion of this basic question, one that many are sure to ask. Row 3 does not consider the likely impacts of altered sediment delivery, however.

Effects of and on levees. Although the DEIR/DEIS cites the threat of levee failures as a justification for new pipelines or canals, the reviewed documents offer no detailed analysis of how levee failures could affect the various alternatives, or of how the alternatives may affect the economics of levee maintenance. We found no part of the DEIR/DEIS, or of the Draft BDCP,

that relates Delta levees to the BDCP in more than a piecemeal fashion. We discuss these concerns in our review of Chapter 9 (Appendix B).

It can be argued that CEQA guidelines do not identify levees as resources; that BDCP is not a flood-control project; and that levee failure is too speculative for analysis. However, few Delta facilities are more important to its current functions than are its levees, and levee failure has happened too often (and the threat of future failures is invoked too much) to be excluded from thorough analysis in the DEIR/DEIS.

Effects on agriculture. We found little or no discussion of how increased reliability of water exports will affect applications of fertilizer and pesticides, salt accumulation in the San Joaquin and Tulare basins, and water quality of agricultural runoff in the service areas of the Central Valley Project and the State Water Project. The Initial BDCP Responses pointed us to DEIR/DEIS Chapter 30, sections 30.3.2.4 and 30.3.4.1, which do not appear to extend into environmental effects. As with levee failure, the plausible impacts of these effects go beyond mere speculation. Enough is known to bracket and assess a range of possible outcomes.

Tools for decision making

A risk-based decision analysis of alternatives that includes major contingencies would provide a more rigorous basis for structuring the document and refining a preferred alternative, or multiple preferred alternatives, for the BDCP. A risk-based decision framework could be used to explore future opportunities or problems that might arise from potential adjustments in, for example, the size and placement of habitat restorations or the capacity of the Delta conveyance facility. Such analyses could explicitly incorporate uncertainty into the comparisons of alternatives, while assessing other decisions about BDCP actions. The analyses could help allay concerns about overall uncertainty and about the proposed plans for adaptive management. Precedents can be found in Colorado River management and other complex adaptive management programs.

A response to this concern confirms that "there has been limited use of formal risk assessment and decision support tools in BDCP" (Initial BDCP Responses, row 7, page 8)[5]. The response concludes with a request for "specific suggestions about tools that may be available." Relevant reports include Allen et al. (2011), Burgman (2005), Gartner et al. (2008), Harwell et al. (2010), Lund et al. (2008), Lyons et al. (2008), Martin et al. (2009), Regan et al. (2005), Runge et al. (2011), Suddeth et al. (2010), and Thompson et al. (2013).

Assessed impacts and their comparisons

5. Overall are the analyses reasonable and scientifically defensible? How clearly are the roll-up comparisons among alternatives conveyed in the text, figures and tables?

Reasonableness and scientific defensibility

Please see the section below, headed "Best available science" (p. 12).

Clarity

Overall accessibility to the public and decision-makers. The immensity of the DEIR/DEIS impedes thoughtful comparison of its findings about the impacts of the no-action and action alternatives. Much of the draft contains excellent writing, understandable analysis,

[5] http://deltacouncil.ca.gov/sites/default/files/documents/files/ISB-Comment-Form-040114-final.pdf

and cross-references among its various parts. Nevertheless, the draft suffers from a paucity of analytical summaries, synthesis graphics (e.g., p. 5 above), lists of assumptions, and navigational aids that would enable readers to make strategic, well-informed decisions about the alternatives presented. Federal law provides grounds for expecting such clarity in an impact assessment: "Environmental impact statements shall be written...so that decision-makers and the public can readily understand them" (Council on Environmental Quality §1502.8).

It might be argued that, given its length and complexity, there simply was not enough time for the draft to be made readily understandable. This sounds penny wise and pound foolish. Our calls for greater clarity began in June 2012[6] and continued in comments on the 2013 Administrative EIR/EIS[7].

The available summaries include a table of impacts in the Executive Summary (Table ES-9) and chapter synopses in the DEIR/DEIS Highlights Brochure (footnote, p. A-4). These summaries, while welcome, fall short of making the draft understandable and lack qualifying statements. The rather cryptic table of impacts (Table ES-9) notably lacks caveats about differing degrees of uncertainty. Most of the chapter synopses in the Highlights document offer more background than analysis.

Justification for the preferred alternative. The DEIR/DEIS summarizes its case for the preferred CEQA alternative but buries this summary in section 31.3. A readily understandable report would contain an up-front, well-illustrated summary that lays out the main arguments for (and against) the preferred alternative by comparing it against other options—the no-action alternative, the through-Delta channel corridors, the east and west canals, an isolated tunnel, and dual tunnels of various capacities.

The comparison needs to include visual aids that help the reader visualize the main expected consequences of the various alternatives and relate these consequences to the co-equal goals. The prototype on page 5 illustrates how graphics can compare alternatives more efficiently and quantitatively than do text and tables alone. This kind of diagram should also represent expected major effects on ecosystems and species, and should express uncertainties in the plotted estimates.

Chapter summaries. Useful chapter summaries in the DEIR/DEIS are limited largely to its longest chapters (11 and 12). The Executive Summary provides an overview comparison among alternatives (section ES-9). The Executive Summary also provides a lengthy tabular summary of impacts, but the table is cryptic and graphics are lacking (p. ES-61 to ES-132). The DEIR/DEIS Highlights Brochure summarizes chapters unevenly, in most cases with more emphasis on description than on analysis. The Draft BDCP's prodigious Effects Analysis lacks a summary that goes beyond describing the chapter's contents (Draft BDCP section 5.1).

The DEIR/DEIS thus offers few of the summaries needed by decision-makers or by the public at large. The summaries should approach, in level of detail, the sections that begin the climate appendices to the Effects Analysis (Draft BDCP part 5A). The summaries would also proceed not just impact by impact, as done well in the chapter on Terrestrial Biological

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[6] http://deltacouncil.ca.gov/sites/default/files/documents/files/DISB_Letter_to_JMeral_and_DHoffman-Floerke_061212.pdf

[7] http://deltacouncil.ca.gov/sites/default/files/documents/files/DSC_Letter_on_BDCP_Review.pdf, p. 10-11

Resources (p. 12-5 to 12-31), but by alternatives (for instance, no-action vs. actions, and certain kinds of actions vs. other kinds of actions).

The BDCP documents should incorporate the best available features of scientific communications. Nearly every scientific journal requires articles to begin with a well-written summary or abstract that lays out the main findings and their broader implications. For example, each abstract at the annual workshop of the Interagency Ecological Program includes a "Statement of Relevance" that puts the science in context.

Navigational aids. The DEIR/DEIS includes related parts of the Draft BDCP. This extension is footnoted on front matter of the DEIR/DEIS (p. ES-3, 1-2, and 3-3) and is clarified by cross-references to the Draft BDCP. However, the section "EIR/EIS Organization" (p. 1-31 to 1-35) describes the DEIR/DEIS as being self-contained, as does the DEIR/DEIS Highlights Document (on its p. 5 and 6), and the helpful 145-page index posted in December 2013 covers the DEIR/DEIS only.

The DEIR/DEIS scarcely mentions the public health and ecological problems associated with potential toxicity from the blue-green alga *Microcystis*. The reader must go to the Draft BDCP to find details about *Microcystis* toxicity and discussion of most of its potential environmental effects (Appendix B, review of Chapter 25).

APPROACH, ANALYSIS, TOOLS AND MODELING

Evaluation methods

1. Does the environmental impact analysis utilize appropriate evaluation methods? Were tools/analyses appropriate and described adequately?

As discussed in our response to the first set of charge questions, the DEIR/DEIS contains a great deal of information without condensing it into systematic comparisons of the impacts of alternatives that would help decision-makers, stakeholders, or the public reason their way through a complex series of options. Graphical remedies, illustrated by the diagram on page 5, would not be hard to include in the Final DEIR/DEIS. But beyond merely improving the Final DEIR/DEIS, detailed yet readily grasped comparisons of the alternatives are essential to facilitate the public process, manage expectations, and elicit meaningful public and policy discussions.

Above we noted impacts that the DEIR/DEIS mostly or entirely neglects (p. 6). Reasons to set aside these issues—of effects on San Francisco Bay, Delta levees, and irrigated agriculture—were not evident to us in the wealth of detail provided about the screening process.

In the Effects Analysis in the Draft BDCP's Chapter 5, the semi-quantitative results for each aquatic species are tabulated (e.g. Figure 5.5.1-5 for Delta smelt), but the final assessment of overall net effects is a qualitative interpretation of the tabulated effects. This analysis is highly uncertain because the combined importance of all effects was based on a subjective analysis of the attribute scores conducted by one set of experts. "Experts," however, can include a broad range of perspectives and experiences; another group of experts might well reach a different conclusion (Appendix B, Chapter 11 review).

The hydrodynamic modeling appears to presuppose that any and all failed island levees would be quickly repaired. A more realistic approach would take cues from recent levee failures that have not been repaired. Simulations that include newly flooded islands may require three-dimensional modeling, but the results could be usefully applied to analysis of how levee failures would affect the various alternatives. At a minimum, where hydrodynamic modeling is premised on an optimistic assumption about levee repairs, that assumption should be stated prominently, and attending uncertainty should be carried forward into impact assessments.

The surface water modeling neglects interactions with ground water. While the repertoire of models employed appears acceptable for most cases, the reasoning of their selection ought to be concisely mentioned, given the large number of such models available for analyses. The limitations and assumptions of the models also should be noted.

The air-quality modeling excludes photochemical effects or any type of air quality modeling although earlier discussions greatly focus on photochemical pollutants and their transport.

For aquatic resources, inadequate attention was given to species interactions and food webs, particularly for non-covered species such as invasive clams.

Uncertainty

2. How well is uncertainty addressed and communicated?

Uncertainty is difficult to address and communicate for such a complex and dynamic series of actions. However, without some specific and balanced discussion of the general order of magnitude of error or uncertainty in major results, it is difficult for readers to make informed judgments about the various alternative actions.

Uncertainty is addressed and communicated more in the Draft BDCP than in the DEIR/DEIS, where conclusions are often stated without adequately acknowledging uncertainties or discussing how the project might prepare for or respond to a variety of outcomes. In some instances, uncertainties are used as an excuse not to assess possible outcomes of an action or use certain models (e.g. fish life cycle and bioenergetics models); in many other instances, uncertainties have not been carried forward as caveats to conclusions about impacts.

The DEIR/DEIS needs to address uncertainties more forthrightly so that scientific validity can be better assessed and stakeholder expectations can be better bounded. It may be possible, for instance, to assign a relative confidence level (such as A, B, or C) to many of the impacts listed in Table ES-9.

Greater care is also needed in conveying uncertainty about net effects. The issue here is whether the benefits of one Conservation Measure will counterbalance negative impacts of another Conservation Measure. In many instances, net effects are difficult to estimate reliably because of uncertainties in the magnitude and time-dependency of the individual effects. In many instances, it is even difficult to determine whether the effects of a conservation measure will be positive or negative.

Sensitivity to assumptions, uncertainty, and conflicting data

3. Do the analyses describe sensitivity of conclusions to assumptions and uncertainty and how possible conflicting data and analyses are interpreted?

There is some discussion of the sensitivity of conclusions to assumptions and uncertainty in the Draft BDCP and associated appendices, but that is not carried over into the DEIR/DEIS. Given the complexity of actions being proposed, the abundance of data, and the multitude of analysis techniques available, quantification of uncertainties will be difficult, but some estimates would be helpful. A simple formal decision analysis would likely help organize the problem and provide a framework for separating more from less important uncertainties and their effects on the relative likely performance of alternatives.

Many of the analyses need to spell out underlying assumptions in an easily identified format. In addition, where the assumptions are weak, the implications of this weakness ought to be mentioned. Bulleted lists of key assumptions could clarify:

- Error propagation in the hydrodynamic models (e.g., errors of initial and boundary conditions used for DSM2 and CALSIM II, errors from exclusion of ground-water interactions in the model, and errors from assumptions about locations of habitat restoration projects)
- Major limitations of the models used and conclusions reached
- Sensitivity of model results to an assumed configuration of restoration projects
- Assumptions about reservoir operations in the hydrodynamic models

- Assumptions about continued existence of some of the most subsided and least reliable Delta islands
- Assumptions about how adaptive management is likely to play out.

Places where bulleted, annotated lists of key assumptions would be helpful include:

- Chapter 6: DSM2 used for salinity-flow analysis is a one-dimensional model having inherent limitations in simulating open water areas, flow in bends and small channel, inlet/outlets and three-dimensional turbulent mixing, particularly with sea level decimeters higher than today's.
- Chapter 11: The implicit assumption of no interactions among the covered species as well as other abundance species such as the invasive clams weakens species-specific conclusions.
- Chapter 22: The best practice is to evaluate air-quality models used with existing data to document the uncertainties, but such procedures are either not followed or left undocumented.
- Chapter 23: The models used for noise analysis do not include the nocturnal atmospheric boundary layer effects, which surely will skew the inferences made.

Best available science

4. Is best available science employed in the environmental analysis of project alternatives and their effects?

DEIR/DEIS Chapters 5 to 30 vary in scientific rigor, scientific understanding, inclusion of relevant research findings, and citation of relevant reports. The chapters on Air Quality (Chapter 22) and Mineral Resources (Chapter 26), for instance, appear more robust scientifically than those on Geology (Chapter 9) and Public Health (Chapter 25) (details, Appendix B).

Each chapter and appendix needs a date stamp that describes when and how thoroughly it was last updated. Some of the impact assessments presented are several years out of date, as judged from the references cited (e.g. DEIR/DEIS Chapters 9, 10, and 12; Draft BDCP Appendices 3B and 5E). For instance, projections of tidal-marsh response to sea-level rise appear several years out of date (Appendix B, Chapter 12 review, tidal-marsh sidebar).

Articulation and reasonableness of assumptions

5. Are assumptions used in modeling and for analytical purposes clearly articulated and reasonable considering the complexity and current scientific understanding?

Many of the analyses need to spell out underlying assumptions in an easily identified format, as noted above under the heading "Sensitivity to assumptions, uncertainty, and conflicting data" (p. 11).

MONITORING AND ADAPTIVE MANAGEMENT

Adaptive management is essential for achieving the goals of the BDCP, and state law requires the Delta Stewardship Council to use "a science-based, transparent, and formal adaptive management strategy for ongoing ecosystem restoration and water management decisions" (§85307(f)).

Adaptive management, monitoring, and research are mentioned many times throughout the DEIR/DEIS, but ISB comments are based primarily on section 3.6 of the Draft BDCP, with additional discussion specific to each BDCP action in section 3.4. Appendix 3G of the Draft BDCP also has a section on monitoring, evaluation, and adaptive management. Administration of adaptive management is described in Chapter 7 and some comments on implementation of adaptive management are made throughout Chapter 6. Appendix 3D, deals with monitoring and research and provides tables listing potential compliance and effectiveness monitoring actions.

Direction from the Delta Stewardship Council provided us with two basic questions to address in evaluating how the BDCP incorporated adaptive management, monitoring, and research. As noted above, we consider adaptive management and monitoring in some detail in this response because of their critical importance to successful implementation of the BDCP.

Description and achievability

1. How well is the adaptive management strategy described and are the stated goals achievable?

Description of adaptive management

Adaptive management is described in section 3.6 as a three-phase process containing 9 steps. The overall characterization of adaptive management is consistent with standard works on the subject and with the treatment of adaptive management in the Delta Plan. Section 3.6 also describes issues in designing a robust adaptive management experiment, as well as the pitfalls in implementing an adaptive management experiment. The section clearly describes adaptive management and some of the issues that arise in trying to implement it.

Adaptive Management Team

Although adequate as a description of adaptive management, the process described in section 3.6 is not a strategy for implementation. In the Draft BDCP, the details of design and implementation of adaptive management are left to a future Adaptive Management Team, to be chaired by a Science Manager. The Science Manager is a new position established as part of the Implementation Office responsible for achieving the goals of the BDCP. The Adaptive Management Team is to be comprised of managers because, the Plan argues, adaptive management is fundamentally a management activity. We agree that the Adaptive Management Team should be comprised of managers because buy-in by managers is important to the success of adaptive management experiments. However, adaptive management is not part of the toolbox or the experience of most resource managers. Adaptive management experiments are like clinical trials in medicine—they have requirements for scientific insight and objective validity, planning, execution, time lines, and information gathering that differ from ordinary resource management.

Given the complexity of the scientific questions and uncertainties associated with implementing BDCP and the importance of adaptive management to successful implementation, the Science Manager must be well versed in the design and application of adaptive management and have the ability to interpret this way of implementing and managing conservation actions to

the Adaptive Management Team. It will also be important for the Science Manager to consult with the community of experts in adaptive management and to draw from the experience of practitioners involved in other large-scale adaptive management programs, nationally and globally. Most of all, the Science Manager must know when it is appropriate to use adaptive management and when it is not and realize expectations of what is and what is not achievable. Experience in design and implementation of adaptive management is not one of the qualifications of the Science Manager listed in Chapter 7—but it should be.

Adaptive-management experiments

No specific goals are stated for adaptive management beyond its basic purposes of assisting managers to manage uncertainty, and to learn about the systems they are managing through the management actions that they implement, and to adjust actions when appropriate. Because no specific adaptive management programs are described, it is not possible to determine whether the Plan will benefit from its use. The BDCP recognizes that adaptive management has failed in other situations for a variety of reasons, including failure to plan and model adaptive experiments properly, failure to implement adaptive management plans, failure to ensure adequate funding, failure to follow through with effective monitoring and scientific evaluation of adaptive experiments, and failure to coordinate planning and implementation among scientists, stakeholders, and managers (Walters 2007, Scarlett 2013). The Draft BDCP includes measures to prevent some of these failures. However, until a culture of adaptive management is developed in the participating agencies, implementation of the BDCP is likely to be thwarted by the kinds of obstacles that Walters (1997, 2007) and Allen and Gunderson (2011) describe.

Conducting adaptive management and designing robust management experiments will require a working set of models that link conservation actions to desired outcomes through species or ecosystem dynamics. The BDCP has employed a broad range of models in its effects analysis (described in Draft BDCP Chapter 5 and its appendices). However, it is not clear that these models are available or even suitable for designing adaptive-management experiments. For example, habitat suitability models are probably not sufficient on their own. It was not clear to us whether the Draft BDCP intends the Conservation Measures to be implemented *as experiments*, which is in actuality the heart of the adaptive management process. Instead, it appeared that uncertainties would be dealt with primarily through targeted research projects. It is important to frame adaptive management as experiments that provide opportunities to reduce uncertainty about subsequent restoration actions.

Assuming that the BDCP will, in at least some instances, implement Conservation Measures as experiments, it is important to have an objective way to decide when conducting such experiments makes sense. The Plan acknowledges that adaptive experimentation may not always be desirable but does not offer a clear approach to deciding whether to experiment or not. Because adaptive experimentation requires resources, one way to assess the benefits of a particular experiment is to compare the cost of conducting the experiment against the value of the information that will be gained from the experiment. If the value of the incremental reduction in uncertainty likely to result from an experiment is small relative to the cost of the experiment, it may make sense not to conduct the experiment but to frame adaptive management as an observational study supported by monitoring. Although it remains important to acknowledge the uncertainty, it is also important to recognize that the benefits of reducing uncertainty do not always justify the costs of experimentation.

In some instances (which may be commonplace in the Delta) adaptive experimentation may not be possible: conservation actions may be confounded with one another; control over drivers of change may be lacking; or physical, legal, financial, or social factors may constrain, individually or collectively, the range of options that can be explored. In such circumstances, other approaches to implementation may be better than adaptive management. Several such situations and possible alternative approaches are discussed by Williams et al. (2009) and Allen and Gunderson (2011).

Still other issues will likely affect the application of adaptive management in the Delta, many of them stemming from the complexity of the BDCP and the potential for confounding and conflict among objectives, actions, and outcomes. Some Conservation Measures may benefit one species but may harm another. And although progress towards biological goals is a means to assess the effectiveness of a Conservation Measure, there also need to be triggers to reverse negative impacts. These complications reinforce the need for the Science Manager to have a firm grasp of the potential and pitfalls of adaptive management and an appreciation of continually emerging approaches to managing complex systems.

Adequacy of monitoring

2a. Is the proposed monitoring adequate to evaluate if the goals and objectives are being achieved?

BDCP identifies three kinds of monitoring: compliance monitoring, effectiveness monitoring, and status and trends monitoring. Although this is a logical way of classifying monitoring activities, it does not necessarily mesh well with adaptive management. Adaptive management is designed to generate information that will clarify uncertainties in understanding the dynamics and responses of species and ecosystems to management actions. In some cases the required monitoring might not fit into any one of the three categories.

Compliance monitoring includes monitoring for regulatory compliance and compliance with design standards for Conservation Measures. Potential compliance monitoring actions for each conservation measure are listed in Table 3D-1. Monitoring of design-standard compliance is fairly straightforward, being dictated by specifications in a Conservation Measure. Monitoring for regulatory compliance can be more complex as can, for example, monitoring to ensure compliance with flow or water-quality design criteria. As the design criteria and outcomes for most Conservation Measures are not yet developed, it is difficult to say whether the compliance monitoring actions listed in Table 3D-1 are both necessary and sufficient.

Effectiveness monitoring and status and trends monitoring are combined in Appendix 3D and potential monitoring actions for each Conservation Measure are listed in Table 3D-2 of the Appendix. In the preamble to Table 3D-2, it is stated that "Precise details of each of the effectiveness monitoring actions are not presented here and will be developed and then periodically updated through the adaptive management and monitoring program." Consequently, it is difficult to comment on the adequacy of the proposed monitoring actions at this time. However, Table 3D-2 does not provide any meaningful clues as to how the proposed monitoring will tie into any adaptive management experiments. Without explicit linkages between monitoring and the adaptive management practices it is intended to support, it is difficult to see how adaptive management can really be achieved.

Section 3.4 of the Draft BDCP discusses each of the 22 Conservation Measures in turn and repeats some of the potential compliance and effects monitoring actions identified in Tables 3D-1 and 3D-2. In addition, for some Conservation Measures, section 3.4 provides a table of "key uncertainties" and suggested research projects to address them. Because uncertainty is central to the impetus to adopt adaptive management, we examined section 3.4 for indications of how adaptive management would be used to address the key uncertainties. We found several peculiarities in the treatment of key uncertainties.

1. Key uncertainties are identified for only 8 of the 22 Conservation Measures. For the others, the Chapter specifically states that no key uncertainties (or needed research) were identified. Given the high uncertainty associated with *all* of the Conservation Measures, we find this statement insufficient.
2. Even where key uncertainties are identified, they seem to misrepresent the broad range of uncertainties inherent in a Conservation Measure. For example, only two key uncertainties are identified for CM-2, Yolo Bypass Fishery Enhancement: (a) the effectiveness of Yolo Bypass modifications, and (b) the effects of increased frequency and duration of flooding in the bypass on the health and vigor of riparian vegetation. Uncertainty (a) is vague and, in our view, does not in any sense capture the extent and variety of uncertainties inherent in a major change in hydrology, floodplain inundation, and habitat configuration, and in its effects within and beyond the Bypass. Uncertainty (b) depends on the determination of "health and vigor of riparian vegetation," which are largely subjective terms.
3. Key uncertainties that are identified are all to be addressed through targeted research projects rather than being incorporated into the adaptive management program. Although it may be more efficient to address some uncertainties through targeted research, many could be more effectively addressed in the context of a proper adaptive management design. This possibility does not seem to be considered in the Draft BDCP. A principal strength of adaptive management is that it allows managers to design their day-to-day management actions to provide critical information on key uncertainties. The BDCP does not appear to take advantage of this strength. Perhaps the responsibilities of the Adaptive Management Team are to include such design considerations. This would be appropriate but, if so, the text should reflect this responsibility. This concern applies not only to the design of adaptive management experiments but also to the clarification of key uncertainties.
4. Another benefit of incorporating uncertainties into a broader adaptive management plan is that individual uncertainties and outcomes can be linked to one another. The Delta is an interconnected system, and actions in one region are affected by actions in other regions. Although targeted research will often be the best option, it will be important to embed these efforts in a broad and holistic adaptive-management framework to address the inter-connectedness.

Although the Draft BDCP does not appear to make effective use of an adaptive management process, the monitoring and research activities described may still be sufficient to measure progress toward achieving the BDCP objectives. Given how the Draft BDCP is structured, however, it is difficult to determine if this is the case. In assessing the suitability of monitoring, there is a logical flow of relationships from conservation objectives, to actions to achieve those objectives, to expected outcomes from the actions, to monitoring to detect those outcomes, and then to evaluating criteria for success or failure and finally to making adjustments

as needed. These components do not seem to be associated in this way anywhere in the Draft BDCP, even though its Chapter 3 describes the necessary variables. In Table 1 below we have combined some information from two different tables to illustrate the relationship between objectives, actions, outcomes, and monitoring for CM-4 (Tidal Natural Communities Restoration). A similar assessment could be done for other Conservation Measures.

Table 1. Examples of biological objectives, how a Conservation Measure advances those objectives, proposed monitoring actions, metrics to be measured during monitoring, and the proposed criteria for success. Compiled from Tables 3.4.4-1 and 3.4.4-3 for CM-4 (Tidal Natural Communities Restoration).

Objective	How action advances the objective	Monitoring action	Relevant metric	Success criteria
L2.5: Maintain or increase the diversity of spawning, rearing, and migration conditions for native fish species in support of life-history diversity.	Tidal restoration is expected to improve some rearing habitat elements for Chinook salmon, Sacramento splittail, longfin smelt, delta smelt, sturgeons, and possibly steelhead. Tidal natural communities restoration in West Delta ROA is also expected to improve future rearing habitat suitability for delta smelt within the anticipated eastward movement of the low-salinity zone with sea-level rise.	Site level assessment	Use of restoration sites by covered fish species	Detection of site use by Chinook salmon, splittail, and the following covered fish species: longfin smelt and Delta smelt in the Suisun Marsh, West Delta and Cache Slough ROAs; steelhead in the West Delta, Cache Slough and Cosumnes/ Mokelumne ROAs
L2.7: Produce sinuous, high-density, dendritic networks of tidal channels through tidal areas to promote effective exchange throughout the marsh plain and provide foraging habitat for covered fish species.	Where feasible, tidal restoration projects will be designed to meet this objective. This habitat element will provide direct foraging opportunities for salmon and splittail and, with sufficient amounts of restoration, may provide prey for pelagic fishes.	Site level assessment	Tidal natural community geo-morphology	Presence of sinuous, high-density, dendritic networks of tidal channels through tidal areas
L2.9: Increase the abundance and productivity of plankton and invertebrate species that provide food for covered fish species in the Delta waterways.	Restoration of tidal natural communities is expected to improve some rearing habitat elements for Chinook salmon, Sacramento splittail, longfin smelt, delta smelt, sturgeons, and possibly steelhead.	Plankton and invertebrate sampling in restored habitats	Plankton and invertebrate abundance in restored floodplain	Presence within and transport from restored tidal natural communities to adjacent open-water habitat occupied by covered fish species

This example table illustrates the logical connections among conservation objectives, restoration actions, anticipated outcomes, and proposed monitoring. Perhaps at this stage in the planning that is the best one can expect. At a more detailed level, however, a multitude of questions remains. Consider Objective L2.5, "Maintain or increase the diversity of spawning, rearing, and migration conditions for native fish species in support of life-history diversity." Without questioning whether this objective is meaningful as a way to strengthen the viability of covered fish species, knowing whether one has achieved the objective depends on knowing the current diversity of spawning, rearing, and migration conditions for native fishes (what are the metrics for these attributes of habitat?), knowing that this diversity of habitat supports life-history diversity (what are the metrics of life-history diversity?) and knowing that restoring tidal natural communities will increase habitat diversity for native species in ways that do, indeed, strengthen life-history diversity.

Similar comments could be made about the objectives to create networks of dendritic channels in restored tidal marshes and to enhance plankton production to provide food for covered fish species. Is measuring the presence of dendritic networks sufficient or should the amount (or minimum amount on an absolute or percentage basis) of sinuous networks be the goal? Similarly, will the presence of plankton and invertebrates provide enough information to assess success? It may be better to have benchmarks (e.g., 20% increase over some period of time). It will also be important to consider the composition of the plankton and invertebrate assemblages because organisms are not equal in their food value.

The proposed monitoring touches only superficially on these objectives. Our purpose in pointing out these complexities is not to nit-pick about Conservation Measures but to illustrate that the objectives are more nuanced and the potential outcomes more complex than suggested by the proposed monitoring. At this stage we cannot say whether the proposed monitoring is necessary and sufficient to evaluate whether the goals and objectives are being achieved. We assume that the Adaptive Management Team will further refine the goals and objectives. Such refinement, and the validation of monitoring actions, would be greatly strengthened if the models linking objectives to outcomes were more clearly presented. Ultimately, the monitoring needs to determine how well the 22 Conservation Measures combined affect the health and productivity of the covered species.

Managing adaptive management

2b. Are the data management, analysis, reporting, and decision-making processes adequate to create a defensible and transparent implementation of adaptive management?

Decision-making

In the Draft BDCP, sections 3.6.4 and 7.3.4 address issues of data management, analysis, and reporting. The proposed administrative structure for BDCP is hierarchical. At the top, providing oversight and dispute resolution, is the "Authorized Entity Group" consisting of representatives of DWR, Reclamation, and Water Contractors. State and federal fish and wildlife agencies will participate in a "Permit Oversight Group," which will ensure regulatory compliance with Draft BDCP authorizations. Implementation of the Draft BDCP, including adaptive management, monitoring, and research, will be the responsibility of a newly created Implementation Office headed by a Program Manager who will report to the Authorized Entity Group. A key individual in the Implementation Office will be the Science Manager, who will

report to the Program Manager and will have responsibility for guiding and facilitating adaptive management, monitoring, and research. In this capacity, the Science Manager will chair an Adaptive Management Team. The Adaptive Management Team will include representatives of DWR, Reclamation, CVP and SWP water contractors, CDFW, USFWS, and NMFS. The IEP Lead Scientist, the Delta Science Program Lead Scientist, and the Science and Research Director of NOAA Fisheries' Southwest Fisheries Science Center are to be nonvoting members of the Team.

The Adaptive Management Team will take the lead in developing a framework for monitoring and will enlist the assistance of the Interagency Ecological Program (IEP) in implementing the program. The Science Manager and the Adaptive Management Team will develop and implement a process for compiling, evaluating, and synthesizing the results of monitoring and will prepare a plan to maintain databases of monitoring and synthesis results. The Adaptive Management Team will also manage the BDCP research program in coordination with IEP and the Delta Science Program. The Team will identify research priorities and will administer a process to select and coordinate the researchers who will be involved in the program. In addition, the Adaptive Management Team will be responsible for the compilation and synthesis of the results of studies and analyses undertaken by other organizations that are assisting in the implementation of the Draft BDCP. The Science Manager will ensure that BDCP science activities, reporting, and reviews are coordinated with other science activities being conducted in the Delta. Based on these analyses, the Adaptive Management Team will recommend to the Program Manager any necessary changes in the Draft BDCP or the Conservation Measures.

Overall, this decision-making arrangement does not seem to bring enough authority and resources for adaptive management to be implemented decisively and in a timely way. With this structure, each cycle of adaptive management would probably occur very slowly, if at all.

Data management

This proposed administrative structure centralizes—in the Adaptive Management Team and the Science Manager—the key administrative decisions regarding adaptive management, monitoring and research, data management, analysis, and development of recommendations concerning science-based modification to the BDCP. If the individuals involved have the appropriate skills and the independence needed to critically evaluate project effectiveness, and if provisions are made to link data management and data bases with existing relevant data bases (both in-house and external to the main agencies involved in BDCP), then the centralized system should be effective. The BDCP envisions making use of the science synthesis approaches developed in the Delta Science Plan and working with the Delta Science Program to assemble, analyze, and synthesize the large volume of data that will be accumulated. We endorse this approach. We also support ensuring that the BDCP data are publically available so outsiders can make their own analyses.

Large volumes of data will be generated as BDCP is implemented, but BDCP is only one of many activities in the Delta that will be generating voluminous scientific data. A distinguished panel found that as of 2012, "science efforts related to the Delta are performed by multiple entities with multiple agendas and without an overarching plan for coordinating data management and information sharing" (National Research Council, 2012). Goals of the Delta Science Plan include coordinated data management and sharing among agencies involved in

Delta science. The BDCP's scientific work should be tightly integrated with the Delta Science Program to ensure that science and data management for the BDCP follow the "One Delta, One Science" concept, which will provide benefits to all parties, particularly regarding the credibility and transparency of scientific work overall.

It may be difficult to ensure that the appropriate skill sets are present in the Implementation Office. We have already noted that the listed qualifications for the Science Manager do not include expertise in adaptive management. Because this is a new position, this shortcoming is easily corrected. However, personnel for the Implementation Office, which will provide the staff to manage the databases, analyses, modeling, etc., will be drawn from existing staff in DWR and other state agencies. The BDCP needs a staffing plan that dovetails with the need to strengthen the agencies' capabilities in field observations, data management, modeling, and synthesis.

Timing

In a key role not identified in the documents, the Science Manager and Adaptive Management Team should identify the goals and objectives for monitoring, the desired outcomes, and an adaptive framework for evaluating when outcomes have been met. In Table 3.E-2, Effectiveness Monitoring Actions are described, for example, and in some cases the timing and duration for monitoring are described. Without knowing the response rates of the system, or how different restoration actions and climate change will interact with the desired outcomes, it does not seem feasible to establish a specific timeframe. Rather, the described timeframes should be viewed as initial guides that will be revised depending upon outcomes, since it may take more (or less) time for outcomes to be realized.

Adaptive-management decisions often must be made quickly, yet implementing the full 9-step adaptive management process can be ponderously slow, especially when encased in a hierarchical organizational structure. There is the potential to exacerbate a science-policy conflict: scientists often want to obtain deeper knowledge about complex details, whereas managers and policy-makers are interested in reaching decisions about which actions to take and where best to allocate resources (the "more research" vs. "just do it" conflict). Consideration should be given to how to make adaptive management flexible and nimble, yet still scientifically rigorous.

Adaptive management will need to keep pace with change in the Delta. One strategy is to use model projections of future conditions to anticipate how practices might need to change to fit future conditions—"anticipative" adaptive management. Vlieg and Zandvoort (2013) have contrasted this approach, which is practiced in the Rhine-Meuse Delta in the Netherlands, with the "reactive" adaptive management proposed for the Delta, suggesting that a hybrid of the two approaches might be best. Because the details of adaptive management in BDCP have yet to be developed, there is an opportunity to consider these ideas.

Collaboration

Although the Draft BDCP acknowledges the need to coordinate adaptive management with the Delta Science Program, it largely ignores the framework for adaptive management developed in the Delta Plan and (especially) the Delta Science Plan. Instead, an operational structure is described that is almost entirely within the BDCP governance organization, as outlined in Chapter 7 of the Plan. This contrasts with a growing recognition of the need to

engage a wide array of people and entities in a truly "collaborative adaptive management" (Susskind et al. 2012, Scarlett 2013). A Collaborative Science and Adaptive Management Program (CSAMP) and Collaborative Adaptive Management Team (CAMT) were formed in mid-2013 to develop a robust science and adaptive management program, primarily to inform the implementation of the current Biological Opinions applicable to the Delta[8]. Although these groups were formed too recently to be included in the Draft BDCP documents, their relations to the adaptive management structure proposed for BDCP should be included in the Final documents.

Funding

Funding for adaptive management can also become a contentious issue (Walters 2007). The Plan (Chapter 8) identifies a budget on the order of $500 million for monitoring (both compliance and effectiveness monitoring) and an additional ca. $400 million for research (Tables 8-30 and 8-31). No funding is specifically earmarked for adaptive management in the Plan. This is appropriate, as adaptive management should be an integral part of planning and implementation for all the Conservation Measures, not a separate activity. However, adaptive management planning and implementation cost more than traditional management, both in personnel and capital expenditure, as synthesis and changes in management must be actually and routinely implemented. It is not clear that these extra costs were included in the budget for the Implementation Office. Chapter 3 identifies a separate "supplemental adaptive management fund" of at least $450 million (section 3.4.23.5) that could be accessed if other resources are insufficient or cannot be accessed to support an adaptive change in Conservation Measures. Apparently, these funds are not available, however, for routine costs of management. The budgets presented in Tables 8-30 and 8-31 were based on estimated staff and resources required to undertake the monitoring and research actions listed in the Plan plus an additional $140 million to cover monitoring and research needs not identified in the Plan. How the supplemental adaptive management fund budget was determined is not clear.

Although the budget for monitoring and research is substantial, it is actually small compared with BDCP's total cost. Even a budget of this size could easily be exhausted by the multitude of possible monitoring and experimental actions for each Conservation Measure. The Draft BDCP has identified a broad range of possible monitoring and research actions related to the Conservation Measures. But the Draft BDCP also acknowledges that these will need to be reconsidered as the detailed implementation plans develop. The Adaptive Management Team will have the difficult task of determining how to allocate the inevitably limited resources for monitoring and research. Difficult trade-offs are inevitable, highlighting the need to develop an objective, rigorous, and transparent process for prioritizing monitoring and research activities.

A great deal of planning and evaluation will be required during the early years of implementation. We envision a need for further analyses to clarify conservation actions and how to fit these into an adaptive management program, pilot testing of some conservation actions, negotiations for land acquisition, and many other tasks necessary to finalize the conservation program. This suggests a front-loading of activity in the Implementation Office. However, on an annualized basis the budget for the Implementation Office does not differ much across the 50-

[8] http://deltacouncil.ca.gov/sites/default/files/documents/files/Item_7_Attach_1_CAMT%20Progress%20Report%20Version%206_0%20140207.pdf

year term of the project. We suggest evaluating whether additional funds should be allocated for up-front planning and evaluation, including development of suitable interagency data, modeling, and monitoring capabilities.

Contingency plans

Monitoring and adaptive management are proposed to evaluate whether conservation actions are achieving their intended objectives. What if things do not go as planned? The history of ecological restoration shows that restoration projects rarely have exactly the intended consequences in the expected time frame. Section 3.4.3.4.2 in the Draft BDCP states that contingency measures will be developed for site-specific conservation actions to be implemented in the event that success criteria are not met. However, the Draft BDCP also states that these contingency measures differ from adaptive management because they are site-specific and targeted at meeting success criteria. Similar contingency plans are mentioned for other Conservation Measures throughout section 3.4. There will inevitably be situations, however, in which the adjustments are not possible or incur too great a cost or where there is a large-scale failure of restored habitat to function as anticipated. What happens then?

Given the complexity and the high stakes of many of the actions to be undertaken in BDCP, it would seem prudent to have contingency plans and action thresholds at least generally outlined *before* discovering that things are not working as planned. There is no mention of contingency plans in section 3.6, which describes adaptive management. Contingency planning is not mentioned in Draft BDCP Chapters 6 and 7 (Plan Implementation and Implementation Structure) nor in the DEIR/DEIS. The Draft BDCP should build contingency plans into the adaptive management process.

Additional comments

Steps toward adaptive management in Appendix 3G

1. Page 3, lines 32-37: "An equally important purpose of this memorandum is to introduce a simple deterministic, stage-based life cycle approach to define BDCP objectives, periodically review and update them, and monitor progress toward achieving the intermediate and final Cohort Replacement Rate (CRR) milestones.....it is imperative to establish interim objectives in order to guide monitoring and the management decision making process in the near term."—Without using the term, this statement outlines the beginnings of an Adaptive Management Program. Page 6 goes on to list general assumptions and then introduces the models to be used. Uncertainty is discussed in the Introduction as well.
2. Page 8, lines 25-27: "Where species-specific data were available they were used directly. More often, this will not be the case and adjustments were made based on how different life history characteristics would be expected to influence survival."—This is followed by assumptions, by data from other areas that lend support to the assumptions, and by statement of future challenges in model modification. This is probably the best that can be done under the circumstances. The approach seems to fit into the early steps of the adaptive management process.
3. Page 11, lines 9-13: "There are several other factors that might be considered in further defining or revising these Interim Survival Objectives, including scaled objectives based on wet and dry years. However, at this point we are reluctant to more finely define or scale

survival objectives until additional species-specific survival estimates are collected over a range of hydrologic conditions. However, as new information becomes available, the potential to define wet and dry year expectations should be revisited."—Again, this statement both acknowledges and contributes to the adaptive management process. Likewise, climate change is presented as an uncertainty issue in terms of future annual variability scenarios.

Broad questions

1. What strategies for funding and oversight of monitoring and adaptive management will best promote credibility and independence in the science supporting adaptive management?
2. What kinds of management actions will be subject to adaptive adjustment? Are both operations and habitat Conservation Measures subject to adaptive management?
3. What future conditions are likely to prompt adaptation? The draft mentions sea-level rise and changes in Delta outflow requirements. Other futures worth considering include the flooding of additional subsided islands, requirements for upstream reservoirs to release cold water, tightened water-quality standards for byproducts of disinfection, and salinity regulation for Delta and south-of-Delta agriculture.
4. Will requiring the Adaptive Management Team to reach consensus be unrealistic and lead to delays or inaction?

Other remarks on Draft BDCP Chapter 3

1. The interaction between the Adaptive Management Team and the Implementation Team is critical for the success of the 9-step adaptive management process described in section 3.6.3.4. More details should be provided about how these two teams will interact in actually doing adaptive management.
2. In section 3.6.3.5.4 it is stated, "The adaptive management and decision-making processes described in this section do not apply to these real-time operations." How will this limitation affect the adaptive management plan as a whole?
3. Appendix 3E-7, lines 6-8: "Precise details of each of the effectiveness monitoring actions are not presented here and will be developed and then periodically updated through the adaptive management and monitoring program (Section 3.6)."—In terms of effectiveness monitoring, this is not an unexpected response. Some specific monitoring actions are mentioned in Table 3E-2 but these are general and often repetitive.
4. Research questions in Table 3E-3 are broad, and in some cases somewhat repetitive in terms of data already being collected in the Delta (which would require reanalysis or a meta-analysis). The document acknowledges that these will be modified over time.

STATUTORY QUESTIONS

Scientific basis and clarity

1. *Comment on the scientific basis and clarity related to the EIR-EIS conclusions:*

Issues of clarity are considered above, under "Completeness, structure, and effectiveness of presentation" (p. 4-7), and in our overview. The responses below, on the scientific basis for the conclusions, draw on the resource-chapter reviews in Appendix B, to which we refer the reader for details.

Freshwater flows

a. *the review and analysis of the range of flow criteria, rates of diversion, and any other operational criteria required to satisfy the criteria for approval of a natural community conservation plan as provided in subdivision (a) of Section 2820 of the Fish and Game Code, and other operational requirements and flows necessary for recovering the Delta ecosystem and restoring fisheries under a reasonable range of hydrologic conditions, which will identify the remaining water available for export and other beneficial uses.*

DEIR/DEIS Chapter 5 examines the changes in surface water operations and deliveries that would likely accompany each of the project alternatives. For each alternative, results for Delta outflow, exports, project deliveries (north and south of the Delta), and major surface reservoir storage are presented. The modeling approach uses CALSIM II, with additional temperature and Delta flow and salinity modeling, for a particular climate change scenario (sea level rise and climate warming), averaging a wide range of potential climate warming scenarios for conditions around the year 2060.

The analysis of this complex problem for a wide range of alternatives is inherently difficult and potentially confusing. The analysis presented is more advanced than is typically seen for project evaluation in employing climate change scenarios. This implies some uncertainties, as system operating rules and environmental regulations are likely to change as well with climate. The modeling results are reasonably good, though unavoidably imperfect. However, the model results are overwhelming in quantity, not well summarized, and insufficiently linked to interpretation. An explicit comparison of the range of water deliveries for major user locations (project and non-project) over the range of wet and dry conditions would be valuable.

Chapter 5 provides little comparative summary of impacts on water supply. This shortcoming limits the ability of this analysis-filled chapter to contribute to thoughtful discussion and comparison of the alternatives. There seems to be little difference between 6,000 cfs and 9,000 cfs alternatives, presented, though deliveries for the 3,000 cfs tunnel capacity are much less. Much of the difference among alternatives seems likely to be driven as much or more by operating and regulatory policies than by infrastructure capacities. This should be a topic of meaningful discussion.

The major analytical problem is the gap between CALSIM-II modeling of the water-supply system and actual operations. The State Water Project and Central Valley Project account for only a part of the water management decisions and impacts in this vast system. DWR and USBR modeling has improved considerably in recent decades but remains centered on the SWP

and CVP. This limited modeling therefore largely ignores or oversimplifies most water management decisions in California, which are those taken by local and regional governments and water users. The limited modeling thus seems inadequate for impact analysis of a system governed largely by local agencies.

Related to this problem is the continuing evolution of the CALSIM model and its variants. MBK modeling presented to us in the January 2014 meeting of the ISB highlighted differences in results that reflect both model evolution and modeler judgment. The MBK results (which still remain unpublished and proprietary) also highlighted the complicating effects of operational decisions and of the regulations that govern them. (Delays in making these results public are interfering in the ability to consider these results.) According to Mount et al. (2013), current regulations would limit flexibility for operations of dual facilities.

Climate change

b. the potential effects of climate change (including possible sea level rise up to 55 inches), and possible changes in total precipitation and runoff patterns on the conveyance alternatives and habitat restoration activities considered in the EIR.

The reviewed documents explicitly consider how climate change may affect water supply and ecosystems, and how the proposed Conservation Measures may act to lessen these effects. However, the likelihood and magnitude of these effects and of the associated uncertainties need to be stated or addressed more clearly in several respects: synergistic effects triggered by climate change; changes in frequency and impacts of extreme events and extreme conditions; and the range of plausible impacts on the effectiveness of the Conservation Measures (review of Chapter 29 and tidal-marsh sidebar in review of Chapter 12). There will be considerable uncertainty as to how water system operations, levee maintenance, environmental regulations, and water demands will react to climate change. In all areas, considerable changes should be expected, although the exact responses are now unavoidably uncertain.

Fish and aquatic resources

c. the potential effects on migratory fish and aquatic resources.

Please see our Appendix B for a detailed review of DEIR/DEIS Chapter 11. Concerns expressed there include:

1. The chapter needs to consider impacts from an ecosystem perspective. The existing analysis by Conservation Measures and individual species, although perhaps necessary, neglects the co-equal goal of *ecosystem* health. Success will depend on a fully functioning system, and therefore on analyses that incorporate integration and interaction across species, within a species, and across regions.
2. Positive and timely benefits of habitat restoration are highly uncertain. Failure to realize these benefits will invalidate the final conclusion of no net negative effect.
3. Full life cycles receive too little attention, as do effects of flow on entrainment.
4. The qualitative nature of the effects analysis aligns its results more with "hypotheses" than with "conclusions" or "predictions."
5. Uncertainty in the analyses needs to be carried forward, underlying assumptions need to be stated more explicitly, and hypotheses need to be distinguished more clearly from conclusions.

6. Adaptive management of migratory fish and aquatic resources will require a well-planned and comprehensive program of research and monitoring that will target causality and test hypotheses in the Draft BDCP. The decision-tree process is not adequately described.

Water quality

d. the potential effects of each Delta conveyance alternative on Delta water quality

The DEIR/DEIS analyzes all Delta conveyance alternatives for their potential impacts on water quality. The analyses generally conclude that the different alternatives would not alter water quality appreciably, for most constituents of concern. Our review of Chapter 8 describes concerns about these findings, including:

1. Some of the analyses hinge on comparison of data from different environmental monitoring programs that differ vastly in limits of detection. The DEIR/DEIS draws conclusions that are likely incorrect because they are based on non-detects of analytes.
2. The models used to estimate changes in water quality are likely to have uncertainty, particularly under future conditions with more complex hydrodynamics due to climate change and likely changes in Delta levees.
3. The chapter relies on existing water quality guidelines to determine ecological harm. Such guidelines are increasingly recognized as being inadequate to protect against loss of ecosystem function.
4. The chapter ignores water-quality impacts of providing a more reliable water supply for agriculture. While the DEIR/DEIS does consider economic benefits to agriculture, the consequences to water quality of increased use of fertilizers and pesticides have not been considered. Surprisingly, there seems to be no quantification or comparison of the effects of project alternatives on salt exports to the West side of the San Joaquin Valley.

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APPENDIX B

Comments by the Delta Independent Science Board

on individual chapters

of the BDCP Draft Environmental Impact Report/Environmental Impact Statement*

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* Appendix B consists of comments on individual chapters of the DEIR/DEIS, provided by individual DISB members or subsets of DISB members. While most chapters have been reviewed by one or more members of the DISB, a few have not been reviewed. However, review of those few additional chapters would not alter the overall conclusions of the DISB regarding the scientific basis of the DEIR/DEIS.

ACRONYMS IN THIS APPENDIX

Acre Feet per year	af/yr
Air Quality	AQ
Avoidance and Minimization Measures	AMMs
Bay Delta Conservation Plan	BDCP
Bay Delta Conservation Plan public review documents	Draft BDCP
Best Management Practices	BMPs
Biological Opinion	BiOp
California Environmental Quality Act	CEQA
Contaminant of Emerging Concern	CEC
Central Valley Project	CVP
Conservation Measure	CM
Conservation Zone	CZ
Cubic feet per second	cfs
Delta Independent Science Board	DISB
Department of Water Resources	DWR
Disinfection By-Product	DPB
Draft of the BDCP Environmental Impact Report/ Environmental Impact Statement	DEIR/DEIS
Dissolved Organic Carbon	DOC
Delta Risk Management Strategy	DRMS
Electromagnetic Field	EMF
Export/Import Ratio	E/I ratio
Geospatial Information Systems	GIS
Greenhouse Gases	GHG
Interactive Object-Oriented 5 Simulation Mode l	IOS
National Environmental Protection Act	NEPA
National Research Council	NRC
Nitrogen: Phosphorous ratio	N:P ratio
Old and Middle Rivers	OMR
Polycyclic Aromatic Hydrocarbons	PAHs
Particulate Organic Carbon	POC
Polychlorinated Biphenyls	PCBs
Restoration Opportunity Area	ROA
San Francisco Estuary Institute	SFEI
San Joaquin River	SJR
Sacramento River	SR
State Water Project	SWP
Toxic Air Contaminants	TACs
Total Dissolved Solids	TDS
Total Phosphorous	TP
Total Suspended Solids	TSS
United States Bureau of Reclamation	USBR
United States Geological Survey	USGS
Water Quality Control Plan	WQCP
Wastewater Treatment Plant	WWTP

CHAPTER 3: DESCRIPTION OF ALTERNATIVES

I. Overall Assessment

Chapter 3 of the DEIR/DEIS has a fairly complete, but confused presentation of the alternatives. To better make sense of the alternatives, it was useful to re-order and organize these alternatives.

II. Scope

Three general strategies for Sacramento-San Joaquin Delta exports are examined:

- Through-Delta water exports (2 Alternatives, plus existing conditions),
- Dual exports with a combination of intakes south and north of the confluence of the Sacramento and San Joaquin rivers (SR and SJR, respectively) (11 Alternatives), and
- Peripheral exports exclusively from north-of-confluence intakes (3 Alternatives).

These Alternatives and existing conditions are summarized in Table 1 and mapped in Figure 1. With the exception of Alternatives 4, 7, and 8, the remaining Alternatives have a physical export capacity of about 15,000 cfs each. Each physical Alternative has a specific set of operating policies employed in its analysis. Dual conveyance, Alternative 4 (the Draft BDCP CEQA preferred Alternative), is examined with four operational scenarios. Habitat restoration actions often vary significantly between physical Alternatives, as summarized in Table 2. Variants in operating policies are summarized in Table 3. In addition, a separate discussion of Alternative 9, a(n) unique through-Delta Alternative, is included at the end of this discussion.

Table 1. Organized Summary of Alternatives

Alternative	Strategy	Conveyance Alignment	Physical Export Capacities (cfs)			Operations
			Total	North	Intakes	
Existing Conditions	Through Delta	Delta Cross Channel, sloughs, and reverse flows	15,000	0	South Delta	Existing conditions
No Action	Through Delta	Delta Cross Channel, sloughs, and reverse flows	15,000	0	South Delta	Includes sea level rise and climate warming
9	Through Delta	Separate Corridors, Screened at Delta Cross Channel and Georgiana Slough	15,000	0	South Delta	Scenario G
5	Dual	Pipeline/Tunnel	15,000	3,000	North & South	Scenario C, tidal habitat to 25,000 acres
3	Dual	Pipeline/Tunnel	15,000	6,000	North & South	Scenario A
4 (CEQA Preferred)	Dual	Modified Pipeline/Tunnel	15,000	9,000	North & South	Scenario H (4 variants)
7	Dual	Pipeline/Tunnel	15,000	9,000	North & South	Scenario E + 20 miles of channel margin habitat enhancement and 10,000 acres of seasonal floodplain
8	Dual	Pipeline/Tunnel	15,000	9,000	North & South	Scenario F + up to 1.5 MAF more Delta outflow
1A	Dual	Pipeline/Tunnel	15,000	15,000	North & South	Scenario A
1B	Dual	East Canal	15,000	15,000	North & South	Scenario A
1C	Dual	West with West side intakes	15,000	15,000	North & South	Scenario A
2A	Dual	Pipeline/Tunnel	15,000	15,000	North & South	Scenario B
2B	Dual	East Canal	15,000	15,000	North & South	Scenario B
2C	Dual	West with West side intakes	15,000	15,000	North & South	Scenario B
6A	Isolated	Pipeline/Tunnel	15,000	15,000	North Delta	Scenario D
6B	Isolated	East Canal	15,000	15,000	North Delta	Scenario D
6C	Isolated	West, with West side intakes	15,000	15,000	North Delta	Scenario D

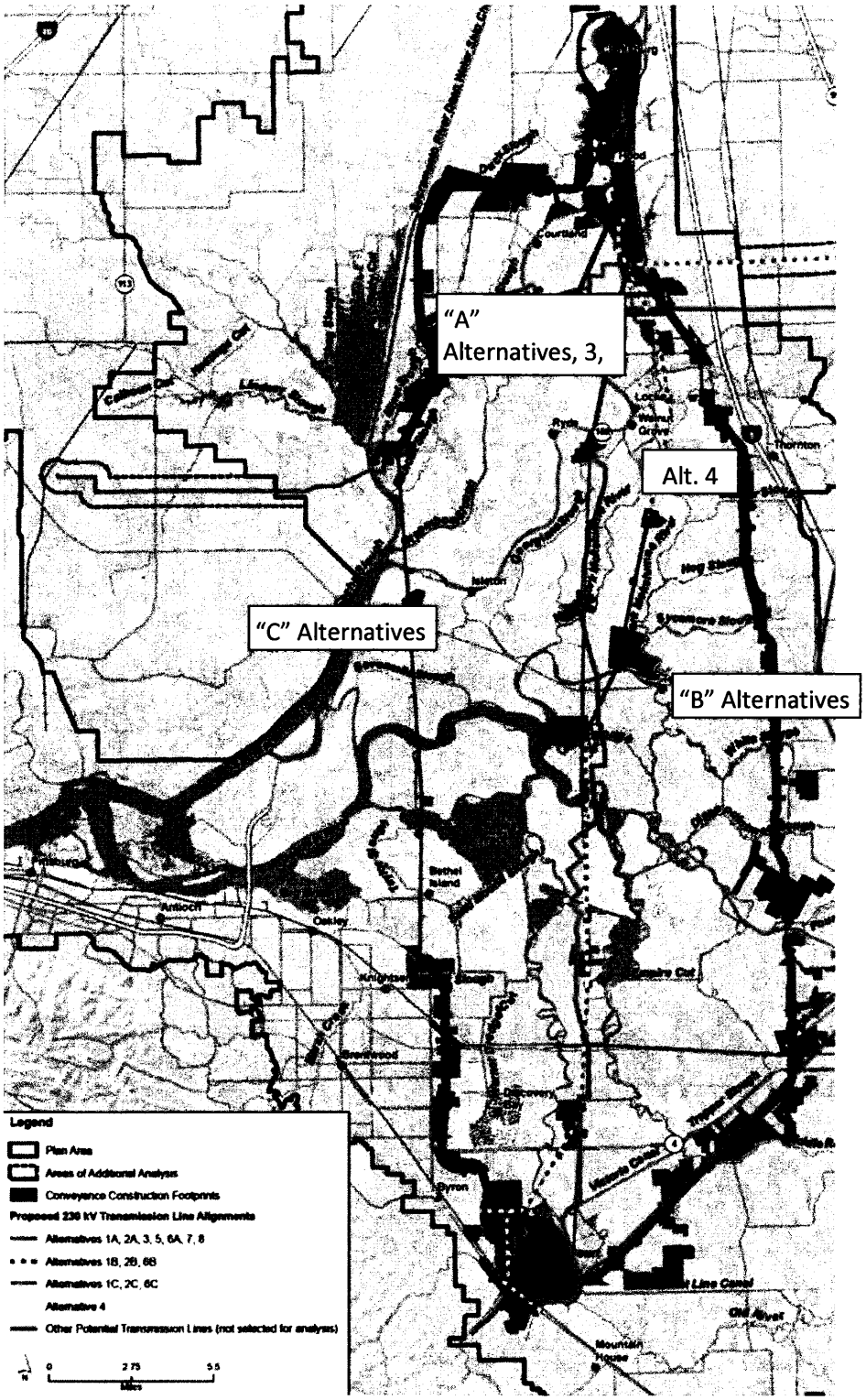

Figure 1: Conveyance Alignments for Alternatives 1-8 [needs redrafting]

Table 2. Summary comparison of conservation component acreages and variations among the Alternatives (after Table ES-8 and Section 3.6.2)

Conservation Component	Variations
65,000 acres of restored tidal perennial aquatic, tidal mudflat, tidal freshwater emergent wetland, and tidal brackish emergent wetland natural communities within the Draft BDCP ROAs (CM4).	Alternative 5, reduced to 25,000 acres. Alternative 9, expect different locations for restoration or enhancement activities.
10,000 acres of seasonally inundated floodplain habitat within the north, east, and/or South Delta ROAs (CM5).	Alternative 7, expand to 20,000 acres of restored seasonally inundated floodplain fish and wildlife habitat, particularly along the San Joaquin River. Alternative 9, expect different locations for restoration or enhancement activities.
20 linear miles of channel margin habitat enhancement in the Delta (CM6).	Alternative 7, expand to enhancement of 40 linear miles of channel margin habitat Alternative 9, expect different locations for restoration or enhancement activities.
5,000 acres of restored native riparian forest and scrub habitat (CM7).	Alternative 9, expect different locations for restoration or enhancement activities.
2,000 acres of restored grassland and 8,000 acres of protected or enhanced grassland within Draft BDCP CZs 1, 8, and/or 11 (CM8 and CM3).	
Up to 67 acres of restored vernal pool complex and 72 acres of restored alkali seasonal wetland within CZs 1, 8, and/or 11(CM9), 600 acres of protected vernal pool complex within CZs 1, 8, and/or 11 (CM3).	
1,200 acres of restored nontidal marsh within CZs 2 and 4 and/or 5, and the creation of 320 acres of managed wetlands (CM10).	
50 acres of protected nontidal marsh (CM3).	
150 acres of protected alkali seasonal wetland complex in CZs 1, 8, and 11 (CM3 and CM11).	
1,500 acres of protected managed wetlands (CM3 and CM11).	
5,000 acres of protected managed wetland natural community (CM3).	
45,405 acres of cultivated land (non-rice) and up to 1,500 acres of cultivated land (rice) protected (CM3 and CM11).	
Operable barrier (with boat lock) at the head of Old River would prevent returning and outmigrating salmon from entering Old River to minimize exposure to S. Delta pumping. Partially closed gate flow would pass through the fishway traversing a series of baffles.	Only for Alternatives 2A, 2B, 2C, and 4

Operating polices

The operational scenarios are described briefly below and in more detail in Section 3.6.4.2, *North Delta and South Delta Water Conveyance Operational Criteria.*

- Scenario A (Alternatives 1A, 1B, 1C, and 3) includes most No Action objectives for South Delta exports and required Delta outflow, new criteria for North Delta diversion bypass flows, and assumed operations of the proposed Fremont Weir (notch) during high SR flows; this scenario does not include Fall X2 objectives or the SJR inflow/export ratio. Depending upon the time of year, the minimum bypass flow ranges from 5,000 to over 15,000 cfs. Different North Delta diversion capacities influence the volume of pumping from the South Delta and overall Delta operations.
- Scenario B (Alternatives 2A, 2B, and 2C) include the Fall X2 criteria, but not the SJR inflow/export ratio. Scenario B would also include less negative OMR flow limits, and an operable barrier at the head of Old River. All other No Action rules apply, and the north Delta intake bypass rules are as under Scenario A.
- Scenario C (Alternative 5) incorporates all the No Action rules and the north Delta intake bypass flow rules are as under Scenario A. The north Delta operations were limited because of a single 3,000 cfs intake on the Sacramento River.
- Scenario D (Alternatives 6) eliminates use of south Delta intakes and uses only the same north Delta intake bypass flow rules as Scenario A. Existing south Delta export rules would not apply, including the E/I ratio. All the No Action outflow rules apply.
- Scenario E (Alternative 7) modified Scenario A criteria for bypass flows, Fremont Weir gate operations, Rio Vista minimum flows, Delta outflow, and south Delta export operations.
- Scenario F (Alternative 8) modifies Scenario E to include specific Delta outflow criteria and cold water pool management criteria for specific reservoirs.
- Scenario G is similar to Scenario A, but is modified to conform to the conveyance as separate surface corridors for Alternative 9, without north Delta intakes. Instead, water continues to flow by gravity from the SR into two existing channels, Delta Cross Channel and Georgiana Slough, without North Delta Diversion Bypass Flow Criteria and Operations for Delta Water Quality and Residence Time. The Delta Cross Channel and Georgiana Slough gates would open only under higher flow conditions, with operable barriers on the Mokelumne River system as well.

Diversion restrictions include:

1) 2009 NMFS BiOp: SJR inflow/export ratio that limits combined exports based on the SJR inflows in April and May. Limits on reverse OMR flow in December–June of many years (adaptively managed based on fish monitoring).
2) Minimum monthly Delta outflows specified in D-1641 for each month, depending on the water year type (i.e., runoff conditions).
3) Maximum salinity objectives specified in D-1641 for each month or period for water users
4) Spring X2 location objectives introduced in the 1995 WQCP. X2, specified by month and (unimpaired) runoff in the previous month.
5) 2008 USFWS BiOp included an outflow requirement for September- November of wet and above normal water year types. Fall X2 rule requires X2 at or downstream of Collinsville in above normal years and downstream of Chipps Island in wet years.

6) State Water Board has recently explored additional operational rules that would require Delta outflow to be a specified percentage of monthly unimpaired flow.
7) North Delta bypass flows: July–September 5,000 cfs, October-November 7,000 cfs in all years. December–June allow bypass flows to increase with river inflow. Low-level pumping of 6% of the river flow would be allowed most of the time, but major diversions could not begin until the SR flow exceeds a specified threshold.

In-Delta barriers

The existing South Delta Temporary Barriers Project consists of seasonal installation and removal of three temporary rock barriers in Middle River near Victoria Canal, Old River near Tracy, and Grant Line Canal near Tracy Boulevard Bridge. These rock barriers are designed to act as flow-control structures, trapping tidal waters behind them following high tide. These barriers improve water levels and circulation for local South Delta farmers. A fourth barrier, installed at the head of Old River at the divergence from the San Joaquin River, is designed to improve migration conditions for salmon originating in the SJR watershed during adult and juvenile migrations, which occur annually in the fall and spring, respectively. In the fall, the head of Old River barrier improves downstream dissolved oxygen conditions; during the spring, the barrier is intended to prevent downstream migrating salmon smolts in the SJR from entering Old River. In 2009 and 2010, DWR installed and operated a nonphysical barrier at the head of Old River as an Alternative to the spring rock barrier at this location. The nonphysical barrier uses underwater bubbles, light, and sounds as a behavioral deterrent and tests the effectiveness of excluding outmigrating smolts from entering the South Delta via Old River without having to physically block the flow of water into the channel with a rock structure. In the future, DWR may install and operate the nonphysical barrier at the head of Old River as an Alternative to the spring rock barrier.

Alternative 9 is a unique through-Delta Alternative with four separate flow corridors: (1) the North Delta separate water supply corridor that conveys water from the SR to Middle River; (2) the South Delta separate water supply corridor along Middle River and Victoria Canal that conveys water from the SJR to Clifton Court Forebay; (3) the San Joaquin separate fish movement corridor that provides flow for fish migration from the upper SJR to the lower SJR downstream of Franks Tract; and (4) the Mokelumne separate fish movement corridor that diverts from the Mokelumne River through Lost Slough and Meadows Slough to the SR. Two fish-screened intakes would be constructed: one each at the Delta Cross Channel and Georgiana Slough. Once in the channel, water would flow south through the Mokelumne River and SJR to Middle River and Victoria Canal, which would be dredged to accommodate increased volumes of water. Along the way, diverted water would be guided by operable barriers. Water flowing through Victoria Canal would lead into two new canal segments and pass under two existing watercourses through culvert siphons, eventually reaching Clifton Court Forebay.

Alternative 9 includes the following water conveyance-related facilities:

- Operable barriers on the Mokelumne River near Lost Slough, Snodgrass Slough near the Mokelumne River, extension of Meadows Slough to the SR, and installation of an operable barrier on Meadows Slough. These facilities would provide a path for fish migration from the Mokelumne and Cosumnes Rivers through Lost Slough and Meadows Slough to the SR, except during flood flows.
- On-bank diversions with fish screens at the Delta Cross Channel and Georgiana Slough.

- A boat lock and channel at the diversion structure at Georgiana Slough.
- An operable barrier at Threemile Slough to reduce salinity in the SJR during low Delta outflow and potentially to reduce fish movement from the SR to the SJR.
- Operable barriers along Middle River at Connection Slough, Railroad Cut, Woodward Canal, and immediately downstream of Victoria Canal to isolate Middle River from Old River. Dredging would occur at each of these locations.
- Dredging along Middle River from Mildred Island to Victoria Canal and along Victoria Canal for a siphon to provide gravity flow into Clifton Court Forebay.
- Expansion and extension, through dredging, of Victoria Canal under West Canal, across Coney Island, and under Old River to Clifton Court Forebay.
- An Intertie Canal with a control gate between Clifton Court Forebay and the Tracy Fish Facility.
- Closure of the Clifton Court Forebay inlet gate from Old River except during flood flows.
- Closure of channel between Old River and the Tracy Fish Facility except during flood flows.
- Closure would include channel modification to allow continued access to River's End Marina from Old River.
- Operable barriers along the SJR separate fish movement corridor at the upstream confluence of Old River and the SJR (head of Old River), Fisherman's Cut at False River, and Franks Tract to isolate Old River (San Joaquin River separate fish movement corridor) from the SJR.
- A pumping plant on the SJR at the head of Old River to convey additional flows with organic material into Old River.
- A pumping plant on Middle River upstream of Victoria.

Table 3. Comparison of Operational Rules under Draft BDCP Operational Scenarios and Alternatives (after Table ES-7)

Operational Scenario and Alternative	Months	No Action	A Alt 1	B Alt 2	A Alt 3	H Alt 4	C Alt 5	D Alt 6	E Alt 7	F Alt 8	G Alt 9
New Operational Rules Controlling Maximum North Delta Intake Diversions											
Maximum Capacity of North Delta Intakes (1000 cfs)	-	0	15	15	6	9	3	15	9	9	0
Bypass Flows (% of SR at Freeport)	Jan–Dec	O	X	X	X	X	X	X	X	X	O
Delta Operational Rules Controlling Maximum Allowable CVP and SWP South Delta Exports											
Physical/Permitted Limit for CVP (4,600 cfs)	Jan–Dec	All									
Physical Limit for SWP (10,300 cfs)											
SWP Article 21 Delivery (when San Luis is Full)											
Available San Luis Reservoir Storage											
Seasonal CVP and SWP Delivery Pattern											
Permitted Limit for SWP (6,680 cfs plus 1/3 of San Joaquin River Dec 15–March 15)	Jan–Dec	X	O	O	O	O	X	O	O	O	X
Export/Inflow Ratio -S.Delta intakes: 65% Jul–Jan, 35%Feb–Jun		X	Xa	Xa	Xa	Xa	Xa	O	Xa	Xa	X
SJR Inflow/Export Ratio	Apr–May	X	O	Ob	O	Ob	X	O	Xc	Xc	Od
Reverse Old and Middle River Flows	Dec–Jun	X	X	Xe	X	Xe	X	O	Xf	Xf	X
Delta Operational Rules Controlling Minimum Required Delta Outflow											
Maximum Salinity (EC) for Delta Diversions	Jan–Dec	All									
Minimum Monthly Specified Outflow	Jan–Dec	X	X	X	X	X	X	X	X	Xg	X
Maximum Spring X2 Location	Feb–Jun	X	X	X	X	Xh	X	X	X	X	X
Maximum Fall X2 Location	Sep–Oct	X	O	X	O	Xh	X	X	X	X	X

Notes: "X" Draft BDCP Alternative has this operational rule. "O" Draft BDCP Alternative does not have this operational rule.
Key to letters following the "X" in above table:

a) In computing the E/I ratio for these scenarios, the SR inflow is considered to be downstream of the North Delta intakes, with the exception of Scenarios H2 and H4, for which SR inflow was assumed to be upstream of the proposed North Delta intakes.

b) Under these scenarios, a different strategy was applied to achieve similar objectives as the SJR I/E ratio.

c) SJR I/E ratio applies December - June and therefore would apply for five months longer than under the No Action Alternative.

d) SJR I/E ratio is applicable when the SJR flow at Vernalis is greater than 10,000 cfs.

e) More restrictive/protective than Scenario A.

f) More restrictive/protective than Scenario B.

g) More restrictive/protective than in the No Action Alternative; required Delta outflow is expressed as a percent of unimpaired flow.

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h) For Alternative 4, maximum Spring X2 Location will be determined based on the results of the decision tree process for spring outflow. Maximum Fall X2 Location will also be determined by the decision tree process under Alternative 4.

BDCP 1785

Decision Tree Approach for Alternative 4

The BDCP Draft Environmental Impact Report/Environmental Impact Statement (DEIR/DEIS) leaves the key question of how the altered outflows would affect fish for Alternative 4 open. It proposes a ten-year research program that is to provide, upon completion of the new conveyance, "the fall and spring outflow criteria that are required to achieve the conservation objectives of the Draft BDCP for Delta Smelt and longfin smelt and to promote supply objectives of the Draft BDCP" (page 3-207). Six other species of concern (e.g. salmon) are not considered in the evaluation of spring and fall outflows, and the criteria for Delta Smelt may not be the same criteria as for longfin smelt. The proposed program would evaluate various combinations of operational spring and fall flows, some of which are expected to have adverse impacts on fish if restoration is not effective (e.g., DEIR/DEIS 11-1293, 11-1296, 11-1297). Appropriate questions to be answered by the studies and competing hypotheses are stated, but we found little basis for judging the program's adequacy and prospects. Missing elements include: (1) description of the scientific approach and monitoring to be used, (2) assessment of the range of year types (extremely wet to extremely dry) required for success, (3) consideration of which restored habitats will need to be functioning to test the hypothesis that additional habitat and improved food resources will benefit fish as much as would enhanced spring and fall outflows, (4) criteria that will be used to make the decision on which outflows will be required (e.g., a threshold population size that needs to be achieved), and (5) the outflows that will be required if the research program does not provide a definitive answer.

CHAPTER 4: APPROACH TO THE ENVIRONMENTAL ANALYSIS

I. Overall Assessment

The chapter does an adequate job of explaining the approach taken in the environmental analysis. However, the final assessment of net positive or no negative effect shown in the DEIR/DEIS is highly uncertain.

II. Scope

This chapter describes the approach to the environmental analysis. It provides a clear description of the difference between CEQA and NEPA baselines.

III. Quality of Analysis

Three geographic regions are considered in this chapter: upstream of the Delta, the legal Delta, and the State Water Project (SWP) and Central Valley Project (CVP) service areas. Areas downstream of the Delta (i.e., San Francisco Bay) were not included even though the National Research Council (NRC) scientific review specifically stated that this area should be included. Adequate justification for lack of consideration of impacts to San Francisco Bay was not provided in this chapter or elsewhere in the document, although there are potential impacts. For example, the expected reduction in sediment supply has the potential impacts of: 1) tidal marshes in the Bay could be less resilient to sea level rise, and 2) increased water clarity in the Bay could render it more responsive to nutrient inputs.

The chapter clarifies that the habitat restoration measures proposed are given only program level analysis for several reasons. Yet because of the uncertainty in location, implementation, and effectiveness of proposed restoration actions, the positive impacts of those actions that were considered as part of the DEIR/DEIS are highly uncertain.

CHAPTER 5: WATER SUPPLY

I. Overall Assessment

The lack of a comparative summary and an interpretation of results are the chapter's greatest weaknesses. The near-absence of a systematic comparison and discussion greatly reduces the ability of this analysis-filled chapter to contribute to thoughtful discussion and comparison of Alternatives. Since almost all of these water exports are to support the economic activities of agriculture and urban water needs, an explicit comparison of these economic impacts would provide information needed to evaluate the overall impact of the Alternatives.

There seems to be little difference between the 6 kcfs and 9 kcfs Alternatives. Deliveries for the 3 kcfs tunnel capacity are much less. However, much of the difference among Alternatives seems likely to be driven as much or more by operating and regulatory policies than by infrastructure capacities. This makes it imperative that project operating policies be explored as systematically as the range of physical capacities.

II. Scope

This chapter examines the changes in surface water operations and deliveries that would likely accompany each of the project Alternatives. A mercifully brief overview of California's water resources begins the chapter, followed by overviews of the SWP and CVP projects, other local projects in the Delta, and the regulatory and water rights setting. For each Alternative, results for Delta outflow, exports, project deliveries (North and South of the Delta), and major surface reservoir storage are presented. The modeling approach employed CALSIM II, with additional temperature and Delta flow and salinity modeling, for a particular climate change scenario (sea level rise and climate warming), averaging a wide range of potential climate warming scenarios for projected 2060 conditions. This analysis approach is of a fairly typical nature, with the exception of more seriously addressing climate and sea level changes.

The analysis of this highly complex problem for a wide range of Alternatives is inherently difficult and potentially confusing. The amount of model results presented is overwhelming, but there seems to be little effort to set these numbers to a story. It is a bit like an orchestra playing a symphony without a conductor and with the sheets of music sometimes shuffled. The notes are all there and mostly well-played individually, but the experience is less than satisfying.

An explicit comparison of the range of water deliveries for major user locations (project and non-project) over the range of wet and dry conditions would be valuable.

III. Quality of Analysis

The major analytical problem is the gap between CALSIM modeling of the system and actual operations. The SWP and CVP projects represented in CALSIM are only a small part of the water management decisions and impacts in this vast system. DWR and USBR modeling has improved considerably in recent decades, but remains CVP and SWP centric, largely ignoring or oversimplifying most water management decisions in California taken by local and regional governments and water users. This is adequate for simple SWP and CVP project analysis, but seems inadequate for statewide impact analysis of a system where the operations and decisions of local agencies have major consequences – conjunctive use, water conservation, market transfers, reuse, local reservoir operations, etc. Local agencies are likely to have more ability to adapt and interact with the CVP and SWP than is indicated in the modeling of this chapter.

To this problem, the continuing evolution of the CALSIM model and its many variants over time must be added. As shown by the results of the MBK modeling presented at an ISB meeting in January 2014, there will be differences in results reflecting both model evolution and different professional judgments in modeling complex systems – and these technical differences will likely be worth millions of dollars to different individual stakeholders.

A final problem is the continuing evolution of environmental and water regulations. Current regulations allow relatively little flexibility for operations of dual facilities (a point made by Mount et al. 2013). But, as demonstrated by changes in the last decade, these regulations can change dramatically over decadal periods. It seems a bit cheeky to prognosticate environmental regulations so far into the future.

Overall, there are both value and limits to our ability to estimate and compare the performance of Alternatives, for water supply and in many other regards. Many uncertainties are inherent in estimating and comparing the performance of diverse Alternatives for a complex and ever-changing system far into the future, or even today. We should not quest for certainty in such estimates and comparisons. Even as we try to narrow uncertainties, we should also organize Alternatives, institutions and decision-making to adapt as conditions change.

A simple illustration of the uncertainty inherent in this system is our inability to estimate the mean annual flow of the SR (a major driver of system performance). Over 84 years of record, the average SR flow is 22 million acre-ft (maf)/year, with the standard deviation of annual flow from this sample being about 10 maf/yr. This means that our estimate of the mean annual flow of California's largest river in terms of flow has a standard deviation of almost 1.1 maf, meaning that there is a 32% chance that the "true" SR mean flow is less than 20.9 maf/yr or above 23.1 maf/yr (means are normally distributed). (This reliability decreases if runoff is non-stationary.) Considering the value of water in California, this unavoidable uncertainty is easily worth hundreds of millions of dollars a year to water users.

Some lessons from the presented results seem to be that:

- The delivery reliability and difference between a 6 kcfs and 9 kcfs tunnel capacities are not large. However, 3 kcfs tunnel capacity delivers much less. (Figures 5-30 to 5-36). It would be useful to overlay annual exports for No Action, Existing Conditions, and Alternatives 3, 4, 5, 8, 9.
- Operating rules, and by extension regulatory framework, might make more difference in water deliveries than tunnel capacity.

Minor points:

- Page 67, what is WS-1 and WS-2?
- Where are Tables 5-4 through 5-9 results for Alternative 4?

IV. References Cited:

Mount, J.; W. Fleenor; B. Gray; B. Herbold; W. Kimmerer. (2013) *Panel Review of the Draft Bay Delta Conservation Plan*, report prepared for The Nature Conservancy and American Rivers, September 2013, 152 pp.

CHAPTER 6: SURFACE WATER

I. Overall Assessment

Overall the chapter is innocuous and uses canonical tools, and standard inference methods. The reason for selection of particular tools over select alternatives is not identified. Significant potential impacts are predicted for many Draft BDCP Alternatives under categories SW 4-6, and mitigation measures are proposed. It is not clear why a determination has not been made on the impacts of reverse flow conditions in Old and Middle Rivers under Draft BDCP Alternatives, although Chapter 6 lays out many of the impacts for each Alternative; a clarification is needed.

The existing summaries of Chapter 6 are limited to tabular entries in the Executive Summary and brief text in the Highlights Brochure. The table identifies nine surface-water impacts (pages ES-61 and ES-62), and the Highlights text offers four bulleted paragraphs (page 21 of Draft BDCP_highlights.pdf).

Like most of the DEIR/DEIS, Chapter 6 still lacks an informative summary of expected impacts of the No-Action and action Alternatives. It contains no up-front analysis that succinctly compares the Alternatives: No-Action vs. Actions, certain kinds of actions vs. other kinds of actions. It also offers no summary by impact, in contrast with Chapter 12 (Terrestrial Biology; pages 12-5 to 12-31). Chapter 6 still needs a cogent analysis of how the preferred Alternative (Alternative 4) compares to other Alternatives in terms of effects on, and effects of, surface water.

II. Scope

This chapter deals with environmental consequences of potential surface water changes from disturbances introduced by Draft BDCP conveyance and related facilities [CM1], operational facilities, conservation components [CM 2-22], and restored areas. The area examined is thought to be the most affected by SWP/CVP water supply operations and/or habitat restoration in the Delta and Suisun Marsh Restoration Opportunity Areas. Surface water in the Delta, upstream areas and in-export areas also will be affected by climate change and present/future projects. The changes affect the risks of floods, flow patterns, drainage, surface-ground water interactions, and streams. The construction of facilities as proposed by the Draft BDCP would occur in the SR/SJR basins, and the changes to SWP/CVP operations will affect the flow in the Delta and upstream. Surface water of many SJR and SR tributaries, as well as surrounding hydrologic basins, where conveyance features are located (pipes and canal systems) are unaffected. For each Draft BDCP Alternative, nine impacts are analyzed, and in some cases, mitigation measures are identified to reduce adverse impacts on run-off patterns, drainage, sedimentation, flooding, potential exposure, and risks to people or structures. The No-Action Alternative also is considered.

Surface hydraulics in the Draft BDCP area are complex, and are determined by circulation, transport, and mixing in Delta waters. The hydraulic network consists of over 700 miles of tidally influenced channels and sloughs, water supply facilities and about 18,000 diversions and 1,115 miles of (project and non-project) levees. The major forcing includes freshwater flow into the Delta, tidal input from the Pacific (as high as 600,000 cfs) and operation of water supply facilities. Sacramento River and Yolo bypass waters are the primary contributors, and move south and westward, followed by the SJR, which flows from the south. Pumping slows or reverses the flows that would naturally go north and west in the SJR (§5, §6 and §8). Operation of hydraulics structures has important tasks, including: elevating water

surfaces for diversions, preventing fish from entering canals, and changing of circulation patterns.

Amongst a myriad of impacts possible, the most critical ones have been identified for the analysis. For example, SWP/CVP reservoir storage and related changes to flood potential, peak monthly flow in SR and SJR, and reverse flows in Old and Middle river as a result of changing hydraulic characteristics are considered. The existing conditions are compared with the year 2060 scenarios of No-Action/No-project and Draft BDCP Alternatives with sea level rise and climate change (CEQA comparisons). Also compared are 2060 model conditions with Draft BDCP Alternatives that include climate change and No-Action Alternatives with climate change only (NEPA comparisons). The surface water resources have been evaluated at the project level when sufficient details are available; otherwise it resorts to programmatic level analysis.

The Effects Analysis (Ch.5 of the Draft BDCP) assumes reasonable thresholds to identify adverse effects under NEPA or a significant impact under CEQA, based on the number of months the reservoir is close to the flood storage capacity and peak monthly flows. Nine impacts (SW 1 to SW9) have been established and analyzed, and the results are placed in the framework of CEQA and NEPA effects.

III. Quality of Analysis

Commonplace modeling tools are used (CALSIM II together with ANN; DSM2 for water quality and particle tracking; CVHM hydrologic model), which are described in Appendix 5A. Also included therein are modeling assumptions, input parameters, and additional information. Impacts [SW 1-9] for each Alternative are addressed in a rigorous way. We offer the following comments for consideration:

- The chapter involves a comprehensive and laborious study, and has identified a wide range of impacts covering storage issues related to flood potential, peak monthly flows and flow reversals at critical locations. Related issues such as water quality, fish and aquatic resources and agricultural resources are addressed in other chapters. The inferences are almost entirely based on model outputs, but the reader is left to guess the uncertainties and how uncertainties affect these inferences, which are expressed in terms of 'no impact' and 'less than significant impact' etc. Uncertainties of complex models of the sort used here can be unacceptably high, model calibrations leave much to be desired (see Kimmerer et al. *San Francisco Estuary & Watershed Sc.*, Feb 2008), and inter-comparisons of different models are scarce (NRC 2012). Some recent references to model testing, if available, may help. CALSIM III has better capabilities for ground water-surface water interactions and disaggregation of demand units, and it would be useful to know whether the conclusions made would change if it is used.
- Flow-salinity relationships in Delta are evaluated using DSM2, which is linked to the neural network ANN to evaluate whether certain salinity requirements are met. The training of ANN is based on the current data, and the relationships so obtained may not be applicable to future scenarios with modified flow structures. In addition, DSM2 is a one-dimensional model and has inherent limitations in simulating open water areas, flow in bends, and small channels, as well as inlet/outlets. The Delta circulation patterns, which are strongly influenced by horizontal mixing, diversions, and freshwater input, therefore may not be adequately simulated by the modeling system used.

- Tidal energy coming from outside the Golden Gate is another limited resource in the development of habitat in the Delta and its larger estuary. A major effect of many of the proposed habitat restoration activities (as well as potential island failures in the future) is likely to be the changes in tidal amplitude and mixing. This will affect the suitability of certain characteristics for restoration. It will reduce mixing of inland and coastal waters and high-tide related flooding in the Delta. This aspect needs further consideration.
- Little is mentioned about the role of adaptive management, although development of hypotheses within the framework of complex Draft BDCP Alternatives would be difficult. Any information in this regard can be helpful.
- It is assumed that the Alternatives would modify the operations of SWP/CVP facilities but not the facilities owned and operated by other water rights holders. Thus, the surface waters of many SR and SJR tributaries are assumed to be unaffected (§6.3.1). Naturally, one would expect changes to the modus operandi of other owners in response to potential changes due to Draft BDCP Alternatives. Similarly, changes in flow regulations for environmental and water quality objectives into the distant future are not examined or discussed (and would be difficult to examine). No analysis or statement regarding such feedback is given.
- It was determined that estimating peak flows in a sub-monthly time step based on monthly flows of CALSIM II would not be reliable for flood risk analysis. Can HEC-RES-SIM or other modeling systems with higher temporal resolution be used in this regard?
- The list of communities subject to flooding does not include Bethel Island, a community of a few thousand on a fairly deeply subsided island (page 6-21).
- Chapter 6 considers how the Draft BDCP and its Alternatives may affect levees. It provides a lucid summary of levees as essential and vulnerable in flood control (pages 6-11 to 6-18). It also analyzes potential near-term damage to levees from construction of water-conveyance facilities (impact SW-7) and from creation of subtidal habitat (SW-8). Other parts of the DEIR/DEIS consider how Delta levees affect other resources. Levees are described as vital to water supplies under current conditions (pages 5-61 to 5-64; pages 3E-16 to 3E-18). By corollary, levees remain important under most of the action Alternatives, both for water supplies and for ecosystem restoration. A comprehensive levee chapter would bring these issues together. Its summary would compare Alternatives by their expectable effects on levee maintenance, not just during and soon after construction, but also on a 50-year timescale.

IV. References

National Research Council. (2012). *Sustainable Water and Environmental Management in the California Bay-Delta*. Washington, DC: The National Academies Press, 2012

Kimmerer, W.J. and M. L. Nobriga. 2008. Investigating Particle Transport and Fate in the Sacramento-San Joaquin Delta Using a Particle Tracking Model. San Francisco Estuary and Watershed Science. Vol. 6, Issue 1 (February), Article 4.

CHAPTER 7: GROUNDWATER

I. Overall Assessment

The most insightful aspect of this chapter is the likely effect of changes in Delta water deliveries on overdraft in the San Joaquin and Tulare basins. However, these results are not summarized and presented in a way that facilitates the thoughtful use of these results in comparing Alternatives. Peripheral canal Alternatives, where unlined, can significantly increase local groundwater levels in some areas, and decrease them in other areas (Figure 7-13). This also is examined with modeling results. Much of the results are based on modeling analysis.

The modeling analysis of these groundwater impacts itself seems largely adequate, although the awkward and partial summary of results in a comparative format seems to miss the opportunity to inform on major relevant impacts. Salinity results and impacts are not reported.

Absence of a comparative summary and interpretation of results are the chapter's greatest weaknesses. The near-absence of systematic comparison and discussion reduces the ability of this analysis-filled chapter to contribute to thoughtful discussion and comparison of Alternatives.

II. Scope

The chapter examines the effects of project Alternatives on groundwater in the Delta and in the southern Central Valley. Construction impacts on local groundwater are expected due to tunnel and canal construction and modeling results are presented on these issues.

The impacts of Alternatives on groundwater elevations within and south of the Delta are fairly well examined. However, there seems to be no comparison of the Alternatives in terms of likely changes in groundwater quality south of the Delta. The salinity of agricultural lands south of the Delta seems likely to be affected by the total salt load of water exported to this region. These salt loads are not presented or compared, even though modeling results appear to exist with the required outputs for this calculation. Other studies have found that changes in salt loads from changes in Delta operations and Alternatives could have considerable impact on agricultural land and profitability in the southern Central Valley (Medellin, et. at., 2008).

III. Quality of Analysis

The modeling is based on the USGS CVHM model. It would be useful to have a short discussion of uncertainty in this model's results, and a comparison with the state's C2VSIM model of Central Valley groundwater, which is also commonly employed. Both models are quite a bit better than their forebears, and for this purpose they seem likely to show qualitatively similar results.

Alternatives that reduce total water exports are likely to encourage additional overdraft in the large water project service areas. This could be substantial and almost equivalent to the amount of export reduction (Chu 2012). The DEIR/DEIS notes this, and has done modeling studies of it, but does not appear to present quantitative estimates of this effect – only the reduction in exports (Table 7-7). The analysis of differences in declines in groundwater levels in the southern Central Valley for different Alternatives should be more systematically and quantitatively presented.

The Alternatives are not expected to produce great long-term groundwater changes in the Delta. The largest effects seem likely to be localized from project construction.

An unlined canal (e.g., peripheral canal) might well have widespread waterlogging on lands near the right-of way.

Additional inundation of habitat, either permanent or seasonal, could increase groundwater seepage problems for local subsided islands. This seems likely to decline with time due to pore clogging. Experiences with ship channel dredging in the Delta might provide some lessons and data on this.

Specific Page Comments:

Page 7-3, line 38. "Groundwater modeling studies of the Sacramento Valley suggest that, on average, the flux of groundwater discharging to the rivers is approximately equal to the quantity of water that leaks from streams to recharge the aquifer system. The studies suggest that in average years, stream recharge and aquifer recharge are each about 800,000 AF per year (Glenn Colusa Irrigation District and the Natural Heritage Institute 2010)." This cannot possibly be, unless the basin is overdrafting. Most of the Sacramento Valley generally is in rough balance, so the recharge from streams and surface infiltration roughly equals aquifer pumping and groundwater discharge to rivers. Recent C2VSIM modeling for TNC shows quite different results, with much more stream loss to aquifers in recent decades to supply basing aquifer pumping.

Page 7-10. "TDS varies more widely in the Eastern San Joaquin Sub-basin, ranging between 50 and 3,520 mg/L. The high salinity of groundwater is attributed to poor-quality groundwater intrusion from the Delta caused by the decline of groundwater levels. This saline groundwater front has been particularly apparent in the Stockton area since the 1970s (San Joaquin County Flood Control and Water Conservation District 2008). Ongoing studies are attempting to identify the source or sources of chloride in groundwater along a line extending from Manteca to the northern side of Stockton. Initial concern was that long-term overdraft conditions in the eastern portion of the sub-basin were enabling more saline water from the Delta to migrate inland. Other possible sources include upward movement of deeper saline formation water and agricultural practices (U.S. Geological Survey 2006a)."

This seems misleading. The cited USGS report indicates that the salinity coming into groundwater is of marine origin, probably from the time when the surrounding sediments were formed. Given that sea water has not come nearly this far into the basin in recent geologic time, these are likely from ancient salt deposits, not tied to current or recent surface water management. The document later mentions (page 7-12) saline groundwater in shallow aquifers (<100 ft) under the central Delta. This should be mostly peat deposits laid down in the last 6,000 years. Where would these salts come from? The sea level has been rising for over 10,000 years and salt water has rarely, if ever, intruded into these aquifers during this time. Some saline drainage from agricultural operations might be possible.

Table 7-7. Long-Term State Water Project and Central Valley Project Deliveries to Hydrologic Regions Located South of the Delta (TAF/year)

Alternative	San Joaquin and Tulare Region	Central Coast Region	Southern California Hydrologic Region
Existing Conditions	2,964	47	1,647
No Action Alternative	2,519	40	1,484
Alternative 1	3,070	51	1,853
Alternative 2	2,846	49	1,711
Alternative 3	3,023	50	1,821

Alternative 4 Scenario H1	2,949	49	1,784
Alternative 4 Scenario H2	2,767	40	1,491
Alternative 4 Scenario H3	2,781	48	1,668
Alternative 4 Scenario H4	2,610	39	1,370
Alternative 5	2,709	45	1,613
Alternative 6	2,285	34	1,136
Alternative 7	2,272	36	1,162
Alternative 8	2,069	27	803
Alternative 9	2,529	43	1,410

IV. References

Chu, H. (2012). Groundwater Overdraft in California's Central Valley: Updated CALVIN Modeling Using Recent CVHM and C2VSIM Representations. Master's Thesis, Department of Civil and Environmental Engineering, University of California – Davis.

Medellin, J.; R. Howitt; and J. Lund. (2008). Economic Effects on Agriculture of Water Export Salinity South of the Sacramento-San Joaquin Delta, Appendix I to *Comparing Futures for the Sacramento-San Joaquin Delta*, Public Policy Institute of California, San Francisco, CA. August 2008

CHAPTER 8: WATER QUALITY

I. Overall Assessment

As noted for other chapters in the DEIR/DEIS, a concise and informative summary of the chapter would be extremely useful to readers and reviewers. This chapter, covering water quality impacts of the different Alternatives, is not very informative because of its reliance on a few modeling approaches, most notably CALSIM and DSR2, without an explanation of the limitations of these models. There is a noted lack of emphasis on validating model outputs with observational data, as well as a lack of any presentation or discussion of the uncertainties associated with the models. It is also unclear whether the models were run under likely scenarios of future conditions in the Delta (e.g., changing precipitation patterns, decreased snow pack, changes in timing and amount of freshwater delivery, higher temperatures, etc.).

II. Scope

This chapter covers the environmental setting and potential impacts of the different Draft BDCP Alternatives on water quality in the Delta as well as upstream of the Delta. It does not cover impacts downstream of the Delta, even though that was a specific recommendation of the National Research Council. Numerous constituents that can compromise water quality are covered, but it is difficult to tell which constituents are covered without reading the document in its entirety. For example, polycyclic aromatic hydrocarbons (PAHs) are covered in Section 8.2.3.14, but are not listed in Tables 8.1, 8.2, 8.3, 8.4, or 8.5. The reasons for including some constituents in those tables, but not others, are not clear. Temperature is specifically noted as being covered in Chapter 11, rather than in this chapter, but it seems sensible to include temperature impacts, or at least a summary of temperature impacts, in this chapter specifically dealing with water quality issues. This chapter does not cover ancillary effects of the Draft BDCP on water quality. Notably, an increase in water reliability may well result in altered agricultural practices, to include changes in crops, with associated changes in pesticide and fertilizer applications. That is a notable omission.

III. Quality of Analysis:

There is a general lack of knowledge displayed by the authors of this chapter about certain water quality constituents. This was most obvious in sections covering dioxins, PAHs, and emerging pollutants [more correctly called contaminants of emerging concern (CECs)]. Nomenclature and descriptions of these classes of compounds are often incorrect, sometimes egregiously so. For example, polychlorinated biphenyls (PCBs) are incorrectly classified as a subset of dioxins, and then statements are made about dioxins that are incorrectly extrapolated to PCBs. Moreover, the authors do not seem to know the difference between commercial PCB mixtures (e.g. Aroclor® 1254 or 1260) and individual PCB congeners (e.g. PCB-126), listing these disparate substances as PCB-1254, PCB-1260, and PCB-126. PAHs are specified as being derived from combustion products, ignoring the very large portion of PAHs coming into ecosystems as a result of spills and leakage of petroleum and its refined products, such as gasoline and diesel fuels. Very optimistic descriptions of CECs and their removal from wastewater by WWTPs are given, but no acknowledgment is made of many other CECs that are shown to be highly recalcitrant to such removals. Such demonstrations of unfamiliarity with the subjects covered do not engender confidence in the analysis.

For the discussion of carbon, it is recommended that carbon should be separated into its dissolved and particulate forms for consideration of water quality impacts and implications for Delta organisms. Dissolved organic carbon (DOC) is the form most likely to react with chloride and bromide and result in formation of disinfection by-products. Hence, emphasis was placed on DOC in this chapter. However, the chapter overlooks the role of carbon as a "master" ecosystem variable and the fact that dissolved and particulate forms cycle differently. DOC is mostly cycled through the microbial food web and is not typically transferred to upper trophic levels. In contrast, particulate organic carbon (POC) is comprised of microalgae as well as detritus from the watershed, marshes, and aquatic environment. POC is utilized as a "food source" for primary consumers, so this energy is transferred to higher trophic levels.

In addition to concerns about "lumping" carbon into a single parameter, carbon "quality" is not addressed. Carbon quality (e.g., sources, age, biochemical composition) is a key determinant of ecosystem processes such as food and energy. Carbon quality also influences organic matter respiration and is a contributor to water quality issues such as low dissolved oxygen (hypoxia) and methylation of mercury.

The treatment of nutrients is also lacking. The authors consider only ortho-phosphate and not total phosphorus (TP). In freshwater, TP is a much better predictor of algal productivity because so much P can be carried on and released from suspended sediments. There should be better linkage between the total suspended solids (TSS) section and the phosphorus section. If a regression had been done between TP and discharge rather than phosphate and discharge, it is very likely that a relationship would have been seen (page 8-214). From this chapter, it seems as though the upgrades to the Sacramento WWTP will not decrease phosphorus inputs, or if they would, it is not considered here. It is clear that for ammonia, the biggest change (and most significant improvement) is coming from the upgrade to the Sacramento Wastewater Treatment Plant. The analysis of ammonia, nitrate and phosphorus is entirely based on regulatory water quality standards with no attention paid to the biological consequences of more or less nitrogen, phosphorus, or altered N:P ratios. In the P discussion, the authors propose that phytoplankton production is related to light, not nutrients (page 8-214). With decreased sediment loads this may no longer be the case, or certainly it is not expected to be the case in the future as sediment loads (from past mining activity) continue to decrease. Hence, nutrient impacts on algae do need to be considered. In particular the potential of altered nutrient ratios to either encourage or reduce toxic algal blooms should have been considered. It is mentioned but discounted as unimportant in the SWP and CVP canals (pages 8-450 and 8-470).

As stated above, there is an over-reliance on model outputs, both to describe existing conditions as well as to project the effects of Alternatives on water quality constituents. There do not seem to be either a) attempts to compare model outputs for existing conditions to existing water quality data, or b) calls for monitoring of future conditions in order to inform adaptive management of Draft BDCP implementation. Because models will always be incorrect, such observational data are obviously required. Moreover, models were run for only certain constituents and not others; this needs to be clarified and the reasons for selective applications of models should be explained. Models should also be run under likely scenarios of future conditions in the Delta (e.g., changing precipitation patterns, decreased snow pack, changes in timing and amount of freshwater delivery, higher temperatures, etc.), and measures of uncertainty associated with the models should be presented and discussed with respect to their impacts on confidence in model outputs. It is also unclear whether the model runs considered the role of changing turbidity and light levels. Recent data indicate that concentrations of suspended

solids have been declining in the SR. This could impact ecological responses in the future (e.g., phytoplankton blooms). Turbidity will likely increase during the water conveyance construction phase, as well as during habitat restoration due to sediment disturbance. Following construction, concentrations of suspended solids (and light levels) may be quite different than they are today or over the timeframe 1992-2003, which was used for the model conditions. This could substantially alter water quality in the Delta and adjacent waters, again in ways that might not be predicted from model outputs.

There are concerns about remobilization of soils and sediments with legacy contaminants during construction of water conveyance structures and habitat restoration, which were not addressed in the DEIR/DEIS. Reservoirs of contaminants could be disturbed during excavation and construction projects. Some of these legacy contaminants could have detrimental impacts on organisms due to their tendency to bioaccumulate. Also, in regard to bioaccumulation, mercury and selenium appear to be the only constituents that were evaluated for their bioaccumulative properties. A range of organic contaminants (e.g., PAHs, dioxins, some endocrine disrupting compounds) also bioaccumulate, but this was not acknowledged or addressed in the DEIR/DEIS document.

The authors are rather cavalier about how they treat detection limits for analytes, especially when studies had high detection limits that are above water quality criteria. For example, on page 8-46 they report many non-detects of PCB-1254, -1260 etc. (sic), but do not report detection limits. It is later stated that SFEI data show detects, but detection limits were 0.01 pg/L, for individual PCB congeners, and that the SFEI detection limits are seven orders of magnitude lower than other studies. On the next page, they then report many non-detects (presumably with the higher detection limits in the range of 10 ng/L), and also list criteria for PCBs under various guidelines. Even though those criteria are far below the detection limits used, it is concluded that criteria have not been exceeded, presumably because PCBs were not detected.

On page 8-163 the following statement is made:

"Assessing pesticide-related effects is substantially challenged by: 1) limited available monitoring data in the Delta and other water bodies of the affected environment, and 2) a continually changing pesticide use market. Due to a number of factors, including historic pesticide use patterns and analytical capabilities, there is more data available for certain classes of pesticides, such as OP insecticides, than that for other classes of pesticides, including herbicides, fungicides, and insecticides such as pyrethroids and carbamates."

Despite the acknowledged difficulty in predicting water quality impacts of the project, caused by lack of observational field data, as far as we could see there was no call for enhanced monitoring of pesticides in the Delta. As stated above, reliance on model outputs without their validation by comparison to observational data is a flawed approach, especially for assessing the effects of water quality constituents with high levels of uncertainty surrounding them, such as pesticides. In the section on pesticides, it was also remarkable that there was no mention of recent investigations showing very significant synergism between carbamate and organophosphate insecticides, or research showing rapid acquisition of pesticide resistance in native copepod species in the Delta.

CHAPTER 9: GEOLOGY

I. Overall Assessment

Chapter 9 makes a murky case for its plausible conclusion that the proposed Draft BDCP actions would not add much to the existing geologic risk. The scientific basis for this conclusion is clouded by problems summarized in the sections below. Also mentioned in this review are potential scientific benefits that the chapter overlooks.

II. Scope

Geology affects the Delta as both resource and threat. Geology comes into play as a resource where including aquifers (Chapter 7), forming parent materials for agricultural soils (Chapters 10, 14), providing aggregate or natural gas (Chapter 26), and containing fossils (Chapter 27). The geologic threat mentioned most in the DEIR/DEIS is earthquake-induced failure of Delta levees (page 1A-8 to 1A-9; 2-3; 3E-16 to 3E-18; 5-61 to 5-64; 6-11 to 6-18).

Chapter 9, a "resource chapter," assesses geology as a threat to persons and property. The chapter enumerates, for impact assessment, the 16 threats listed in summary Table ES-9 as GEO-1 to GEO-16 (page 66-67). Most are tied to earthquakes. Five of the potential impacts would occur during construction of water-conveyance facilities under conservation measure CM-1 (GEO-1 to GEO-5); another six during operation of these facilities (GEO-6 to GEO-12); and the remainder in association with habitat restoration efforts (GEO-13 to GEO-16).

As summarized in Table ES-9, the CEQA impacts are "less than significant" both before and after mitigation for all 16 threats under all the action Alternatives. The table rates the No Action Alternative as having three potential impacts that are "beneficial."

III. Quality of Analysis

Narrow assessment of levee failure

Although Delta levees figure abundantly in the DEIR/DEIS as a Delta resource, no resource chapter addresses impacts to levees comprehensively. Delta levees are presented as vital to water supplies (pages 3E-16 to 3E-18, 4-9, 5-61 to 5-64, 29-19 to 29-20; Appendix 5B) and to flood control (pages 6-11 to 6-18), and the threat of levee failure is cited as a reason the proposed conveyance facilities are needed (pages 2-3, 31-5). In addition, Chapter 4 of the Draft BDCP describes levee improvements to be carried out as part of several of the proposed conservation measures. Yet formal assessment of levee-related impacts appears limited to Chapter 6 (Surface Water) and Chapter 9 (Geology). These chapters ask whether the construction and operation under the various Action Alternatives would increase chances of levee failures from floods and earthquakes. The Geology chapter limits its consideration of levees to the immediate vicinity of facilities at or near the ground surface. No chapter considers two broader effects: how Delta levee failures would affect water operations under the various Alternatives (summarized pages 29-19 to 29-20); and how the various Alternatives would affect the economics of maintaining Delta levees.

A comprehensive assessment of levee-related impacts would treat them more broadly. It would ask how levee failures would affect each Alternative in terms of water supplies and ecosystem health. It would also explore how each Alternative may affect incentives and funding for levee maintenance and it would evaluate each Alternative in light of the climate change impacts (sea-level rise, extreme floods) discussed on pages 29-19 and 29-20. The broadened

assessment would consider the No-Action and Action Alternatives in light of recent reports about Delta levees. These include discussions of hazards to Delta levees (Mount and Twiss, 2005; URS Corporation and Jack R. Benjamin & Associates Inc., 2008; Brooks et al., 2012) and of strategies for risk reduction (Suddeth et al., 2010; URS Corporation and Jack R. Benjamin & Associates Inc., 2011; Bates and Lund, 2013)

Debatable choices about levels of significance

The DEIR/DEIS estimates that the Action Alternatives would have "less than significant" impacts on the potential for death, injury, or property loss from earthquakes and their effects. This assessment applies both before and after mitigation according to the summary table (pages ES-66 and ES-67). Safeguards built into engineering design and construction practices are expected to prevent "an increased likelihood of loss of property, personal injury or death of individuals (example, pages 9-53 to 9-54).

Chapter 9 does not appear to factor a background threat of levee failure into these reasonable conclusions. The chapter summarizes this threat in section 9.3.3.1.1 (pages 9-49 to 9-50), and the threat looms in other parts of the DEIR/DEIS as well (pages 2-3; 3E-16 to 3E-18; 5-61 to 5-64; 6-11 to 6-18). In a further instance, a water-supply assessment cites the threat of earthquake-induced levee failures that could flood as many as twenty Delta islands at once (page 5B-12). The impact assessments in Chapter 9 do not appear to consider Action Alternatives in combination with levee failures unrelated to the actions. Would these combinations result in any increased likelihood of losses to persons or property?

The tabular summary of potential impacts on pages ES-66 and ES-67 can be misread as implying that benefits assigned to the No-Action Alternative do not extend to the Action Alternatives. The benefits are derived from "ongoing plans, policies, and programs" that seem largely independent of the Draft BDCP (pages 9-50 to 9-51).

Indefinite plan for assessing liquefaction hazards

Liquefaction, in which pore-water pressure lowers the strength of granular material, is the main process by which earthquakes are likely to cause levee failure in the Sacramento - San Joaquin Delta (URS Corporation and Jack R. Benjamin & Associates Inc., 2008). The liquefiable materials may be within a levee, beneath the levee, or both. The modes of resulting damage may include sliding, settlement, cracking, and groundwater eruption. Unlike localized breaches in the Delta's written history, the failures associated with future liquefaction may extend along levees for hundreds of meters. These concerns provide ample justification for the sections in Chapter 9 that accordingly consider liquefaction hazards to Delta levees.

Chapter 9 provides little information, however, about the basis for its liquefaction analyses. Such analyses commonly begin with borehole data like those in Figure 9-4. The chapter states that the analyses will use "available soil data from the [Conceptual Engineering Reports]" of proposed Draft BDCP conveyance alignments (page 9-46). Those reports are listed on pages 9-1 and 9-2, but they do not appear to be available online—a status that in today's world is effectively equivalent to not existing at all.

Subsequent steps are summarized in a one-paragraph statement of approach (page 9-70). The approach appears to follow the so-called "simplified procedure" that engineers routinely use in liquefaction-hazard assessment. This procedure originated over 40 years ago (Seed and Idriss, 1971) and was updated in the last decade (Idriss and Boulanger, 2008).

Uncertainty not mentioned in Chapter 9 surrounds current implementation of the "simplified procedure" of Seed and Idriss (1971). Competing curves relate the occurrence or

non-occurrence of liquefaction to material properties and ground motions (Idriss and Boulanger, 2010; Seed, 2010). The matter is under study by a National Research Council committee (http://www8.nationalacademies.org/cp/projectview.aspx?key=49573).

Even if this uncertainty is set aside, Chapter 9 appears deficient in details on how liquefaction-hazard assessment under the Draft BDCP will be carried out. Such details appear to await "final facility designs" in which "site-specific geotechnical and groundwater investigations would be conducted to identify and characterize the vertical (depth) and horizontal (spatial) extents of liquefiable soil" (page 9-70).

A reviewer may reasonably wonder whether the liquefaction part of the impact assessment is to be carried out at the project level or the program level. An overview on page 3-22 states that project-level assessments are provided for conveyance facilities (CM1), while program-level assessments are made for other actions. Whatever the case for liquefaction, its assessment seems part of a mitigation measure for preventing any increase in the "likelihood of loss of property, personal injury or death of individuals" (example, page 9-53).

Neglect of other clues to liquefaction risk

Comprehensive assessment of liquefaction risk to levees in the Delta and the Suisun Marsh was central to the Delta Risk Management Strategy (DRMS) study discussed in the next section (page 28). The assessment was based in part on application of the "simplified procedure" of Seed and Idriss (1971) to borehole data from Delta levees. The assessment also took account of the steepness of levee banks. The products include maps of the Delta and Suisun Marsh that show the distribution of potentially liquefiable sand beneath levees, the presence of sand within levees, and the levee-failure vulnerability in three generalized categories (URS Corporation and Jack R. Benjamin & Associates Inc., 2008, Figs. 6-35, 6-36, and 6-37). The sand beneath levees was found most widely liquefiable in northern and southeastern parts of the Delta, areas that include proposed Draft BDCP conveyance facilities.

Chapter 9 appears to say nothing about these findings. As its leading example of liquefaction-hazard mapping the chapter instead uses findings from the year 2000 (page 9-22, Fig. 9-6). These findings were not built into DRMS because "all aspects of that analysis, the seismic hazard model and, the fragility analysis are out of date" and because several principals in the 2000 work advised against using it (URS Corporation and Jack R. Benjamin & Associates Inc., 2008, App. B, page 6-1). The depiction of hazard in Figure 9-6 contrasts with that by the DRMS study. For instance, Figure 9-6 of Chapter 9 shows all Sherman Island levees as having high potential for damage from liquefaction, while DRMS Figure 6-37c assigns a majority of Sherman Island's levees to the lowest of three categories of vulnerability to earthquakes (URS Corporation and Jack R. Benjamin & Associates Inc., 2008).

The liquefaction map in Figure 9-6 also neglects a common approach to sketching liquefaction hazard on a regional scale. As illustrated by damage to railroad bridges by the 1964 Alaska earthquake (McCulloch and Bonilla, 1970), the abundance and severity of liquefaction commonly varies with the age and depositional environment of geologic materials. Geologic maps may thus be transformed into liquefaction-susceptibility maps (Tinsley et al., 1985; Holzer et al., 2009).

In the Delta, mapped geologic materials of greatest concern for liquefaction are the sand and silt that accumulated in stream channels during recent millennia. Some of these form ribbons of potentially liquefiable material that extend beneath Delta levees. Many such ribbons have been delineated from historical maps and from interpretation of aerial photographs (Atwater, 1982; Whipple et al., 2012).

Also of potential concern is wind-deposited sand that extends into most of the Contra Costa County part of the Delta. Chapter 9 mentions these geologic materials (pages 9-4 to 9-8) and identifies them as "liquefiable during major earthquakes" (page 9-69).

Reliance on a superseded assessment of seismic hazards

Chapter 9 makes abundant use of a draft report from the Delta Risk Management Strategy (DRMS) study cited above. This study included a comprehensive assessment of seismic risk to levees of the Delta and Suisun Marsh. The risk assessment study runs 270 pages as section 6 of the final report issued in 2008 (URS Corporation and Jack R. Benjamin & Associates Inc., 2008). A 2007 draft (URS Corporation and Jack R. Benjamin & Associates Inc., 2007), underwent abundant revision after critical review (URS Corporation and Jack R. Benjamin & Associates Inc., 2008, App. A, B). Chapter 9 uses only the 2007 draft, which it typically calls "the seismic analysis" and cites as "California Department of Water Resources (2007a) and as "DWR (2007a)." Among text and tables in Chapter 9 are about 85 such citations in all.

This situation leaves the reader wondering whether use of the final 2008 report, instead of the 2007 draft, would change the impact assessment in Chapter 9. A spot check of Tables 9-7 and 9-11 shows minor differences with entries in the corresponding tables in the 2008 DRMS report (URS Corporation and Jack R. Benjamin & Associates Inc., 2008, Tables 6-1 and 6-5, respectively). A fuller assessment of the impact of the obsolete DRMS version is beyond the scope of this review.

Chapter 9 recently went out of date in its citations about probabilistic estimates of earthquake shaking in California. The earthquake probabilities cited on page 9-10 were estimated more than a decade ago by the 2003 Working Group on California Earthquake Probabilities. The 2007 group released an updated assessment as Uniform California Earthquake Rupture Forecast 2 (Field et al., 2009). Table 9-12 (page 9-21) effectively cites this assessment by referencing the related 2008 version of the USGS national seismic hazard maps. But a rigorously up-to-date version of Chapter 9 would have mentioned a further iteration, UNCERF3, that was released in part in November 2013 (Field et al., 2013), in preparation for the 2014 national update.

Carelessness with assertions and references

"These organic soils [the peat of tule marshes] formed from accumulated detritus of the tules and other vegetation." (page 9-3)—Tidal marshes and tidal swamps aggrade by trapping sediment that tides bring in and by retaining organic matter that the wetland plants produce on site. The retained organic matter includes roots and below-ground stems (rhizomes) that the plants inject into wetland soils (Nyman et al., 2006; Mudd et al., 2009; Kirwan et al., 2010; Miller and Fujii, 2010; Takekawa et al., 2013, pages 10-11).

"It was necessary to use different sources to compile the geologic map" (page 9-3)—A new source not mentioned is mapping by Sowers et al. (2013). An example of this mapping, along the Sacramento River south of Sacramento, was presented as a poster at the 2010 Bay Delta Science Conference.

"The text descriptions [of geologic map units] are taken directly (i.e., verbatim) from the work done by Graymer et al. (2002) because this work...provides the most recent and relevant general descriptions of the geologic units that occur in the Plan Area" (page 9-3)— This compiler's choice is a debatable one. The Delta makes up less than 1/6 of the map area of Graymer et al. (2002), and barely 1/3 of the Delta lies within that map area. A Graymer map name adopted on page 9-4, "Delta mud deposits," poorly describes deposits that are dominated by peat in the central Delta. The associated description of Delta peatland as

lowered by "compaction and deflation" misrepresents subsidence that owes more to decomposition (pages 10-11 to 10-12) (Deverel and Leighton, 2010).

"This correlation [of geologic names used on two different maps] is only an approximation provided by the chapter author to aid the reader. It is not a scientific or peer-reviewed analysis." (pages 9-4, 9-6, 9-7, 9-8)—Disappointing

"In 1935 the University of California Agricultural Experiment Station mapped the surface soils" (page 9-4)—The work perhaps alluded to here, without citation, is the classic Delta-wide soil survey by Cosby (1941).

"The Delta and Suisun Marsh are in...one of the most seismically active areas in the United States" (page 9-10)—Seems at odds with another statement on the same page: "...the San Francisco Bay Area and Delta region have generally experienced low-level seismicity since 1800."

"...tsunami inundation area on the shores of the Sacramento River" (page 9-25)—The statement apparently refers to Carquinez Strait.

"Peak acceleration response at a period of zero seconds or PGA is also widely used to characterize the level of ground motion." (page 9-45)—Peak ground acceleration is conventionally defined as "maximum acceleration experienced by the particle during the course of the earthquake motion" without respect to frequency (http://eqint.cr.usgs.gov/parm.php).

"With respect to the hazard of a seiche, the existing water bodies in the Delta and Suisun Marsh tend to be wide and shallow." (page 9-50)—Disregards channels

"Levees constructed on liquefiable foundations are expected to experience large deformations (in excess of 10 feet) under a moderate to large earthquake in the region" (page 9-50, reiterated page 27-22)—This unreferenced statement appears to be taken verbatim from a DRMS report; it appears on page 6-37 of the final seismic-hazard assessment (URS Corporation and Jack R. Benjamin & Associates Inc., 2008). A more nuanced statement would cite this report's Figure 6-35 as evidence that liquefiable foundations, identified through geotechnical borings, are most common in northern and southeastern parts of the Delta. In a further nuance worth mentioning: for the 1906 San Francisco Earthquake, "calculations indicate that small to moderate damage would have occurred if the levees were at today's configuration during the 1906 event" (URS Corporation and Jack R. Benjamin & Associates Inc., 2008, page 6-36).

Chapter 9 cites large reports without pointing the reader to specific pages or figures within them. A more rigorous assessment would cite by chapter and verse.

The reference list for Chapter 9 excludes not just the final DRMS reports (URS Corporation and Jack R. Benjamin & Associates Inc., 2008; URS Corporation and Jack R. Benjamin & Associates Inc., 2011) but also a prominent update on procedures for assessing liquefaction hazards (Idriss and Boulanger, 2008) and an authoritative review of Delta subsidence (Deverel and Leighton, 2010).

Lack of summary

Like most of the DEIR/DEIS, Chapter 9 lacks an informative summary of expected impacts. The chapter's existing summaries are elsewhere, and they are limited to tabular entries in the Executive Summary and to watered-down text in the Highlights Brochure.

The chapter needs a summary, pitched to specialists but accessible to others, that would build on the entries on pages ES-66 and ES-67, and on the text in Highlights pages 26 and 27.

The summary would make clearer how the various Alternatives, including the No-Action Alternative, compare with one another in terms of effects on geology as a threat (and perhaps also as a scientific resource). Included would be an analysis of how the preferred CEQA Alternative compares with the No Action Alternative.

The Executive Summary of the DEIR/DEIS could tabulate the Chapter 9 impacts more clearly. Each of the three groups of potential impacts shares identical text that could be gathered in a header in the "Potential Impact" column. The text for the individual impacts could then be condensed to make clearer, at a glance, the differences among them.

Benefits overlooked

A CEQA guideline recommends assessing impacts that would "Directly or indirectly destroy...a unique geologic feature." Another CEQA guideline asks, "Does the project have the potential...to eliminate important examples of the major periods of California history or prehistory?"
(http://ceres.ca.gov/ceqa/docs/Adopted_and_Transmitted_Text_of_SB97_CEQA_Guidelines_Amendments.pdf)

Chapter 9 might thus consider, as incidental benefits of Draft BDCP Action Alternatives, geologic discoveries along routes of proposed tunnels and canals. Such discoveries may provide long-term context for 21st-century questions about climate change and ecosystem restoration (Malamud-Roam et al., 2006; Canuel et al., 2009). Precedents include incidental use of bridge-foundation borings as guides to sea levels and marsh accretion at San Francisco Bay (Trask and Rolston, 1951; Atwater et al., 1977).

Borings for proposed Draft BDCP tunnels are already providing insights into prehistoric volcanic eruptions. The borings have sampled volcanic ash layers that erupted about 400,000 years ago near Bend, Oregon, and about 600,000 years ago near Mount Lassen, California (Maier et al., 2013). Widespread volcanic-ash layers are important to geologists not only as signs of catastrophic hazards but also as unique tools for assigning, to the same instant in geologic time, climatic and tectonic events in widely separated places (Sarna-Wojcicki et al., 1983; Sarna-Wojcicki et al., 1985). Such scientific use of Draft BDCP geology would complement the engineering application of the findings in Figure 9-4.

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CHAPTER 10: SOILS

I. Overall Assessment

Chapter 10 concludes that the proposed Draft BDCP actions would cause significant harm to farmland soils by burying some beneath construction spoil and by inundating others in habitat-restoration areas. The chapter also determines that the soils pose little threat to the Draft BDCP actions. These plausible findings are undercut by inadequate summaries, missing references, and minor inaccuracies.

II. Scope

Chapter 10 treats soils both as agricultural resources and as construction hazards. In five of the nine soil impacts considered, the question is how an action (or inaction) will affect soils by means of erosion or decomposition. In the four other impacts, the soils pose potential hazards to people and facilities.

With four exceptions, the CEQA impacts for all options are termed "less than significant" both before and after mitigation (pages ES-67 to ES-68). In two of the exceptions, the No-Action Alternative is called "beneficial" because of non-BDCP efforts to arrest subsidence from decomposition of peat (SOILS-3, SOILS-8). In the other exceptions, topsoil is lost to decomposition under the No Action Alternative, to burial under spoils from construction of conveyance facilities, and to inundation from habitat restoration (SOILS-2, SOILS-7).

Not included among impacts assessed is soil loss from unintended flooding. Lasting losses may be limited to scour ponds and their aprons if levee breaches are repaired. On islands left permanently flooded the losses are of course greater.

III. Quality of Analysis

Inadequate summaries

Like most of the DEIR/DEIS, Chapter 10 needs to begin with an informative summary of expected impacts. The existing summaries are limited to tabular entries in the Executive Summary and brief text in the Highlights Brochure. The table enumerates nine soil-related impacts (pages ES-67 and ES-68), and the Highlights Brochure describes soil losses as a Draft BDCP impact (page 28 of Draft BDCP_highlights.pdf).

A useful summary, placed at the beginning of Chapter 10, would quantify losses and relate them to the No-Action and Action Alternatives. For instance, a table similar to the one on page 39 of the Highlights Brochure would itemize losses of agricultural soil from burial by tunnel waste, excavation of canals, and intentional breaching of levees. The table and associated text would analyze Action Alternatives by broad category, as done effectively in the Chapter 12 summary.

The summary would make clear, quantitatively, how the various options, including the No-Action Alternative, stack up in terms of effects on and of the soils. The summary might show, for instance, that the tunnel Alternatives would cause fewer losses to certain kinds of agriculturally important soils than would the canal Alternatives.

The existing Highlights text conflates landforms and soils in a confusing fashion. This text should conform more nearly to the Chapter text, which creates no such confusion (pages 10-3 to 10-6).

The Executive Summary of the DEIR/DEIS could tabulate the Chapter 10 impacts more clearly (pages ES-67 and ES-68). The impacts form two groups: SOILS-1 to SOILS-5 on

conservation measure CM1, SOILS-6 to SOILS-9 on other conservation measures. Each of the two groups of potential impacts shares similar or identical text that could be gathered in a header in the "Potential Impact" column. The text for the individual impacts could then be condensed to make clearer, at a glance, the differences among them.

The tabular summary on pages ES-67 and ES-68 could distinguish more clearly between No Action and Action Alternatives in terms of No-Action impacts that also apply to proposed BDCP actions. Under impacts on subsidence, the summary presents the No Action Alternative as beneficial because of subsidence-reversal projects independent of the proposed BDCP actions, without applying this benefit also to the proposed BDCP actions. Similarly, "significant" soil loss, under the No Action Alternative, if caused chiefly by decomposition of peat, would seem to extend to the proposed BDCP actions.

References missing

Page 10-2, lines 35-38—This summary of geological history, referenced to a report from 1950, exaggerates the roles of Carquinez Strait and inorganic sediment in building the historical channels and tidal wetlands of the Delta. Chapter 9 cites additional, newer references that could help here.

Page 10-3, lines 20-21—Could also cite the classic survey by Cosby (1941).

Page 10-4, line 4—According to this generalization from 1950, peat with many rhizomes of *Phragmites australis* [the current species name for this reed] underlies peat with many rhizomes of *Schoenoplectus acutus* and *S. californicus* [the current names for the main bulrushes]. Subsequent work has not reproduced this finding (Atwater, 1982; Drexler, 2011).

Page 10-4, footnote 1—The most up-to-date, reliable source on peat thickness is Deverel and Leighton (Deverel and Leighton, 2010, page 8). The 2007 California Department of Water Resources reference cited in the footnote is an obsolete draft of a report finalized in 2008 (URS Corporation and Jack R. Benjamin & Associates Inc., 2008).

Page 10-10, lines 16-17—Prefer Galloway et al. (1999) as comprehensive and technically sound, as well as written and illustrated for broad audiences

Page 10-11, lines 6-21—A standard reference not cited: Thompson (1957).

Page 10-11, line 24—Update to Deverel and Leighton (2010).

Minor points:

Page 10-2, lines 2-3 and 31-33—Distinguish between "soils" in the agricultural sense and "soils" as used by engineers.

Page 10-3, line 33—This summary could identify the soils of modern tidal wetlands and compare them to the diked and drained soils of former tidal wetlands. Likewise for the summary of Suisun Marsh soils on page 10-4, lines 20-22.

Page 10-5, line 16—The heading "Valley Fill" is potentially confusing because it brings to mind Sacramento Valley, San Joaquin Valley, Central Valley.

Page 10-11, line 1—Now *Schoenoplectus acutus* and *S. californicus.*

Page 10-11, line 5—Is this peat depth residual (after subsidence) or original (ca. 1850)?

Page 10-12, line 42—The current rates of subsidence vary with substrate. The rates are probably zero in the large part of Jersey Island where Pleistocene dune sand is exposed at the ground surface. This is an important point that bears on restoration opportunities in other parts of the Delta where mineral soils have already been exhumed; these areas can't subside further by decomposition of peat. This issue reappears on page 10-26, beginning on line 32, with a section that describes subsidence from decomposition of organic soils as continuing "to varying degrees." The section does not describe geographic differences. A fuller description would identify the west-central Delta as the main area where mineral soils are not widely exposed.

Page 10-13, line 17—This section could be expanded to discuss consequences of arresting or reversing subsidence. A supporting reference: Miller and Fujii (2010). The discussion would help anticipate the benefit identified on page 10-26, line 40.

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CHAPTER 11: FISH AND AQUATIC RESOURCES

I. Overall Assessment

Overall the DEIR/DEIS could demonstrate a more balanced approach by fully discussing results from an ecosystem perspective (to add to the species-by-species discussions), fully embracing uncertainty and discussing it uniformly while distinguishing knowns from unknowns, and explicitly stating assumptions and differentiating conclusions from hypotheses. The detailed piece-by-piece and part-by-part treatment of CMs and species, although perhaps necessary, dilutes the merit of the overarching ecosystem perspective of the intent of this plan. Success will depend on a fully functioning system and analyses that incorporate integration across species, within a species, and across regions. Adaptive management will require a well-planned and comprehensive research and monitoring program that will target causality and test Draft BDCP hypotheses.

Our specific concerns with this chapter of the DEIR/DEIS include: (1) positive benefits of habitat restoration are highly uncertain, and if not realized, will invalidate the final conclusion of no net negative effect; (2) further analysis of effects of flow on entrainment is needed; (3) the decision-tree process is not adequately described; (4) interactions and synergies among species and the potential impacts on other ecologically important species are not adequately considered; (5) the qualitative nature of the effects analysis makes results more aligned with 'hypotheses' rather than 'conclusions' or 'predictions'; (6) full life cycles are not adequately considered; (7) a more complete description of adaptive management is needed; and (8) uncertainty in the conclusions is not adequately acknowledged throughout the DEIR/DEIS.

II. Scope

This extensive and comprehensive chapter evaluates impacts of construction, maintenance, and operation of each of the Alternatives of Conservation Measure (CM) 1 and many of the other conservation measures on fish and other aquatic resources. Impacts on 20 fish species are evaluated. Eleven covered fish species that are federally threatened or endangered (Delta Smelt, longfin smelt, Sacramento splittail, fall-, winter-, and spring-run Chinook salmon, steelhead, green sturgeon, white sturgeon, Pacific lamprey, and river lamprey) are discussed separately for each of the Alternatives and most CMs, often for multiple fish life stages. The nine non-covered species that are California Species of Concern or of recreational and/or commercial importance (striped bass, American shad, threadfin shad, largemouth bass, Sacramento tule perch, Sacramento perch, Sacramento-San Joaquin roach, hardhead, and California bay shrimp) are discussed collectively. In addition, impacts of CM 1 and Alternatives on other cold-water habitat species in upstream reservoirs are evaluated.

As stated in Chapter 11, the actual effects of the actions are dependent on a clear understanding of Chapter 5 (the Effects Analysis) in the Draft BDCP. For example, "The methods used to analyze impacts to covered and non-covered fish and aquatic species in Chapter 11 rely on the models and data included in the Effects Analysis…An understanding of the Effects Analysis will help inform a review of Chapter 11. In some instances, the description of fish species life stage timing and distribution varies between the Effects Analysis and DEIR/DEIS. These differences are in the process of being updated to match one another…" (page 11-2).

Sixteen of the 22 CMs are dealt with in detail for each of the covered species. These can be summarized as impacts as a result of the construction, maintenance and operations of the new

water conveyance systems (CM 1), impacts from habitat restoration efforts, (principally CM 2 and CM 4 but also CM 5, CM 6, CM 7 and CM 10) and those individual activities (CM 12 – CM 19 and CM 21) that are designed to "reduce the direct and indirect adverse effects of other stressors on covered species." The latter include reductions in predators, illegal harvest, invasive vegetation, enhancement of hatcheries for some species, installation of nonphysical fish barriers, and improved oxygen conditions in the Stockton Deepwater Fish Channel.

In essence, a simplified summary of the primary projected impacts of the DEIR/DEIS is:

1) The construction, maintenance and operation of a new water conveyance system could change downstream flow rates and could have negative impacts on some species. However, the new conveyance system will allow additional flexibility in flow control that may improve resilience to climate change and may reduce fish entrainment losses by shifting intake usage between North and South intakes based on fish abundances in the area.
2) Habitat restoration, including flood plain inundation, may increase physical habitat area and food production for covered species via increased phytoplankton production.
3) Targeted activities will attempt to reduce predators, control invasive species, reduce illegal harvest, and be beneficial to certain species in various ways.

There were also several mitigation measures proposed to minimize the biological effects of construction and maintenance activities. In many cases it is argued that any negative impacts caused by changes in outflow would be fully compensated for by other conservations measures, principally habitat restoration.

III. Quality of Analysis

Effectiveness of Habitat Restoration

A fundamental component of the overall program is the success of comprehensive habitat restoration and connectivity. In essence it is argued that the positive benefits of habitat restoration and (aquatic related) conservation measures CM2 – CM22 will counterbalance any negative impacts that might be triggered by CM1 through changes in flows and water diversions.

It is a reasonable hypothesis that each Conservation Measure CM 2 – CM 22 might be beneficial to one or more covered species. Yet the degree of uncertainty does not rule out that the effects will be zero or negative. The uncertainty in the level of success of these measures makes it difficult to make the case scientifically that these benefits will counterbalance negative impacts elsewhere. If proposed habitat restoration actions are not implemented in a timely fashion or are not as effective as assumed in the DEIR/DEIS, then the positive impacts of those actions would no longer be present, and the final assessment of a net positive or no net negative effect would not be valid. A key uncertainty that has a profound impact on the assessment of impacts is the extent, timeliness, and effectiveness of the protection and restoration actions, particularly restoration of tidal marshes and floodplains (including the Yolo Bypass).

Extent: Specific sites for restoration activities have not been determined, nor has their ability to pass environmental review requirements been assessed. If willing land-sellers are not found or if environmental problems are identified (e.g., excess methyl mercury production), then

those preservation and restoration actions and the positive benefits attributed specifically to them in the impact analysis would not occur. Likewise, the analysis of hydrodynamic changes with new intakes and habitat restoration are central to evaluation of the effects on fishes. Yet the hydrodynamic analysis is based on one possible configuration of habitat restoration, and if that is not the final configuration, the results of the hydrodynamic analysis could change. The sensitivity of conclusions to the configuration of habitat restoration should be evaluated in the DEIR/DEIS.

Timeliness: Construction and flow operations may have impacts immediately, whereas the restoration impacts and benefits may lag a decade or more after construction. Often it is claimed that the negative impacts in one area (e.g., flow changes on covered species) can be compensated for by habitat restoration. Analyses suggesting this result are often based on the implicit assumption that the new habitats are 100 % effective and fully functional ecosystems that are tightly integrated physically and biologically with the rest of the Delta. The literature strongly suggests, however, that there are significant time lags between construction of a new habitat and its full functionality. This means that the benefits of habitat restoration may not occur for a long time and that the benefits may be too late for some species if negative impacts come first. These time lags were not fully considered in the DEIR/DEIS. The effect of time lags on overall conclusions should be evaluated in the DEIR/DEIS. Alternative scenarios should be considered in which habitat restoration begins sooner or is phased in to maximize the benefits (e.g., by starting with habitats that will have the largest impacts). The priority of habitats to be restored is not indicated, so it is not clear if the most critical habitats will be first on the list.

Effectiveness: Even if all acres are acquired and restoration actions are taken in a timely manner, whether those actions will deliver the anticipated benefits or not is also uncertain. For example, the analysis regarding habitat restoration assumes there will be increases in phytoplankton production and that these increases will be transferred up the food web to covered species. This largely ignores an equally likely result that the added biomass of phytoplankton will be consumed by clams, which have had substantial effects on phytoplankton abundance and species composition throughout the Delta. Moreover, new zooplankton could also be consumed by other fishes. Whether or not any increases in primary production will be transferred to zooplankton and on to covered species that may reside in the restored area or outside of it is largely unknown.

Based on a thorough and credible review of the scientific literature and extensive experience in the ecosystem, Mount et al. (2013) question whether the tidal marsh and floodplain restorations will deliver the food subsidies anticipated to Delta and longfin smelt. Their concerns seem justified. Increase in habitat area is not necessarily a metric for increases in habitat quality or functionality. Although the Adaptive Management Team is tasked with assessing the effectiveness of the restoration actions, there is no description of management actions that will be considered if the positive effects are not observed. Hence we are not able to determine if those actions could possibly compensate for the negative impacts identified.

Impacts of Flow Operations

The main impacts of new flow operations (CM 1) on fishes are to: 1) allow flexibility to shift entrainment from the South Delta intakes to the new North Delta intakes, and 2) change

flow rates and other associated conditions (e.g. water temperature and turbidity) downstream from the North intakes.

Entrainment: It is suggested that overall entrainment of fishes may be reduced by increasing flexibility to re-routing flows into the North or South intakes on the basis of fish distributions in the area as well as the use of improved intake structures at the North intakes (new screening processes and state-of-the-art positive barrier fish screens). However, one credible analysis of the modeled flow regimes (Mount et al. 2013) points out that, although significant uncertainties are incorporated into the CALSIM modeling, they are not given adequate consideration when statements about effects are made. In addition, both Mount et al. (2013) and a credible review by MBK Engineers (presentation at January 2014 ISB meeting) question whether the system can be operated as simulated in the CALSIM modeling and hence whether the predicted reductions in entrainment will actually occur. Reducing entrainment by shifting intakes to those areas with fewer fish requires good estimates of fish concentrations in the immediate area. Therefore, estimates of entrainment should be bracketed based on model uncertainties.

Flow rates: The impact of altered outflow cannot be adequately assessed with the information given because the operational flows are not yet determined for Alternative 4. Some of the possible flow regimes have negative impacts. It has been established that the abundances of many of the covered species show a correlation with flow rates. Uncertainties about the level of spring and fall outflow will be addressed with two decision trees, one for fall and one for spring. It is argued that the decision-tree process will run for about 10 years and inform the initial operations of CM 1. Targeted studies will address this uncertainty before the new facilities are operational, but there is no description of these studies or a clear designation of how optimal flow rates can be balanced for different species. The decision-tree process will focus on longfin smelt and Delta Smelt with consideration of salmon and sturgeon but no apparent consideration of other species. It is not clear what would be done if 'optimal' flows differ across these species. Moreover, other species abundances such as young-of-the-year striped bass also correlate with flows, and there is no consideration of potential changes in abundances of these young predators. Overall, it is stated that a science plan and data collection program will be developed and implemented but the design of that program is not stated, the amount and source of funding not identified, and the experiments to be done not determined. If the success of the studies is dependent on having years with a range of flow conditions, then success is uncertain at best. It is impossible to determine if the proposed research program will be adequate to address either the uncertainties that have been identified or the hypothesized causal mechanisms (turbidity, suspended solids, temperatures, salinity) that might lead to more informed flow operations.

Species Differences and Interactions

Overall, there was little consideration of interactions and synergies among species. Also, potential impacts on other ecologically important species in the ecosystem have been ignored or inadequately presented.

Because species were assessed individually in the evaluation of the effects of water operations, significant differences in effects among species were identified. In contrast to the detailed individual species discussions, the nine non-covered species were lumped and considered as a group in Chapter 11 because the effects of most conservation measures "on non-

covered fish and aquatic species would be similar for all non-covered fish species included in Chapter 11." First, no reason is given as to why the nine non-covered species are included and others excluded apart from being "identified by state or federal agencies as special status or of particular ecological, recreational, or commercial importance." (page 11-1, lines 29-30). Clearly, one could argue that there are other species that have major ecological impacts in the Delta (e.g. two invasive clams) or that might be abundant and have competitive interactions with covered species (perhaps the centrarchids). Also, if habitat restorations become fully functional and provide predator refuge, feeding areas, or sources of food for covered species, the restorations must have impacts on many (perhaps hundreds) other species including the listed non-covered species. Some of these other species, such as nonnative predators and invasive clams, may also benefit from these expanded habitats. Benefits for the other species may dampen any benefits of the habitat restoration for covered species.

Second, the nine non-covered fishes and invertebrates have a huge range of ecological tolerances and requirements, life histories and behaviors. It seems unlikely that effects would be similar across all of these species. The treatments of covered species in the DEIR/DEIS revealed very significant ecological differences among species and even life stages. At best, this approach seems overly simplistic because we expect that individual species will have different responses to the proposed actions. At worst, this sort of lumping could lead to wrong conclusions because both predators (e.g. striped bass) and their prey (e.g. shad, California bay shrimp) are combined. Some of the proposed actions, for example in-flow conditions, might favor a particular covered species but may also favor a non-covered predator such as striped bass. Some further justification for this approach should be given, particularly because some of the non-covered species have strong interactions (e.g. predation) with some covered species.

Likewise, lumping phytoplankton, zooplankton and predators may also enhance uncertainty because clams can alter phytoplankton species composition, fish feed selectively on different types and sizes of zooplankton, and predator species differ in prey choice, feeding behavior, and thermal/habitat requirements. Other important elements of the food web in these habitats, such as emergent and submergent macrophytes and edaphoic microalgae, were ignored. Moreover, there are literally hundreds of species of macroinvertebrates as well as other fish species that are ignored in the DEIR/DEIS, although these species play an essential role in the ecological functioning of the Delta ecosystem. It is difficult to draw species-specific conclusions based on the grouping of some species and exclusions of important food web components such as the invasive clams. We do not suggest that multispecies biological models are required but we do suggest that some sort of balance and rationale be given for species lumping and exclusions so that uncertainties in conclusions can be better understood and underlying assumptions can be formally expressed.

It is not clear how the interactions among species are considered in time and space. Much of the DEIR/DEIS was focused on a detailed discussion of how an individual conservation measure (or a component of a conservation measure such as construction) might impact a specific species or life stage of a particular species. For example, each of the 11 fish species is discussed separately and extensively. However, there was an absence of consideration of interactions and synergies among species. We know we can't really manage species by species, and what is beneficial for one may be adverse for another. This concept has not been adequately captured or addressed. As mentioned, this becomes particularly important in the discussions of habitat restoration, which is intended to provide new food resources in the restored area and to the Delta. There is no consideration of how suggested increases in zooplankton food supply will

be distributed among the target species. There is likely to be competition for these limited resources among covered species or with other species not considered. Information about who uses those resources is critical but not fully considered in the assessment. Food-web models do not adequately consider predators or competitors of the covered species. It did not appear that any biological feedbacks (e.g. resource depletion) were used in the analyses.

Delta Connectivity

Overall, there was little consideration of interactions and synergies among different proposed CM actions or between different geographic regions within the Delta and beyond the Delta.

It is not clear how the cumulative effect of restoration in different parts of the Delta is addressed. Conservation measures are planned in many different locations throughout the Plan Area and it is suggested that negative impacts in one area can be offset by positive impacts in another area. This necessarily contains an implicit assumption that the entire Draft BDCP area is functionally interconnected both physically and biologically. It assumes that CM impacts on a particular life stage of a species in one part of the Delta can be balanced by other CM impacts that may occur at other times, on other life stages, and in other locations. This has not been demonstrated.

Additional consideration is needed of how factors outside the BDCP area interact within the BDCP area. The DEIR/DEIS included some forcing factors (such as climate change, tides, reservoir and upstream flows) and to a certain extent the potential for new invasive species from outside the BDCP area. Yet there is little discussion of biological influences or migrations from outside the BDCP area. A good example is longfin smelt, which has a baywide ecosystem distribution. Changes in flows may be very important in migrations into the BDCP area and the role of these smelt in other parts of the Delta. While the connectivity of the Delta ecosystem was not addressed for longfin smelt and other species, we note that the life cycle model for salmon does acknowledge the fact that salmon spend different portions of their life in different regions of the Delta, San Francisco Bay and Pacific Ocean systems, and are impacted by how long they spend in the Delta and the timing of migration through the Delta. This approach was not used for other species. Also, there has been little effort to translate biological changes in the BDCP area to downstream regions.

Qualitative Analyses

The impacts on fish are largely assessed based on qualitative analyses, including expert judgment. The relation of these analyses to the specific models presented in the Effects Analysis (Chapter 5 of the Draft BDCP) is not clear. The qualitative analyses seem to conclude that the negative impacts of construction and flow operations will be minimized through Adaptive Management of operations and that the other conservation measures (in CM2 – CM22) will be beneficial and largely make up for the negative impacts. Since the relative degree to which any conservation measure will increase/decrease the production of a given fish species is unknown, it is invalid to calculate net effects. This type of statement is invalid in a qualitative comparison because: 1) the relative degree of the negative and positive impacts is unknown, and 2) CM 1 and CM 2 -22 impacts may operate on different life stages of a species. Some life stages may be more critical than others (e.g. bottlenecks).

The assessments of effects of each part of each conservation measure on fish and aquatic resources are qualitative, with considerable uncertainty in the conclusions reached. The methods

used to assess net effects are drawn in part from DiGennaro et al. (2012). The relative importance of a BDCP attribute (or stressor) affecting each life stage of each of the covered species was assessed largely by expert judgment (on a scale of +4 to -4) during a workshop. Scores were based on importance (none = 0, very high = 4) and on the basis of the degree of change of that attribute caused by the Draft BDCP. These analyses could have been strengthened by:

1. Conducting an independent assessment by a second group of scientists. Conclusions are only as good as the expert judgment and without replication, uncertainty is high.
2. Qualitative analyses should include and fully document assumptions. The analyses need to recognize that conclusions largely provide a mechanism for verbal description of potential effects and provide a hypothesis of effects rather than any predictive forecast.

Net effects and the degree of certainty are tabulated for each attribute (e.g. Figure 5.5.1-5 for Delta Smelt and 5.5.3-4 for winter-run Chinook). Attempts to qualitatively balance positive and negative impacts (i.e. positive benefits compensate for negative impacts) are not valid because the relative strengths of these impacts are unknown. The authors need to fully recognize the uncertainties inherent in the DEIR/DEIS analysis rather than simply providing tables stating no net effect. Moreover, the net effects analysis is highly uncertain because the combined importance of all effects was a subjective analysis of the attribute scores. Another group of experts may reach a different conclusion.

Full Life cycle considerations

For the covered species, each CM is often evaluated for each life stage of the species. It is often claimed that negative impacts of one CM and usually on one life stage can be offset by another CM that may be acting on another life stage. This type of analysis assumes full biological functionality and physical/ecological connectivity across the region and among the areas where CMs are being applied. Moreover, it assumes that all life stages are equally important. Consideration should have been given to what is currently restricting a species production and an acknowledgement that actions on that bottleneck are likely to have a higher impact than actions on other life stages. For example, if larval recruitment is a serious life-stage bottleneck, then it is not clear that any efforts to improve juvenile conditions will have population-level impacts. We recognize that it is difficult to make these kinds of assessments until after there is a better understanding of the complete life cycle and the operations of stressors. Yet this limitation or added uncertainty needs to be addressed, particularly when conclusions are being made about 'net effects'. The OBAN and IOS life-cycle models that focused exclusively on Chinook salmon do not do this and do not include most of the CMs. A number of other life cycle and bioenegetics models for other species were excluded from consideration. Some of these models (e.g. smelt) could be quantitative and apply to specific questions raised in the Draft BDCP.

Adaptive Management

Several very specific Biological Goals or targets are defined in the Draft BDCP. For each species-level Biological Goal there is a variety of CMs that could contribute to that goal. Adaptive management is a key part of the overall Draft BDCP. However, given that a number of CMs apply to a number of species, there is no explanation of how adaptive management will be

used to target the specific CM that is causing any changes observed for individual species. Research will need to be carefully designed to understand the causal relationships. There is no description of: (a) how individual targets or thresholds will be determined across time to trigger an action, (b) how much progress is needed to maintain a particular action, (c) how much negative change would need to be observed to effect a change in the CM, or (d) what would happen if results were mixed across species (i.e., some covered species received a positive benefit and others received a negative benefit).

Uncertainty

The Delta is a physically, chemically and biologically complex ecosystem. There has been extensive research, monitoring and modeling for the Delta area but much remains unknown, particularly with respect to causal mechanisms. The ecosystem has also undergone major changes in hydrology and water flow, habitat structure, and biological composition, including a reduction in a number of species and massive invasions by others (e.g., clams). Much of this complexity and change has been captured in the various sections of the Draft BDCP as well as some of the individual species descriptions in Appendices to Chapter 11. In this context, the DEIR/DEIS analyses are designed to predict the nature of the changes that might occur over the next five decades due to construction and operations of a massive new water conveyance system in the Delta and a series of efforts to restore habitats and institute a number of other Conservation Measures. All of this is done under major known or estimated (climate change, population increases) but also unknown (new invasive species or discovered causalities) changing environmental conditions. This is a daunting challenge.

Ultimately, the question is whether and what sort of effect the combined CMs will have on key covered species and on the ecosystem as a whole. It is critical to be able to balance negative effects with positive effects. To a large degree the relative impact of any one CM remains uncertain and 'conclusions' of net effects analyses could be better termed 'hypotheses'. There are uncertainties in causality, the analyses performed, the future unknowns and changes, or responses of other species and ecosystem components that are not considered, any or all of which could have indirect and unintended consequences.

We recommend that this uncertainty and the many underlying assumptions be dealt with upfront, forcefully and directly. There is uncertainty throughout all of these discussions. Quantitative estimates of uncertainty are rare. Moreover, the handling of uncertainty seems inconsistent throughout. The uncertainty of the level of understanding of the factors limiting species production, model validity, and overall conclusions reached are more clearly acknowledged in the Draft BDCP than in the DEIR/DEIS. Sometimes the uncertainty in the data or models is used to outright eliminate the application of certain models (e.g., fish life cycle models). Other times the uncertainty in the output is stated as the conclusion (i.e., no conclusion can be drawn). Sometimes the uncertainty is mentioned, and yet other times the uncertainty is not mentioned at all. In general, the latter becomes more common as one moves from the Draft BDCP to the DEIR/DEIS details to the Summary parts of the chapter. Often the rollup summaries are not reflective of the uncertainty of the issues expressed in the body of the report. Rollup of conclusions tend to downplay uncertainties. A typical example of this is on page 11-18 "The effects of the restored habitat conditions (CM 2...CM 4...CM 5...CM 6...and CM 7...) would be beneficial for all covered species because there would be an increase in the amount of habitat as well as food production in, and export from, the restored areas". The certainty of this conclusion is not reflective of the uncertainty of the analyses.

Table 11-1A-SUM2 is another example of the problem mentioned above. Data clearly show a relationship of outflow to splittail abundance and any reduction in that flow might have a negative impact. Although the DEIR/DEIS claims a positive impact from the Yolo Bypass, the table itself shows the net effects of flows on splittail are not adverse, less than significant or even beneficial. These types of conclusions without precautionary notes about uncertainties or assumptions can be misleading.

In addition, there are clearly many assumptions that are necessarily part of any such analyses. We suggest that the fundamental assumptions be succinctly stated up front in each section. Statements of assumptions allow a more logical evaluation of conclusions, and would provide a more balanced and understandable presentation of the methodology used.

Cumulative Effects

The analyses are targeted toward assessing impacts over a 50-year period. Yet, many of the effects on individual fish are evaluated at points in time, normally only for a year or for a particular life stage. It is possible that a low impact (positive or negative) of a few percent during a year can have a significant effect if accumulated (and compounded) over each year for 50 years, but it is not clear if this been incorporated into any of the biological models. The multi-year modeling of growth, reproduction and mortality of Delta Smelt is a good example of existing quantitative approaches that could be applied (Rose et al. 2013a 2013b). Simple bioenergetics models could have been used to assess effects of changes in temperature on fish growth rates.

Additional General Questions/Points

- Temperature plays a key role in fish growth, reproduction, and physiology, and behavior is often very sensitive to even small changes in temperature. Although temperature was considered in the sturgeon analyses it is not clear that it was fully considered in other species, particularly for those where temperature might be near critical thresholds. Temperatures might be affected if changes in flow rates affect the degree of tidal intrusion or residence times of water in the system.
- Flows are considered important to many fish species, yet the causal relationships of fish abundances with flows remains enigmatic. Will research and monitoring (e.g. as part of the decision-tree analyses) include measures of other potential forcing factors such as water temperature, predation rates, suspended solids, salinity, and food densities?
- How were (or will) thresholds or tipping points be considered in the analyses or adaptive management programs?
- There was very little discussion of the two invasive clam species which, according to the published literature, have had a huge impact on the ecological functioning of the Delta ecosystem (e.g. changes in chlorophyll levels, species compositions, *Microcystis*). Were they fully considered in the analyses of habitat restoration and potential new food sources? Clams may likely consume portions of any new food produced. They are a key ecological component of the ecosystem and should be specifically considered.
- Wherever possible, modeling should show 'bracketed results' or ranges of uncertainty.
- Propagation of errors in physical/hydrodynamic/hydrological models will be compounded when then applied to biological models as forcing functions.

IV. References Cited

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CHAPTER 12: TERRESTRIAL BIOLOGICAL RESOURCES

I. Overall Assessment

Chapter 12 uses a logical approach, a wealth of detail, and thoughtful analysis in evaluating potential impacts to terrestrial habitats and organisms. Unlike the rest of the DEIR/DEIS, it makes many of its findings accessible in a comprehensive lead-off summary. Like the rest of the DEIR/DEIS, however, understanding and evaluating the material in Chapter 12 requires frequent referencing to other chapters, and to multiple places in the Draft BDCP.

Our main concerns:

1. *Losses and gains of habitat*—To simplify estimates of losses and gains in habitat, the chapter equates a species' habitat with one or more natural communities. This simplification weakens the link between habitat value and habitat losses and gains and contributes to uncertainty in the calculations.
2. *Timing of restoration*—The chapter sets optimistic expectations about the time required to replace a mature habitat of slow-growing terrestrial species.
3. *Restoration effectiveness*—There is an implicit assumption that the projected habitat gains from restoration and protection needed to offset habitat losses associated with BDCP actions will be fully realized. Experience suggests that this is rarely the case.
4. *Performance measures*—The chapter lacks detailed metrics of desired ecological results of the various conservation measures, even as summaries derived from the Draft BDCP.
5. *Adaptive management and monitoring*—Adaptive management is frequently mentioned as the solution if things don't work out as planned, yet few details are provided (these are in the Draft BDCP) and lessons from terrestrial habitat restorations that were managed adaptively are scarce or absent. Implementing the Draft BDCP will require extensive monitoring landward of the traditional coverage through the Interagency Ecological Program. The demands for monitoring may be underestimated (and therefore underfunded).
6. *Contingency plans*—It is unlikely that all the actions and measures in the Draft BDCP will play out as planned. Beyond calling on adaptive management, there is little indication of any back-up plans if habitat restoration falls short because of funding, unwilling sellers, climate change, or other factors.
7. *Linkages among species or actions*—In contrast with the Draft BDCP's emphasis on linking conservation measures in space and time, Chapter 12 mostly treats each species and each action independently of other species and actions.

II. Scope

Chapter 12 of the DEIR/DEIS, which addresses the potential impacts of Draft BDCP conservation measures on terrestrial biological resources, begins with an informative summary.

Effects on natural communities, covered plant and animal species, and other species of concern are considered; most of the attention is focused on individual species. The general approach to gauging impacts, compensating actions, and mitigation for species is to: (1) use available information to construct a habitat suitability (HSI) model for the species; (2) use the model in combination with GIS to determine where available habitat occurs, weighted by habitat value; (3) overlay the areas that will be affected by various actions under the conservation measures to determine the loss of available habitat; (4) compare the amounts (and occasionally locations) of habitat to be restored or protected to determine whether they compensate for losses; (5) supplement with Avoidance and Minimization Measures (AMMs) and/or other specific management actions to enhance the value of restored or protected areas or reduce impacts; and (6) where necessary, implement additional Mitigation Measures to ensure sufficient habitat availability.

This is a logical approach. The analyses of impacts on natural communities and species from the conservation measures associated with the Alternatives are comprehensive and detailed. In most cases, the proposed habitat restoration will more than compensate for the losses associated with construction and operation. Where it falls short, additional actions are proposed. For example, loss of acres of vernal pool complex is estimated to be greater than replacement through protection and restoration in the near term. The difference is anticipated to be addressed through a variety of restrictions on activities or AMMs: "With these AMMs in place, Alternative 4 would not adversely affect vernal pool complex natural community in the near-term" (page 12-2048; unless otherwise noted, all page references are to the DEIR/DEIS documents).

Numerous AMMs and Mitigation Measures are proposed to supplement the habitat protection and restoration measures. In many cases, these involve conducting surveys to obtain additional information on distribution in the study area (e.g., Mitigation Measure BIO-55, page 12-2161), target and protect sensitive areas (e.g., Mitigation Measure BIO-75, page 12-2241), or evaluate the potential effectiveness of proposed conservation actions. For example, the loss of managed wetland habitat for shorebirds and waterfowl in Suisun Marsh would be mitigated by the protection or restoration of 5,000 acres of seasonal wetlands, assuming that: "1) existing managed seasonal wetlands on average in Suisun Marsh provide low biomass and low-quality food to wintering waterfowl and 2) protected seasonal wetlands can be managed to produce high biomass and high food quality. However, the food biomass and productivity in Suisun Marsh would need to be quantified in order to determine if the 5,000 acres was sufficient to avoid an adverse effect on wintering waterfowl in the Suisun Marsh, or if additional mitigation would be needed. Mitigation Measure BIO-179a, Conduct Food Studies and Monitoring for Wintering Waterfowl in Suisun Marsh, would be available to address this adverse effect" (page 12-2561). Many of the AMMs or Mitigation Measures are quite detailed, evidencing sensitivity to the specific ecological requirements of the species.

III. Quality of Analysis

The amount of detail provided in Chapter 12 and its appendices is impressive. There are numerous instances in which the treatment of potential impacts and the measures proposed to counteract them are thoughtful and comprehensive. In some cases, the analysis delves into great detail about what might seem to be potentially minor effects. Concerns are raised, for example, about possible alterations of the photoperiod of sandhill cranes due to lighting at construction sites or on new roadways (page 12-2210). In other situations, however, little supporting detail is provided or the reader is referred to material in other chapters or in the Draft BDCP.

Chapter conclusions

The overall conclusion of the chapter is that the only non-mitigable impacts of BDCP actions would potentially affect bank swallows, through disturbance and/or loss of breeding habitat, and giant garter snakes, through disruption of movement corridors by canal construction (for Alternatives 1B, 2B, and 6B) (see pages 12-3229 – 12-3243). Additionally, although sufficient conservation acreage would be provided by the conservation measures to offset near-term effects of Alternatives 1A, 2A, 3, 4, 5, 6A, 7, 8, and 9, "insufficient cultivated land would be protected (and enhanced) under Alternatives 1B, 1C, 2B, 2C, 6B and 6C to offset loss of habitat for species that use cultivated lands for foraging. Alkali seasonal wetland complex and vernal pool crustacean habitat (alkali seasonal wetland complex and/or vernal pool complex) would need to be restored and protected in addition to what is currently in the Plan under Alternatives 1C, 2C and 6C, as described in Mitigation Measures Bio-18, Bio-27, and Bio-32" (page 12D-39).

Although an EIR/EIS is required to identify the "unavoidable significant environmental impacts" of a project pursuant to Section 15126.2(b) of the State CEQA Guidelines, the non-mitigable potential impacts of BDCP on bank swallows and giant garter snakes (or, indeed, on any terrestrial biological resources) are not included in the broader listing of impacts and mitigation measures in Chapter 31 (Table 31-1).

Areas of concern

Finding what one needs to know to understand or evaluate a particular statement or conclusion in the DEIR/DEIS often involves a considerable amount of searching through thousands of pages, as well as delving into referenced (and non-referenced) material in the Draft BDCP itself. Based on our attempts to do this, we have several concerns with the treatment of terrestrial biological resources.

Losses and gains of habitat

Assessing the potential impacts of Draft BDCP actions begins by determining how much (acreage) of a given habitat is lost or converted to something different—i.e., the "footprint" of the action. The loss is then offset by restoring or protecting an equivalent or greater amount (acreage) of the lost habitat. The calculations in the DEIR/DEIS are therefore made in acreages. There is an implicit assumption that an acre lost can be replaced by an acre gained. The DEIR/DEIS discusses two approaches for dealing with cases in which the gains don't balance the losses. First, it is frequently proposed that the replacement habitat is of greater value. Second, the calculation of "mitigation ratios" (how many acres should be restored or protected to replace an acre lost) considers factors such as importance (value) of habitat to a species, species rarity, threat levels, and uncertainty about the effectiveness of restoration (see page 12D-3). Although this seems to be a reasonable approach to gauging mitigation efforts, it would be good to know how uncertainties of restoration effectiveness were assessed.

"Habitat" for natural communities is determined by classifying communities into several types, which are then mapped. For species, "habitat" is defined through the development of habitat suitability (HSI) models. The results are then used to calculate potentially available habitat and what habitat might be lost or gained as a result of Draft BDCP actions. The details of the HSI models are not in the DEIR/DEIS but are provided in Chapter 2 of the Draft BDCP. These appear to be carefully done, making good use of available literature and unpublished

information; Appendix 2A of the Draft BDCP discusses the assumptions and underlying rationales for each of the HSI models. The DEIR/DEIS correctly notes that the models "do not necessarily indicate with certainty that covered species would not occur in all areas not identified as habitat; but instead indicate that these areas have a much lower probability of species occurrence compared with areas identified as suitable habitat. Habitat suitability models are a tool used to estimate impacts to obtain a maximum allowable habitat loss. On-the-ground surveys, performed by professional biologists, will determine impacts during implementation" (page 2A-4). In other words, lots of monitoring!

The specifications of habitat for a species derived from the HSI models are often quite detailed. In a listing of principles to guide the conservation strategy for aquatic species (Draft BDCP pages 3.2-5 to 3.2-7), the Draft BDCP correctly observed that "habitat should be defined from the perspective of a given species. Habitat is a species-based concept reflecting the physiological and life-history requirements of species. Habitat is not synonymous with vegetation type, land (water) cover type, or land (water) use type." Nonetheless, in calculating the habitat loss/gain functions that are the foundation of assessments of Draft BDCP impacts, habitat has been generalized to correspond with one (or more) of the natural community types. While this generalization was probably necessary to permit the analysis of habitat losses and gains using GIS analysis, much of the useful and important detail in the HSI models has been lost (although it reappears now and then in the AMMs and Mitigation Measures for individual species). Thus, there is often an unspecified (but potentially large) uncertainty associated with the habitat loss/gain calculations.

This uncertainty may be exacerbated by uncertainties in the distributional data that are used in concert with the habitat information to define where a species occurs, and therefore its vulnerability to the construction and restoration actions under different Alternatives. The distributional data (provided in a series of maps for the species considered) require several assumptions, most importantly that: (1) the distribution has been adequately surveyed, and (2) the distribution is stable. The distributional data come from a variety of sources over an unspecified time period (although the data sources may be given in some undisclosed location in the DEIR/DEIS or Plan). They are based largely on records in the California Natural Diversity Data Base (CNDDB). Because this is a presence-only database, confirmed absences (0 values) are ignored and can only be inferred, compromising its value. The database is also incomplete. For example, CNDDB contains only a partial download of records of bird distributions in the California Avian Data Center (CADC). This source of uncertainty is not acknowledged, nor are its potential consequences explored.

Uncertainties in the distributional information may also affect the assessment of habitat "value." There is frequent mention of the expectation that restored or protected habitat will be of greater value than the habitat that is lost to Draft BDCP activities, so the amount of replacement acreage may actually underestimate the "functional" acreage available to a species. "Value" is determined based on recorded distribution and abundance in different vegetation cover types and/or species' ecology. For example, for the giant garter snake, "the modeled upland habitat is ranked as high-, moderate-, or low-value based on giant garter snake associations between vegetation and cover types (U.S. Fish and Wildlife Service 2012), historical and recent occurrence records (Appendix 12C, 2009 to 2011Bay Delta Conservation Plan EIR/EIS Environmental Data Report), and presence of features necessary to fulfill the species' life cycle requirements" (page 12-2131). Although this approach is reasonable, it rests on the assumptions that: (1) current distribution reflects optimal habitat selection, (2) the distributions have been

adequately surveyed and are not undergoing rapid changes, and (3) the restored habitat will actually be better than the habitat lost. There is a clear intent to manage for improved habitat, considering such factors as spatial heterogeneity and connectivity; to the extent that this is realized, the last assumption is probably valid, but it does rest on an accurate understanding of the habitat requirements of the species.

Timing of habitat restoration

Habitat restoration is a complex and time-consuming process, The DEIR/DEIS recognizes this and devotes considerable attention to the timing of restoration efforts. In particular, plans are outlined to ensure that restoration is in phase with habitat loss, so that gaps in habitat availability to a species are minimized. Some restoration is scheduled to begin shortly after permitting of the BDCP, whereas conveyance operations will not begin for at least a decade (although construction of the intake facilities will begin soon after permitting). While this difference in phasing may help to ameliorate impacts of habitat loss for aquatic species, it will be less effective for terrestrial species and communities. For slow-growing flora, such as valley/foothill riparian woody vegetation (page 12-2015), or species that rely on mature habitats, such as black rails that occupy well-developed tidal wetlands (page 12-2165), or Swainson's hawks, white-tailed kites, Cooper's hawks, or ospreys, which require mature trees for nesting (page 12-2255), there may be a temporal mismatch between the loss of mature habitat components and restoration. It may take decades to redeem the lost value. For the latter species, "this time lag between impacts and restoration of habitat function would be minimized through specific requirements of AMM18 Swainson's Hawk and White-Tailed Kite, including transplanting mature trees in the near-term time period" (page 12-2255).

For something like a hawk, however, "habitat" depends on much more than having a suitable tree for a nest. Transplanting mature trees is challenging enough; one can't transplant an entire functioning mature riparian ecosystem. It is inevitable, therefore, that there will be a substantial gap between the loss of habitat for such species and the re-emergence of habitat that meets the full complement of a species' requirements. If this takes decades, population dynamics may be disrupted and local extirpation may follow. The analysis for the salt marsh harvest mouse, for example, warns that up to 20% of the species' habitat in the Draft BDCP area may be affected, diminishing the population and reducing genetic diversity, "thereby putting the local population at risk of local extirpation due to random environmental fluctuations or catastrophic events. This effect is expected to be greatest if large amounts of habitat are removed at one time in Suisun Marsh and are not effectively restored for many years, and if there are no adjacent lands with salt marsh harvest mouse populations to recolonize restored areas" (page 12-2485). The expectations for restoration of mature habitats, even if supplemented by Mitigation Measures and AMMs, strike us as unrealistically optimistic.

Restoration effectiveness

For many natural communities and species, the effects of CM1 on species are to be mitigated by the creation of restored habitat of equal or greater value in Restoration Opportunity Areas. For natural grasslands, for example, the analysis of long-term effects for NEPA projects a loss of 2,947 acres by the end of the BDCP timeframe. The 2,000 acres of restoration associated with CM8 and the restoration of temporarily affected grassland required by AMM10 (431 acres for Alternative 4) would not totally replace the grassland acres lost. There would be a permanent loss of 516 acres of grassland in the BDCP area. However, "the combination of restoration,

protection and enhancement of grassland associated with Alternative 4 would improve the habitat value of this community in the study area; there would not be an adverse effect on the grassland natural community" (page 12-2070).

In this example, as elsewhere in this chapter, one has the impression that there is full confidence that the projected gains in habitat will in fact materialize. There may be considerable certainty about the losses, particularly those associated with construction activities, but there is far greater uncertainty about the mitigation. Will the restoration actually be done? Where will it be located ("somewhere in a Restoration Opportunity Area" leaves a lot of uncertainty)? Will funding be adequate? Will appropriate areas be obtained from willing sellers? Will the species and communities come? Will climate change and sea-level rise erase the restoration gains? These questions are not adequately addressed, and the consequences of failing to reach the restoration, protection, or mitigation goals are not considered (at least in this chapter). Simply referring to adaptive management as a way to deal with such uncertainties is not sufficient.

One aspect of uncertainty that *is* addressed in this chapter (in Appendix 12D) is ecological feasibility: are suitable conditions present within specified conservation zones to implement the appropriate near-term conservation measures? Although the assessment explicitly excludes consideration of socio-economic or engineering aspects of feasibility, there is a comprehensive analysis of the presence of lands supporting required unprotected natural community acreage in specified conservation zones to support natural community protection, and of the presence of lands that meet suitability criteria, such as species range, soil type, land use, natural community, and land elevation to support restoration of natural communities or species habitat (page 12D-2). Appendix 12D is where one can find details about what goes into the determination of mitigation ratios, what principles will be used to guide the selection of areas for protection as part of the Draft BDCP reserve system, and what criteria might be used to judge the suitability of restoration sites. Although the treatment of these factors is generally excellent, the approach fails to consider how the spatial and temporal sequencing of restoration projects can influence their effectiveness in contributing to BDCP goals. Which sites are selected for restoration of habitats at one time may depend on which sites are already being restored and where they are. These sequencing effects may be particularly important for projects associated with waterways, where flows connect places. Such considerations are mentioned in the chapter in connection with the intent to include connectivity among habitats as a factor in planning, but the implications are deeper than that.

Climate change and sea-level rise can create additional uncertainty in habitat restoration efforts. We consider some implications for tidal marsh restoration in greater detail in Box 1.

Box 1. The ability of tidal wetlands to keep their heads above water as sea level rises

Impacts assessed

The anticipated outcomes of tidal marsh restoration under the Draft BDCP depend largely on whether new tidal marshes will survive the rise in sea level projected for the 21st century. Several of the Draft BDCP documents under review consider this question:

- Draft BDCP Appendix 3B, "BDCP Tidal Habitat Evolution Assessment," presents results of modeling that simulates the fate of marshes at Suisun Bay and in the Delta during the next 50 years.

- Draft BDCP Appendix 5E, "Habitat Restoration," refers to this modeling and, in three main places, provides background discussion (pages 5.E-37, EA.4-18 in section E.A.4, and 5E.B-9). Included is a proposed strategy of getting new marshes established soon, before sea-level rise accelerates to the rates forecast for late in the 21st century (page 5E.B-7).
- Draft BDCP Appendix 5.A.1, "Climate Change Implications for Natural Communities and Terrestrial Species," refers briefly to marsh accretion.
- DEIR/DEIS Chapter 12 repeatedly mentions accretion without analyzing it to the level of detail in Appendices 3B and 5E.

The background discussions include brief reviews of how marsh plants as well as suspended sediment can influence vertical accretion in tidal marshes. The references cited include recent journal articles about marsh accretion at the San Francisco Bay estuary (Callaway et al., 2011; Stralberg et al., 2011) and the best available measurements of below-ground productivity by *Schoenoplectus acutus*, the main bulrush among Delta tules (Miller and Fujii, 2010).

Doubtful projections

The accretion estimates in Appendix 3B rely on simplified modeling for Suisun Marsh and on an optimistic assumption for the Delta.

For accretion modeling at Suisun Marsh, Appendix 3B relies on a simplified method used by Orr et al. (2003). In this method, above- and below-ground contributions by marsh plants are assumed to raise the marsh surface by 1 mm per year, and the role of inorganic sediment is estimated from suspended-sediment concentrations. More recent models include specific factors for injected roots and rhizomes and for soil decomposition (Mudd et al., 2009; Kirwan et al., 2010; Kirwan et al., 2011; Fagherazzi et al., 2012; Takekawa et al., 2013). Such models do not appear to have been used in the Draft BDCP projections.

For the Delta, Appendix 3B assumes that marsh accretion keeps pace with sea-level rise (page 7). The report goes on to qualify this assumption: "The ability of marshes to keep pace with higher rates of sea level rise is not yet well understood" (page 8).

Outdated references

The related reference lists cite no post-2011 reports about tidal-marsh accretion excepting, in Appendix 5B, a piece by a science journalist (Kintisch, 2013). A more timely assessment might have considered the accretion modeling cited above and its implications for 21st-century tidal marshes. Also directly relevant are recently published observations of modern accretion rates in San Francisco Bay estuary marshes (Callaway et al., 2012; Thorne et al., 2013) and prior accretion rates in the Delta (Drexler et al., 2009; Drexler, 2011). Updated background on roles of inorganic sedimentation could cite recent reports on horizontal accretion (Gunnell et al., 2013) and coastal sediment starvation (Fagherazzi et al., 2013).

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Performance measures

In view of the uncertainties that accompany many of the actions and responses that are part of the Draft BDCP, it is important to be asking continuously how well the goals and

objectives are being met. Performance measures are essential. For the Draft BDCP as a whole, performance is gauged in terms of progress toward meeting the biological goals and objectives that are part of the overall conservation strategy. All mentions of performance measures in the DEIR/DEIS simply refer to these goals and objectives. In some instances the accounts are quite detailed. For example, in the account for loggerhead shrike we are told: "Under CM11 Natural Communities Enhancement and Management, insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities (Objectives ASWNC2.4, VPNC2.5, and GNC2.4). Cultivated lands that provide habitat for covered and other native wildlife species would provide approximately 15,400 acres of potential high-value habitat for loggerhead shrike (Objective CLNC1.1). In addition, there is a commitment in the plan (Objective CLNC1.3) to maintain and protect small patches of trees and shrubs within cultivated lands that would maintain foraging perches and nesting habitat for the species. The establishment of 20- to 30-foot-wide hedgerows along field borders and roadsides within protected cultivated lands would also provide high-value nesting habitat for loggerhead shrike (Objective SH2.2). These Draft BDCP objectives represent performance standards for considering the effectiveness of conservation actions." (page 12-2428).

Most species accounts in the DEIR/DEIS, however, make no mention of objectives or performance measures. Instead, the biological goals and objectives are presented in Chapter 3 of the Draft BDCP (Table 3.4). The biological goals and objectives are either performance-based (was an action undertaken?) or results-based (did it have the anticipated effects?). For terrestrial resources, the objectives are mostly performance-based (which are easier to measure); results-based objectives are more difficult to measure, but they are ultimately what the BDCP project is all about. Chapter 3 of the Draft BDCP includes lengthy tables and text listing the biological goals and objectives and describing the underlying rationale for each; the specific monitoring efforts for compliance effectiveness *and* the specific metrics that will be used to judge performance; the major sources of uncertainty associated with CM1; and research actions necessary to reduce the uncertainties (performance can also be judged on the basis of success in reducing the listed areas of uncertainty). These are all important details. Even though these details are included in the Draft BDCP, their absence from the DEIR/DEIS, even in a summary form, diminishes its comprehensibility and scientific value substantially.

Adaptive management and monitoring

In a well-planned undertaking such as the Draft BDCP, performance measures should provide a frequent assessment of whether actions are having the desired effects. This is the domain of adaptive management. Adaptive management is *the* key to the success of the BDCP project over its 50-year duration. The adaptive management approach and administrative organization are described in detail in the Draft BDCP (Chapter 3, Section 3.6, and Chapter 7). Yet, adaptive management receives an even more cursory treatment in the DEIR/DEIS than do performance measures. Adaptive management is mentioned frequently in the DEIR/DEIS with no details about how it might be implemented; rather, it is often presented as a panacea for all problems.

Even so, there are numerous instances in which the elements of adaptive management are elaborated without the term being mentioned. For example, on page 12-2081, the amount of habitat restoration is adjusted depending on the rate at which habitat is lost (primarily through restoration of tidal wetland) and the timing of activities. Or on page 12-2233 it is proposed that if breeding occurrences of least Bell's vireo and yellow warbler are documented in the survey area,

consideration will be given to control of nest parasites and predators to foster population persistence. These are good examples of adaptive management based on field monitoring, although they are not presented as such. We consider adaptive management in detail elsewhere in this review.

Contingency plans

Monitoring and adaptive management are proposed to evaluate whether things are proceeding as planned. What if things don't go as planned? The history of ecological restoration tells one that restoration projects rarely result in exactly what is desired, when it is expected. Implementation of many of the AMMs anticipates that various activities (e.g., construction, roads) will be able to be redirected or retimed to avoid or minimize potential impacts. There will inevitably be situations, however, in which the adjustments are not possible or incur too great a cost. What then? Given the complexity and the high stakes of many of the actions to be undertaken in Draft BDCP, it would seem prudent to have contingency plans at least generally outlined *before* discovering that things aren't working. There is little mention of contingency plans in the event that a given action does not produce the desired results.

Linkages among species or actions

The Delta is a complex, interconnected place, in which what happens in one place at one time has cascading effects elsewhere at a later time. Correspondingly, the Draft BDCP undertaking is complex, with many things going on at different places and times, all linked together in different ways. The Draft BDCP and the DEIR/DEIS do not adequately acknowledge and consider these interconnections.

Both the Draft BDCP and the DEIR/DEIS do recognize the need to connect places undergoing restoration or targeted for protection. Establishing connectivity among patches of habitat to facilitate movement of individuals is considered as part of the planning for many species. Landscape ecologists distinguish between "structural" connectivity (i.e., what is seen on a map or a GIS image) and "functional" connectivity (i.e., how organisms actually use connections). The approach taken by Draft BDCP understandably relies on the former, in particular the patterns developed in the California Essential Connectivity Project. Without knowing the specific locations for habitat restoration within the broadly defined Restoration Opportunity Areas, however, it is difficult to evaluate how structural connectivity will be established in practice (although the intent is clearly there). Elements of functional connectivity might be incorporated into the planning by relying on the details of species' ecologies contained in the HSI models.

Connections among actions may be even more important than connections among places. Actions taken to benefit one species may benefit or harm other species. Thus, "Riparian restoration in those more interior portions of Old and Middle Rivers that would be managed for riparian brush rabbit habitat have potential to benefit resident western pond turtles because riparian-adjacent grassland is an important habitat characteristic for the rabbit" (page 12-2154). However, "the restoration programs will increase primarily wetland and riparian natural communities by converting agricultural land or managed wetland. The special-status and common plants and wildlife that rely on wetland and riparian habitats for some stage of their life will benefit from these changes over time. Other species that rely on agricultural land and managed wetland, but do not benefit from wetland and riparian expansion, may decline in the study area" (page 12-3226). In other words, some (perhaps many) actions will entail tradeoffs.

The importance of considering linkages among places and among actions is clearly stated in the conservation strategy of the Draft BDCP: "substantial benefits of the conservation strategy are derived from understanding interconnections between conservation measures across program elements, across the wide geography of the Delta, and across time. In short, the conservation strategy is intended to be greater than the sum of its parts" (Draft BDCP page 3.2-3; see also Draft BDCP pages 3.2-5 to 3.2-7). Aside from brief mentions (e.g., page 31-28 and following), however, the DEIR/DEIS fails to follow through on the intent of the conservation strategy, instead usually considering each species and each action independently of other species and actions. This may be necessary to comply with CEQA and NEPA formatting requirements, but that should not preclude a full consideration of interactions among species, habitats, and actions as well.

CHAPTER 13: LAND USE

I. Overall Assessment

This appears to be a document that was prepared first as a way of scoping out the difficulties that lay ahead w.r.t.? working with existing land use legislation more than as a document prepared for an EIR. It is surprising how little is actually uncovered, especially in any quantitative way, about anything. The chapter makes it very clear that the extensive habitat restoration plan in CMs 2-21 will inevitably conflict with land use regulations and be perceived as having negative impacts but that these will be addressed when specific locations are decided upon.

II. Scope

Every impact affects land use in some ways, there are other chapters on agriculture, recreation, socioeconomics, etc., so this chapter addresses how the project "bumps up against" federal, State, and local land use legislation, including the new Delta Plan. As such, it reads more like a layout of land use obstacles ahead than an actual analysis of land use impacts. This, of course, is because most of the land use impacts, beyond the tunnels themselves, are tied to CMs whose locations and operations are yet to be determined.

III. Quality of Analysis

Chapter section 13.1 provides an overview of existing land use by regions within the study area.

Chapter section 13.2 includes a seemingly complete legal/planning review of land use regulations, including the regulations of the DPC Land Use and Resource Management Plan (LURMP) for the primary zone that became effective in November 2010. The text makes it clear that nothing in this law is applicable to State agencies such as DWR. Numerous additional planning efforts and their regulations including the Delta Plan are summarized.

Chapter section 13.3 addresses environmental consequences. Aerial techniques were used to determine existing land uses in the project areas, impacts were determined by thinking through how the project would conflict with land use objectives, or be incompatible with existing land uses, or would physically "divide" communities. The document then indicates that most of these issues are covered in the other chapters. It also reviews compatibility with the Delta Plan requirements (Table 13.1).

Chapter section 13.3.3 identifies, for each Alternative, and sometimes by conservation measures, the potential acres where there are land use conflicts by city and county land use regulation categories, including possible mitigation measures. Analysis appears to have adequate consistency and thoroughness though everything is qualitative and the effects of CM2-21are even more vague because their locations are not yet specified.

Chapter section 13.4. includes the literature cited within the chapter and primarily consists of land use legislation and planning documents.

CHAPTER 14: AGRICULTURAL RESOURCES

I. Overall Assessment

As with all chapters, a summary comparative table of Alternatives with a short accompanying discussion would be useful. Here, only acres of land lost to agriculture are compared.

The analysis is limited to permanent and short-term losses of agricultural acreage, with little economic analysis or discussion. Farming is the primary economic activity in the Delta.

II. Scope

This chapter examines effects of project Alternatives on agricultural production in terms of permanent and short-term acres of farmland eliminated. This is nicely summarized in their Table 14-8, condensed for inclusion below as an example of a useful summary comparison table.

Table 14-8 (condensed). Estimated Conversion of Important Farmland as a Result of Construction of Water Conveyance Facilities, by Alternative (Acres)

	Perma-nent Subtotal	Short-term Subtotal	Grand Total	% Total Study Area
Alternatives 1A and 6A	4,984	1,329	6,313	1.23%
Alternatives 1B and 6B	18,875	2,144	21,019	4.10%
Alternatives 1C and 6C	13,014	3,170	16,184	3.16%
Alternative 2Aa	4,992	1,826	6,818	1.33%
Alternative 2Ba	18,868	2,669	21,537	4.20%
Alternative 2C	13,019	3,170	16,189	3.16%
Alternative 3	4,838	953	5,791	1.13%
Alternative 4	4,975	1,315	6,290	1.23%
Alternative 5	4,770	833	5,603	1.09%
Alternatives 7 and 8	4,883	1,105	5,987	1.17%
Alternative 9	2,459	559	3,018	0.59%

III. Quality of Analysis

This is mostly an acreage analysis, and omits most relevant economic analysis. Quite a bit of economic analysis capability is available for agricultural land and economic issues in the Delta, Yolo Bypass, and the Central Valley - very little of it has been used in the DEIR/DEIS.

Flooding from island failures. It seems that the No-Action Alternative should include some estimation of the likely flooding of some additional subsided Delta islands. The repair of all failed islands is not what has happened in recent history. Further, there is likely to be additional waterlogging of soils in a few areas that will reduce agricultural activity on some deeply subsided islands.

Salinity comparisons. Salinity changes should also be compared with the No-Action Alternative, as well as existing conditions. This seems to be a more relevant comparison. To what degree do these changes in salinity fall during the crop irrigation season? What is the economic impact of these changes in salinity?

Yolo Bypass inundation. For crop inundation in the Yolo Bypass, there is a nice study led by Richard Howitt quantifying these effects in general. This study is cited, but its results are not employed to give more precise economic impacts.

Estimation of land use and salinity effects on agricultural yields and revenues. Several Public Policy Institute of California studies have estimated agricultural land and economic losses from changes in the Delta using modeling for many individual Delta islands, including salinity effects. This work or similar modeling capability is not cited or employed. Far more quantitative economic and employment impact estimates can be made of the effects of changes on Delta agriculture, by county and even by island.

Waterlogging impacts and costs. It should be possible to have an estimate of the additional waterlogged area from seepage from the surface canal Alternatives, 1B, 2B, 6B. The relevant groundwater modeling results seem to appear in Chapter 7. Perhaps some of this land might be suitable for waterfowl habitat. Why are seepage impacts to agriculture not even roughly quantified? Modeling capability to make rough estimates is certainly available.

Losses from habitat conversion. Even though specific locations for habitat restoration have not been specified, it is still possible to come up with a reasonable range of likely agricultural and agricultural economic impacts. Several reasonable estimation methods are readily available.

Mitigations. An interesting range of mitigations for loss of agricultural land is proposed.

IV. References Cited

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CHAPTER 15: RECREATION

I. Overall Assessment

In general, the material in this chapter is useful and informative to the Draft BDCP. However, inclusion of information such as mosquitoes as a public health risk for recreational users in the Draft BDCP area, further attention to specific CMs that affect recreational users in the Draft BDCP area (CM13: Invasive Aquatic Vegetation Control, CM15: Localized Reduction of Predatory Fishes, CM17: Illegal Harvest Reduction, and CM20: Recreational Users Invasive Species Program), and better linkages with other chapters would increase its applicability.

II. Scope

Chapter 15 details the physical environment, recreation facilities, and both recreation activities and opportunities in the Draft BDCP Area. There are numerous parks, extensive public lands, and private areas with many interconnected waterways that offer diverse recreation opportunities ranging from boating and fishing (the principal recreational activities) to camping, bird watching, sightseeing (e.g. wineries), hunting, wildlife viewing, trail hiking, walking and picnicking. The DEIR/DEIS focused primarily on: 1) how the actual construction and maintenance of new structures will impact recreational use at that location or in the immediate vicinity, and 2) how the operations of the water flow system (CM1) in each of the Alternatives might affect recreational opportunities. Most of the latter are focused on the frequency that reservoir levels will exceed the threshold set for recreational impairment.

Readers are referred to other chapters on Socioeconomics (Chapter 16), Aesthetics and Visual Resources (any changes in resources might affect their draw for recreation, Chapter 17), Fish and Aquatic Resources (changes in abundance or mix of recreational fishes or even the perception of changes might affect recreational fishing, Chapter 11), Public Services and Utilities (Chapter 20), Transportation (e.g. traffic patterns, Chapter 19), Environmental Justice (differential use of recreation facilities, Chapter 28), and Noise (Chapter 23) to review the assessment of how the Draft BDCP will impact these resources. Unfortunately, those results were not reconnected or cross-referenced to their impact on recreation, including tourism.

III. Quality of Analysis

An aspect of the recreational impacts not mentioned in this chapter that will be a consequence of all Draft BDCP Alternatives is covered in detail in Chapter 25, Public Health. This includes the increases in potential vectors of human and diseases, and especially of the biting nuisance caused by mosquitoes. For example, as stated elsewhere in the DEIR/DEIS, "Construction of the water conveyance facilities and water supply operations under all action Alternatives would result in an increase in sedimentation basins and solids lagoons. These new features could result in an increase in standing water, thereby potentially increasing vector breeding locations and vector-borne diseases in the study area" (page 25-34, lines 18-21). At individual construction sites near recreation sites or areas and in-river, construction would be primarily limited to June through October each year. This, of course, is the period of peak mosquito breeding and biting activity in the Delta. Moreover, the economic cost of nuisance mosquitoes is not discussed in either this chapter or in Chapter 25 of the DEIR/DEIS. Increases in mosquito populations will affect virtually all recreational activities in the Delta (e.g. fishing, camping, wildlife viewing, sightseeing), resulting in loss of recreational opportunities and increased human discomfort. Although there is a commitment to develop mosquito management

plans elsewhere, Chapter 15 of the DEIR/DEIS should include this topic as a direct cost on recreational activities in the Delta.

Also, Chapter 15 needs to pay more explicit attention to the other conservation measures because a number of these have the potential to have direct positive or negative impacts on recreation. For example, CM 17 (reduction of illegal harvest) would provide more fish for those who take fish legally. CM 20 might help reduce invaders, which would help the ecosystem overall but might come at a cost to boaters who would have to have their boats inspected. CM13 and CM 15 are both intended to reduce the local densities of 'nonnative predators' on selected species. These predators may likely include (although not specifically identified) the striped bass and largemouth bass that support much of the recreational fishing. The review should discuss how the predator reduction effort might affect fishing per se or the fishers drawn to this area to fish.

CHAPTER 16: SOCIOECONOMICS

I. Overall Assessment

None of the findings are robust given the nature of the analysis, but neither are they unbelievable (beyond the number of hotels). None of the socio-economic effects seem to be linked to environmental impacts. It appears that where the Draft BDCP will be providing compensation for its effects on Delta communities, it will be based on better analyses at the time.

II. Scope

This chapter attempts to predict the socio-economic effects on local communities in the Delta from project construction and operation. It draws on, and in some sense completes, the socio-economics analyzed in the chapters on agriculture and recreation. While the descriptive material is largely on the Delta proper, much of the formal economic analysis is for the five-county Delta region, with some effort made to split off from the Delta portion. The chapter spans economic impacts of tunnel construction and maintenance estimated in dollars and the qualitative effects of the project on "small town feeling." Social impacts are not considered under CEQA but are under NEPA. How economic and social impacts might feedback on environmental impacts does not seem to have been considered.

Because most of the data are for the five counties in the Delta, they are largely, or at least frequently, irrelevant. There are some data for individual cities within the Delta, and occasional reference to data that seem to be derived for the Delta itself. It is not always clear, however, which area the text is referring to.

Lastly, CMs 2 – 22 are not analyzed, though some unsubstantiated conjectures are made that they will have more serious impacts than the tunnel project and its operation.

III. Quality of Analysis

This chapter is largely descriptive, with a fair amount of pretty irrelevant quantitative information about the five counties as a whole included. The efforts to portray recreation and agricultural economic activity are based on existing and projected conditions, but even data sources for existing conditions are not well specified, or even plausible. For example, on page 16-21 starting on line 13 w.r.t. recreation we read:

> There are 98 hotels in the Delta with a total of 5,036 rooms. In the five-county region, there are 406 hotel properties with a total of 33,402 rooms. Slightly less than a quarter of all hotels and roughly 15% of all rooms within the five-county region are in the Delta.

These numbers are only plausible if West Sacramento and Stockton are included in the Delta. This would be fair, but much of the problem is that conventional models are inappropriate for describing the economy of scores of poorly connected islands with cities on their periphery, but cities better connected beyond the Delta than to the Delta. Much of the recreation and other data are ten years old or more. A private data provider (Claritas Marketplace) assembled data from the 2011 census supposedly so that it reflects the Delta, but how the data were assembled and transformed is not apparent. The numbers generally do not comport with casual observation.

Derived data were then used in a standard, widely used, input-output software package called IMPLAN at the "five-county Delta Region" or "five-county region."

IMPLAN includes (1) estimates of county-level final demands and final payments developed from government data; (2) a national average matrix of technical coefficients; (3) mathematical tools that help the user formulate a regional model; and (4) tools that allow the user to change data, conduct analyses, and generate reports. (page 16-43).

CHAPTER 21: ENERGY

I. Overall Assessment

The word "electricity" should replace every use of the word "energy" in this chapter. The reader should be reminded at the beginning of each section that this chapter also only deals with SWP and CVP electricity generation and use. Though short at 60+ pages, the chapter could be half its length by putting the purely descriptive material into an appendix. While the chapter shows that the electricity impacts are quite small, it makes surprisingly little reference to what the environmental impacts of changes in electricity use within CVP and SWP systems might be were the changes in electricity per chance larger.

II. Scope

This chapter evaluates the changes in the hydropower generation or energy usage associated with implementation of BDCP alternatives. Both the operations of CVP and SWP are considered. There is no mention of gravity feed. A change of energy consumption is expected due to both the construction as well as operation of BDCP facilities. An increase of energy usage is expected, which, if supplied by other sources, will have environmental (land use changes, GHG and pollution generation) and economic consequences.

The energy effects were evaluated under 2025 and 2065 conditions because of possible change of run off conditions and sea level rise due to climate change. Monthly TAF pumped at the north Delta intake for each BDCP alternative and No Action alternative were calculated using the CALSIM-II model, from which monthly and annual energy requirements were established for each case and were compared with existing energy usage. The upstream energy generation was assumed to be the same for BDCP baselines and alternatives since the upstream reservoir operations are largely controlled by natural runoff conditions; this is affected by climate change and inter-annual variability but not BDCP operational scenarios. The existing CVP and SWP pumping facilities at the south Delta are estimated to operate with a maximum monthly energy requirement greater than that estimated for BDCP, and hence increased use of existing pumping facilities is not considered of consequence for energy impact studies. The energy use for pumping at the proposed North Delta pumping plants and at the existing Delta and south of Delta pumping plants are evaluated for each of the BDCP alternatives.

The chapter does not take a California or West Coast electrical systems view, only a California State and federal water systems view of electricity, and so it is not possible to assess any systemic implications with respect to increased use of gas-fired electricity generation, for example. No other type of energy use beyond electricity within the water system is considered. Thus, "Electricity Generation and Use within the SWP and CVP Systems might be a better title for the chapter.

III. Quality of Analysis

<u>Usage of Models, Inputs, Analysis and Uncertainties</u>

The energy calculations used are straightforward, and conducted by multiplying the monthly-pumped TAF by the energy requirement per water volume pumped (i.e., pumping energy factor - MWh/TAF), the latter being based on Bernoulli hydraulic head calculations and relevant efficiencies. The MWh/TAF was estimated by CALSIM-II for each alternative, and

CALCIM-II is arguably the best available for Delta flow calculations within the current regulatory framework. The pumping energy factors for south of Delta CVP and SWP water deliveries are assumed to remain the same for each of the BDCP alternatives and baseline, but the energy use varies with the annual deliveries. All assumptions appear to be reasonably sound and justifiable. Uncertainty estimates are not given, however, although for this case some putative estimates are possible. The chapter includes an extensive description of the electricity generation and use in the SWP and CVP that should probably be moved to an Appendix.

Summary, Possible Issues and Referencing

NEPA effects statements and CEQA conclusions are made for issues of major impact and a cumulative effects analysis is made. Essentially, the conclusion for each case is that there would be no adverse (NEPA) effect and that impact would be less than significant and no mitigation is required (CEQA conclusion). A concern with regard to these inferences is heavy reliance on CALSIM-II output, since significant uncertainties may seep in to calculations. The model does not take into account future climate change adaptation strategies that might be implemented and the model output is dependent on the regulatory setting for which the model is applied. If the model overestimates the energy requirements as stated in the DEIR/DEIS, then the conclusions will stand, but this is neither established in the DEIR/DEIS nor substantiated via proper referencing to existing literature. Overall, the methodology employed is sound and the calculation procedure represents sound engineering.

CHAPTER 22: AIR QUALITY AND GREENHOUSE GASES

I. Overall Assessment

The technical content of the chapter is of acceptable standards, but clarifications should be made in a revised version, especially with regard to ozone production and transport as well as including an analysis of greenhouse gas (GHG) fluxes from [CM2-11]. The chapter has done an admirable job in identifying the air quality impacts of CM1 and identifying the Alternatives that are environmentally benign.

II. Scope

Chapter 22 addresses local and regional air quality impacts of criteria air pollutants and toxic air contaminants (TACs) emitted or generated during the construction and operation of Draft BDCP Alternatives. GHG emissions associated with the project are analyzed in relation to regulatory limits as well as control measures. The Draft BDCP could facilitate new growth and development in SWP and CVP Export Service Areas, and air quality associated impacts of such growth are addressed in Chapter 30. Climate change impacts on project Alternatives are discussed in Chapter 29. They all are in the category of controversial community issues (ES Chapter 7).

The study area for air quality effects includes immediate surroundings of project activities, within 1000 feet of construction and operations. For GHG, the area is much broader due to the global nature of GHG forcing. Three (SVAB, SJVAB, SFBAAB) of the fifteen California air basins are identified as important for the study. Each of the air basins is described with regard to geography, climatology, air pollution, and meteorology. Air pollutants are considered in the framework of EPA criteria pollutants (which are further classified in terms of regional and local pollutants) as well as TACs. Health impacts of pollutants are identified and assessed. The National Ambient Air Quality Standards (NAAQS), CAAQS, and CCAA are outlined, and the attainment status of the three air basins in point are listed (Table 22-3). It appears that violations of NAAQS and CAAQS are prevalent in the three air basins with regard to ozone and PM, to the extent that they are classified as non-attainment. Increased emissions can be regarded as adverse, and Draft BDCP proponents are expected to develop an Air Quality Mitigation Plan (AQMP) to ensure that regulations and recommended mitigation are incorporated into future conservation measures. The GHG emissions are discussed in relation to climate change, CEQA guidelines §15364.5, CEQA OPR Advisory, DWR climate action plan, and California Global Warming Solutions Act (AB 32). TACs in California are primarily controlled through the Tanner Air Toxics Act (AB 1807) and Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). Local laws may trump certain Federal and CEQA regulations.

Air pollutants and GHGs are generated during the construction phase as well as operation of the water conveyance facility [CM1]. In the former, the dominant emissions include those from mobile and stationary construction equipment exhaust, employee vehicle exhaust, dust from land clearing and earthmoving, electrical transmission, and concrete batching from onsite plants. As such, this DEIR/DEIS assumes a particular schedule and phasing of activities, which are imperative for emission modeling (Appendix 22A).

The potential air quality and GHG effects of CM1 and habitat conservation measures CM 2–22 have been analyzed, and the implications of CM1 on sensitive receptors associated within residential and recreational land use are evaluated quantitatively at the project level (within 1000 feet of the operations). The effects of CM 2–22 are evaluated qualitatively at the program level. It is argued that it may be sufficient to consider only the air quality and GHG impacts of CM 2-11. Cumulative analyses are also presented.

\ The three air basins cut across four air quality districts [YSAQMD, SMAQMD, BAAQMD, and SJVAPCD] that have different emission standards for criteria pollutants and TACs; *de minimis* threshold levels for each basin have been identified. Many of these districts are already either non-attainment areas or maintenance areas, so extra emissions can have significant impacts. The cases of construction and long term operations are analyzed separately for different (nine) Alternatives and nineteen potential impacts (AQ 1-19) are identified and mitigation actions are proposed. The analysis is fraught by the need to comply with or consider a myriad of federal, state and local environmental standards. CEQA standards are more stringent than NEPA, and neither imposes thresholds for GHG.

No-Action and Action Alternatives are considered in detail, using projections of future climate that include changes in temperature, precipitation, humidity, hydrology, and sea level rise. Some or all air quality districts are affected by the Alternatives. Given the uncertainty of pollution emissions in construction activities, the considerations are only qualitative for CM 2-11. In all, the emissions appear to contribute significantly to criteria pollutants during the construction phase but not in the operation phase. Mitigation actions are required and are proposed through a series of mechanisms such as fees and offset reduction programs.

III. Quality of Analysis

This chapter of the DEIR/DEIS has been done thoroughly and carefully, considering a myriad of sources and project Alternatives. The results are physically plausible, moreso for the construction activities than the higher the air quality impacts, and they occur during the construction phase (nine years), impacting only selected counties. The air quality (AQ) impacts of long term operation of conveyance facilities appear to be insignificant for all Draft BDCP Alternatives.

Best available modeling systems have been used for AQ and GHG modeling. Emissions from heavy-duty equipment land disturbance were calculated using spreadsheets based on the methodology and default emission factors from the California Emissions Estimator Mod (CalEEMod). Emissions have been quantified for both 2025 and 2060 conditions. As expected, some of the data on personnel and equipment are unavailable. Many assumptions were needed to be made, and they are clearly stated in Appendix 22A. Best available input data from DWR, EPA, ARB and ICF are used, and all conceivable sources have been incorporated in developing inventories. The effects of the Alternatives on AQ, criteria pollutants, and GHG emissions from construction and operations were assessed and quantified using standard and accepted software tools, techniques, and emission factors. The models employed are EMFAC 2011 (for traffic), CalFEMod (maintenance), AERMOD and variants (air quality analysis), and AERSCREEN (DPMs, assuming worst case scenarios based on individual sources).

The following comments are offered for further consideration:

(i) SMAQMD requires dispersion modeling of construction generated PM10 emissions, which has been performed using AERMOD. The results are presented in Appendix C in terms of tables with numerous data points that are very difficult to interpret and frankly many readers

would not care to read. It would have helped if the results were presented in graphical form. This is particularly important since PM10 background concentrations currently exceed CAAQS and comparisons between the No-Action Alternatives and Action Alternatives are important. How much do the construction activities increase PM concentration under various CM 1 Alternatives? Are they contributing to extra exceedance days? These are some questions that are important to answer. AERMOD is a source dispersion model and its capabilities are limited in the absence of well-defined mean winds, such as the case of Schultz eddy formation or summer days where slope flows may dominate in complex terrain.

(ii) No model evaluations have been done using current or past data, and hence the results have large uncertainties. If the models have been evaluated for the area, some references would be helpful.

(iii) It is curious why the ozone issue has not been addressed although there have been lengthy discussions in the introductory sections on ozone and its health impacts. Table 22.3 shows that there are substantial numbers of ozone 'exceedance' days and the areas concerned are in non-attainment. Conversely, CO and NOx thresholds are rarely exceeded but the discussions and analyses of them are extensive. Perhaps it is assumed that control over precursor emissions may reduce the chemical products, but this needs to be justified and illustrated quantitatively.

(iv) The suite of models used does not include any photochemical models, and hence the formation of secondary pollutants (e.g., additional PM2.5) is excluded. In the project area, there is considerable land area with agriculture, and hence secondary pollutants can be important. A statement of the reason for exclusion (mainly comes from possible growth in agriculture) is in order.

(v) Prolonged and tortuous discussion of federal, state, county, and local standards, guidelines, and recommendations as well as discussions on modeling made reading this chapter very difficult. Some of the boiler plate material on criteria pollutions and their impacts may be removed (or relegated to an appendix), paving way to a more clear flow of essential material.

(vi) Fundamentals of global warming are described at length in the Chapter, but some of the discussion is redundant and others would fit better in Chapter 29.

CHAPTER 23: NOISE

I. Overall Assessment

In all, the section on noise pollution in the DEIS/DEIR is rigorous and extensive, and some further considerations are in order to account for possible noise refraction at night. Given uncertainties, most of the inferences are qualitative, and are expressed in terms of impacts on the overall Draft BCDP Plan area rather than those over individual counties, communities, and cities that may have their own noise standards. Given the overall inference that the project may have adverse noise consequences (NEPA conclusions) and that the cumulative noise impact is considerable (CEQA conclusions), the Noise Abatement Plan (Appendix 3B) based on BMPs needs to be carefully designed and executed. Suggestions for improvement of this chapter include an earlier termination of trucking and construction activities, initiation of noise monitoring at specific construction sites along with seasonal monitoring, focusing on the mitigation of noise from the long-term operations related to conveyance facilities, including terrain and buildings in models, and changing the accepted background noise condition of 40dBA.

II. Scope

This chapter identifies potential impacts of construction (short-term), maintenance, repair, and operational (long-term) noise related to existing conveyance facilities and conservation measures as well as Draft BDCP Alternatives of the conveyance components CM 1 and conservation measures CM 2-CM22. The No-Action Alternative does not significantly change the noise levels, and status quo is expected to continue, unless in the event of catastrophic events such as levee failures. On the other hand, Draft BDCP Alternatives appear to have a significant impact due to new construction, operations, sensitive land use, worker-exposure and transportation-scenario changes. A comprehensive assessment of impacts and mitigation measures is proposed and analyzed for Draft BDCP Alternatives 1A, 1B, 1C, 2A, 2B, 2C, 3, 4, 5, 6A, 6B, 6C, 7, 8 and 9 for specific operational scenarios, followed by a cumulative analysis of noise and vibration impacts.

The goal was to consider the area encompassed by the Draft BDCP and areas of Additional Analysis (§ 4.2.1.1), but the DEIR/DEIS excludes the SWP and CVP Export Service Areas Region. Considering the localized nature of the sound and vibration effects, this assumption is justified. Existing environment is taken to be typical of a quiet rural setting. The potential noise effects due to growth inducement are addressed in Chapter 30. Chapter 23 gives a good overview of different measures of specifying environmental acoustic effects, including the daytime-nighttime noise levels (DNL, from 10 p.m. to 7 a.m.) and California Community Noise Equivalent level (CNEL, specific to 7-10 p.m.). The issues identified are ground-borne vibrations as well as noise propagation through the atmosphere.

The regulatory framework includes both Federal and State. The former does not have regulatory limits for noise, but recommends limitations for specific sources such as trucks, trains and aviation (e.g., FHWA, OSHA, FRA, FTA) as well as guidance for Aquatic and Biological Resources (Chapter 11) and Terrestrial Biological Resources (Chapter 12). The California Noise Control act requires the Office of Noise Control to work with communities in developing local

noise control programs based on best management practices, which is addressed well in this chapter. The procedure involves analysis and quantification of current and projected noise sources. DWR and USFWS provide guidelines for installing sound walls to shield project activities, and the decision is centered on the increase of (A- weighted) sound levels relative to a threshold of 60 dBA. In the backdrop of such an extensive but voluntary regulatory fabric, this DEIS/DEIR has done a thorough job of identifying existing noise levels in each potentially affected jurisdiction (which is also the NEPA/CEQA baseline) and assigning specific noise sources associated with the project. For the analysis purposes, a 40dBA level is assumed as the background, which is a reasonable value considering that most project activities are taking place in rural areas.

Major sources considered are the traffic noise, ground-borne vibrations and noise from construction machinery. The estimated peak hour construction generated traffic is based on Appendix 19A, the Construction Traffic Impact Analysis Report. No-Action Alternatives, no project Alternatives, and cumulative impact condition are well covered (e.g., see Table 23-15). Local and county noise restrictions are well laid out, and potential environmental impacts of noise pollution are well articulated.

The DEIR/DEIS identifies mitigation measures to remediate for significant impacts. Some of the aspects covered are: ground-borne vibration levels (VdB level) due to operation of heavy drilling and excavation equipment, noise exacerbation due to surface construction equipment, deliveries and worker commutes, and earth moving activities at off-site burrows and spill areas. Effects analyses included noise exposure of communities as well workers at conveyance facilities. Detailed discussions are given on activities that have the potential to exacerbate noise, such as construction of intakes, tunnels, forebays, barge unloading facilities, pumping stations, conveyance facilities, and transmission lines, with a focus on daytime, evening, and nighttime operations. The difficulty of the analysis is clearly recognized, in that the types of equipment, times of operation, and the period of usage are difficult to predict as are the periods of operation of different noise sources. As such, conservative, worst-case estimates are considered where all equipment is assumed to be operating simultaneously. In most cases, the noise is identified to produce significant effects, and thus implementation of best noise-reduction practices as well as working with communities of noise-sensitive lands are recommended to realize levels of less than 60 dBA (this is not a regulatory limit but the consensus of experts followed by USFWS). The analysis also takes into account that there are no Federal or CEQA guidelines for vibrations with regard to tunnel and conveyance facility construction, and hence reasonable methods need to be used for the effects analysis. Long-term operation of conveyance facilities should consider operations during daytime (7 a.m. to 10 p.m., recommended limit < 50 dBA) and nighttime (10 p.m. to 7 a.m., < 45 dBA) hours.

Conversely, the FHWA and FTA have developed methods to evaluate construction noise, which is used in this chapter, although the FHWA does not recommend specific limits for dBA. Rules of thumb commonly used for DWR projects based on the State of California protocols have been used in the analysis of Draft BDCP Alternatives and in recommending mitigation measures (e.g., construction of noise barriers). The No Action Alternative includes continued implementation of SWP/CVP until 2060 and hence the effects are similar to that of the present day.

III. Quality of Analysis

Almost all cited literature is from reports and websites, but given the laborious nature and complexity of the analysis, the coverage is acceptable. Standard noise assessment models are used, and potential (temporary) construction noise levels were assessed using the methodology developed by FTA (2006), assuming usage of standard construction machinery and associated noise levels and exposure. The Traffic Noise Modeling Lookup (TNM) model of FHWA was employed to estimate average noise levels at fixed distances from the roadway centerline based on estimated traffic volumes, types and densities. The model was programmed to produce a conservative, worst-hour estimate of traffic-generated noise levels due to heavy truck and increased commuter trips associated with construction of project and program components (Chapter 3). Some of the key aspects excluded in modeling that will have serious impacts on the project are the nocturnal atmospheric boundary layer effects and the influence of terrain and built up areas.

The following comments are offered for further consideration:

- A Noise Abatement Plan (Appendix 3B, *Environmental Commitments*) will be in place during construction to avoid or minimize adverse effects. In this construction plan, the contractors are required to limit off-site trucking activities (e.g., deliveries, export of materials, etc.) to 6:00 a.m. to 10:00 p.m. to minimize impacts to nearby residences. Recent studies, however, show that in the evening period, after the atmospheric stable stratification develops (Ovenden et al., *J. Acous. Soc. Am.*, 232, 1124-1237), nearby communities become more vulnerable to excessive noise levels because of downward refraction of sound waves. An earlier termination of trucking and construction activities should be considered. This is also applicable for selecting noise-sensitive land sites for siting conveyance facilities.
- Noise monitoring at specific locations of construction has not been mentioned in the DEIR/DEIS, but is recommended considering that in-situ monitoring levels can be much different than the general levels given in chapter section 23.1. Monitoring of noise during different seasons ought to be considered, considering seasonal sensitivity.
- Mitigation of noise to an acceptable level may not possible in some cases, especially during construction. Thus, more attention should be paid to long-term operations, reckoning for which can be done for different times of the day and for different climatological conditions.
- The TNM Model does not take into account the terrain and buildings, and hence noise estimates must be treated with caution when clusters of buildings and above/below grade roadways are present.

For construction activities in areas close to freeway or cities, the assumed background condition of 40 dBA is unacceptable.

CHAPTER 25: PUBLIC HEALTH

I. Overall Assessment

There are some topics in Chapter 25 that are useful in evaluating the effects of the various Alternatives and conservation measures. However, we have concerns about several sections of Chapter 25, including the potential toxicity of certain algal species (e.g. *Microcystis*), the biomagnification of toxic substances (e.g. EMF), vector control issues (mosquitos), and disinfection by-products and contaminants. A detailed section is dedicated to each of those topics below with suggestions and recommendations to include in the DEIR/DEIS going forward.

II. Scope

Chapter 25 focuses on issues related to human health and safety that could potentially be affected by implementation of the Draft BDCP Alternatives. Topics covered include water quality, water borne illness, creation of habitat for vectors that may carry human and animal diseases, and concerns related to creation of additional electric transmission lines needed under most of the Alternatives. Specifically, the chapter deals with drinking water quality as related specifically to humans, bioaccumulation of toxicants in fish and aquatic organisms that are consumed by humans, pathogens in recreational waters, disease-carrying mosquitoes as vectors of human and animal diseases, and electromagnetic fields from transmission lines. Some of these topics are also included in other chapters in the DEIR/DEIS but pathogens in recreational waters and disease-carrying vectors are not addressed in any other chapters.

III. Quality of Analysis

Completeness of impacts addressed

Although the list of topics appears to be complete, additional material should be provided in the Final DEIR/DEIS on some of the topics covered, including potential toxicity of certain algae, biomagnification of toxic substances, control of potential vectors of disease, and consequences of water disinfection by-products. These are described below.

Potential toxicity of certain algal species

Potential toxicity of *Microcystis*, a genus of freshwater blue-green algae that can form cyanobacterial blooms, is a problem of both public health and ecological concern in the Delta. There is a large discrepancy in coverage of this topic in the Draft BDCP and the DEIR/DEIS. In general, *Microcystis* is mentioned infrequently and without detail in the DEIR/DEIS. Moreover, a qualitative analysis of the effects of *Microcystis* described in the DEIR/DEIS indicates that in the majority of cases, neither the public health nor the ecological consequences is even mentioned. In contrast, in the Draft BDCP, there is detailed coverage of this topic, and in the majority of cases the potential effects are highlighted. Most of the mentions (>10% of those found) of *Microcystis* in the DEIR/DEIS are in the appendices, whereas >30% in the Draft BDCP are in the text. This discrepancy in coverage is a major shortcoming in terms of effectively evaluating effects of the Alternatives and the conservation measures in this chapter in the DEIR/DEIS (as in other chapters as well). Moreover, in the Effects Analysis review presentation held on 28 January 2014, the issue of algal blooms was identified as a major potential impact in the Delta.

Biomagnification of toxic substances

In terms of the discussion on Biomagnification of Fish and Shellfish (page 25-8), the presentation of recommendations in a summary Table (Table 25-2. Advisories for Consumption of Fish and Invertebrate Species/Guilds for Each Waterway) seems to be an inadequate way of dealing with this problem of public health concern. Are these advisories on fish and shellfish consumption the only solution when biomagnification of toxics is acknowledged as a potential problem? Moreover, biomagnification is related to issues of environmental justice, in that people with lower income levels are likely to eat more fish and shellfish in the Delta region. Therefore, the biomagnification issue should be also discussed in Chapter 28.

There is an extensive discussion of EMF impacts: (page 25-22, lines 39-43). However, there is also the statement that "There has been extensive research done over the past 20 years on the relationship of EMF exposure and human health risks. To date, the potential health risk caused by EMF exposure remains unknown and inconclusive. Two national research organizations (the National Research Council and the National Institute of Health) have concluded that there is no strong evidence showing that EMF exposures pose a health risk." If the perceived danger represents scientific misunderstanding on the part of some of the public, why isn't more attention in the document directed at correcting this misinformation by providing additional evidence and up-to-date information?

Vector Control

Several issues related to vector control need to be better addressed. For example, creation of potential mosquito habitats will not just have localized effects, as indicated in the DEIR/DEIS. Chapter 25 states that "Potential public health impacts occurring as a result of the Draft BDCP Alternatives primarily would be localized. Given downstream flows, potential health effects from water quality-related impacts would not be transported upstream" (page 25-2 lines 25-27); see also "Potential spread of disease through mosquitoes is expected to occur only within the study area because of the life cycle of mosquitoes and the distance they travel" (page 25-2 lines 30-32). In the case of these water-borne vectors of disease, these statements are not correct as these newly created habitats could serve as "stepping stones" for upstream migration of adult mosquitoes and eventually lead to their colonization of new sources. The California state Mosquito Abatement districts would be aware of this possibility and likely would disagree with the statements in the DEIR/DEIS as well. Objections to this statement in the DEIR/DEIS are also reinforced by the distances that are reported for mosquito migration in Table 25-5, where it is stated that mosquito adults can travel up to 30 miles.

There are no concrete plans presented for controlling mosquitoes when their populations increase. Clearly, this is being left to the future and the activities (which are already overstretched) of the local Mosquito Abatement districts. As stated in the DEIR/DEIS, "Construction of the water conveyance facilities and water supply operations under all Action Alternatives would result in an increase in sedimentation basins and solids lagoons. These new features could result in an increase in standing water, thereby potentially increasing vector breeding locations and vector-borne diseases in the study area." (page 25-34, lines 18-21). This statement is correct, and implementing proposed measures under most Alternatives would increase the amounts of restored and enhanced habitat in the study area, but also would result in a significant increase in mosquitoes. The conclusion is that BDCP would consult and coordinate with the various mosquito abatement districts to implement Best Management Practices (BMPs)

(as is also mentioned in section 31.5.1.3). Several of these BMPs are mentioned from various wetland-mosquito management documents. Is this sufficient coverage of control activities in the DEIR/DEIS in terms of what could be major public heath outbreaks (e.g. West Nile virus and encephalitis)?

The potential costs of nuisance mosquitoes are not discussed in this chapter of the DEIR/DEIS. Decline of home prices, loss of recreational areas and opportunities, and increased human discomfort from increases and expansion of mosquito populations could result. These could have environmental consequences as a result of public dissatisfaction and decreased regard for appropriate behavior in sensitive ecological areas. Inappropriate pesticide use could also increase. Moreover, under section 25-4, "Cumulative Analysis Problems of Disease," vectors are not mentioned in the analysis. References on vector control are representative of a few studies done within the Delta but far from complete.

As with many of the other chapters, there is ambiguity in wording in many parts of Chapter 25. For example, "The availability of preferable mosquito breeding habitat varies by season, and is reduced during dry periods of the year. Available open water habitat can be expected to increase during wet season; however, changes in flow volume in the Delta would result in increased flow velocities, limiting preferable mosquito breeding habitat." (page 25-16, lines 11-15). If the statement means that changes in flow volume during the wet season would not affect the mosquito populations, it would be correct because breeding is minimal at this time of the year. However, if it refers to changes in flow volume during the dry season when mosquito breeding does occur, the statement is incorrect and actually numbers would increase.

Disinfection by-products and contaminants

Specific results and comparisons for disinfection by-products (DBP) are not discussed adequately. In terms of DBP, there are two important considerations that require additional information and clarity in the document: the water system management aspects and the direct public health aspects. The fundamental question that Chapter 25 does not seem to answer adequately is: What are the effects of the Alternatives on the actual changes in dissolved organic carbon and bromide concentrations in the source water, and how does that correspond to changes in DBPs in water delivered to the public after treatment by agencies using the source water? In this chapter, bromide receives far greater coverage than dissolved organic carbon, although the latter may have a significant impact on the formation of DBPs such as TTHMs and HAA5. There are indications that because of the increased variability of concentrations, bromide could increase as much as 43% in some locations, and in the case of drought, these concentrations could be much higher (perhaps almost double). The changes in dissolved organic carbon compounds, which are also a problem, are difficult to tell from the information provided. The combination of the changes in both total organic carbon and bromide under specific Draft BDCP Alternatives and on a temporal basis are important to understanding the impact on DBP formation after treatment.

Moreover, have the potential effects of extended drought periods been considered? These could aggravate the effects of these compounds because temperature and pH (moderated by algal activity) can affect DBP formation, and TTHM and HAA5 are measured on a running annual average basis using quarterly samples. Of note, the term "bromated" is used throughout Chapter 25, and we presume they mean "bromate"?

Agencies are required to be below Maximum Contaminant Levels (MCL) of DBPs. Depending on the Alternative chosen, agencies may be required to modify their treatment

processes, with potential large increases in cost. It is stated on page 25-52 that "While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure." No mention is made as to how these additional costs will be covered; will they be passed on to their consumers? Or is there a mechanism within the Draft BDCP to cover these increased costs of the agencies?

It is also not clear what the overall effect of increased DBP concentrations may have on public health. If it's, say, a few percent, the effect may not be significant. However, MCLs for TTHMs and HAA5 are based on the sum of individual compounds, and an increase in some of the individual component compounds could have potential public health effects. For example some of the brominated analogs, which may be produced in higher amounts when bromide increases in the source water, could have significant public health effects. Have models considered the effects on individual components? If so, it is not evident in this chapter.

Consequences of mercury accumulation, bioaccumulation of other toxic compounds, and fish contamination are not adequately presented in this chapter of the DEIR/DEIS. All of these topics are commonly discussed public health concerns for the Delta, and require more detailed coverage in the DEIR/DEIS. The literature is extensive in these areas and not adequately represented.

Pathogens

Please see comments above about potential toxicity of *Microcystis* algal blooms not being included in the DEIR/DEIS, and the apparent different coverage presented in the Draft BDCP.

Conclusion

Public health concerns are of great importance to people living in the Delta, those that use it for recreation and other purposes, and those occupying outlying areas that may be affected by the proposed activities in the Draft BDCP. Additional consideration of the issues mentioned in this review should be given in the preparation of the Final DEIR/DEIS document.

a) Is the literature from which the analysis builds appropriate?

Although perhaps considered adequate for fulfilling the conventions of the CEQA process, the importance of this document in guiding the direction of project activities should include the most up-to-date scientific information available. For example, references on vector control are representative of a few studies done within the Delta but far from complete. Moreover, virtually no peer reviewed literature is included. In addition, there is little reference to the extensive literature on toxic algal blooms, biomagnification, and water disinfection by-products in the Delta.

b) Are the formal models and/or broad patterns of reasoning relied upon the "best available"?

Specific results and comparisons for disinfection by-products are not discussed adequately in this chapter. For example, (page 25-2, lines 18-21) "The disinfection process for drinking water includes adding chlorine to drinking water sources prior to release into public drinking water distribution systems. The chlorine reacts with organic carbon (total [TOC] and dissolved [DOC]) and bromides that are in water sources and form DBPs." Concentrations of disinfection by-products precursors (bromides and DOC) have often been modeled for this system. As a result, there is considerable analysis capability available for some of these

contaminants that are not evident in this chapter nor is there adequate discussion of these potential impacts. This topic is very important and potential public health effects should be discussed more fully in Chapter 25.

c) Are the inputs (or other basic facts) to the models/reasoning the best available?

In terms of modeling, it's not clear what values were used in their analyses. Did they model raw water concentrations? Have they modeled these with values that would be present throughout the drinking water system after treatment? Were running averages used at specific locations representative of a distribution system (the current approach)?

d) Where modeling judgments and interpretive reasoning are invoked, are they appropriate?
Some of the brominated analogs, which may be produced in higher amounts when bromide increases in the source water, could have significant public health effects. Have models considered the effects on individual components?

e) Are the results and their uncertainties interpreted in a "balanced" way with respect to the strengths and weaknesses of the Alternatives under consideration?

The uncertainties do not seem to have been considered in reaching conclusions from the models used.

CHAPTER 26: MINERAL RESOURCES

I. Overall Assessment

Chapter 26 concludes that the proposed BDCP actions would cause harm to natural gas production while having less-than-significant effects on aggregate.

Most of the expected impact to gas production is from conservation measures that would inundate production areas (impacts MIN-5 and MIN-6). The chapter's assessment of the No-Action Alternative appears to exclude such gas-field losses to unintended flooding. The assessed impact on aggregate includes its consumption by BDCP construction as well as burial of potential aggregate sources.

A key aspect of this chapter that should be included but is missing is how natural gas impacts MIN-5 and MIN-6 affect feasibility of ecosystem restoration under proposed BDCP actions.

II. Scope

The chapter lays out its findings in muscular text that shows command of the subject, and in tabular summaries (Tables 26-4 through 26-7) that ease comparison among Alternatives. The chapter however, lacks an informative up-front summary, and neither the Highlights Document (page 57) nor the Executive Summary (pages ES-130 and ES-131) make up for its absence.

III. Quality of Analysis

Chapter 26 does not examine how natural gas impacts MIN-5 and MIN-6 may affect the feasibility of ecosystem restoration under proposed BDCP actions. Plan Appendix 8.A, "Implementation Costs Supporting Materials" lists mitigation measures: "Avoid displacement of active natural gas wells to the extent feasible through conservation component design" and "Maintain drilling access to natural wells to the extent feasible through design of conservation components" (page 8.A-164). Plan Chapter 8, "Implementation Costs," gives a 50-year estimate of $32 million for "mineral rights and gas-well relocation" (page 8-14). A search on "gas" in Appendix 8.A and Chapter 8 turned up no supporting evidence for the $32 million estimate.

CHAPTER 27: PALEONTOLOGY

I. Overall Assessment

Chapter 27 provides reasonable responses to the CEQA requirement for assessment of potential harm to fossils. The chapter includes an overview of paleontological resources in the Sacramento - San Joaquin Delta, Suisun Marsh, and vicinity, and it systematically estimates potential effects of the Draft BDCP Alternatives on paleontological resources. Two DISB members evaluated the chapter with help from a vertebrate paleontologist. Together we identified several areas of concern: more attention needs to be given to deposits from recent millenniums; sensitive geologic units should not be used as a source of "borrow material"; different counties, communities, cities, etc. have different requirements for paleontological resources; the same protection should be in place for all areas of high and medium paleontological sensitivity; the primary source for levee failure is unknown; and a strong summary should be placed at the beginning of this chapter.

II. Scope

The chapter considers the potential impacts to fossils, especially of vertebrates, from disturbing the ground during construction for CM1 (water conveyance; impact PALEO-1) and for other conservation measures (habitat; impact PALEO-2). The chapter also considers such impacts from other projects that are likely to cause ground disturbance (under the No-Action Alternative). The chapter finds "significant" impacts in all three cases.

The findings are based on reasonable assumptions about what might turn up in excavations. In some areas the digging would reach sedimentary deposits old enough (Pleistocene and earlier) to be considered "paleontologically sensitive" (defined, page 27-6). Macroscopic plant and animal fossils in these deposits are likely to be rare enough to be considered important (page 27-18) as "records of ancient life" (page 27-30).

The sensitivity ratings are typically based on (1) the potential for a geological unit to yield abundant or significant vertebrate fossils or to yield a few significant fossils, large or small, vertebrate, invertebrate, or paleobotanical remains; and (2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecological, or stratigraphic data (which are criteria of the Society of Vertebrate Paleontology). The ratings range from none to high. Chapter 27 states that this full range is present in the area covered by the BDCP conservation measures.

Such paleontological assessments involve a professional paleontologist examining the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and any other local factors that may be germane to fossil preservation and potential yield.

The chapter shows greatest concern for the fossils of vertebrates. The chapter treats vertebrates as the most important fossils to be expected in the Pleistocene alluvial deposits that border much of the Delta, and which extend at shallow depths beneath it. The mitigation measures specify procedures of the Society of Vertebrate Paleontology.

The chapter proposes paleontological mitigation of the BDCP conservation measures. The mitigation efforts involve planning and training meant to encourage identification, collection, and preservation of important fossils unearthed (first spelled out, pages 27-27 to 27-32). The tabular summary, pages ES-131 and ES-132, states that these efforts would reduce, to "less than significant," the effects of conveyance construction for Action Alternative 9 (which

restricts conveyance to existing channels) and the effects of all habitat construction under all the action Alternatives.

III. Quality of Analysis

How valuable are the fossils in Holocene mud and peat?

The chapter states fair reasons to give deposits from recent millennia little attention as paleontological resources. "Muds and peats [less than 10,000 years old] provide a rich source of microfossils for paleo-environmental studies, but microfossils exist in the uncounted trillions throughout deposits of estuarine mud and peat. Therefore, because they are recent in age and because they seldom yield scientifically significant megafossils, estuarine sediments, including peat, are assigned low paleontological sensitivity" (page 27-7 to 27-8).

Nonetheless, because climate change and ecosystem restoration are important in the DEIR/DEIS, Chapter 27 could say more about the paleoecology that has been inferred from Holocene fossils. These young fossils are guides to climatic change and to bygone ecosystems like those slated for restoration under the BDCP (Malamud-Roam et al., 2006; Canuel et al., 2009).

Will sensitive geologic units serve as sources of borrow material?

Stratigraphic units having undetermined to high paleontological sensitivity are present in some of the areas considered as potential sources for borrow material for construction activity. The vertebrate paleontologist advises against using these units, which include the Modesto Formation, Montezuma Formation, and Turlock Lake Alluvium, as sources for borrow material (Table 27-7).

If excavation into these units is common, Chapter 29 could give examples and mention paleontological discoveries that the digging has occasioned.

Will protections vary from one county to the next?

Unlike counties that have specific requirements for paleontological resources, Sacramento, Yolo, and San Joaquin Counties place emphasis on the preservation of historic and cultural values and on compliance with CEQA without specifically considering paleontological resources. If not made clear already, Chapter 27 could say whether as part of implementation, the BDCP would apply in all Delta counties the paleontological provisions of state and federal laws and the mitigation measures mentioned in Chapter 27.

What is the primary source for a statement about levee failure?

Chapter 27 reasonably identifies levee failure as a threat to paleontological resources. The evidence cited includes an unreferenced statement that "levees constructed on liquefiable foundations are expected to experience large deformations (in excess of 10 feet) under a moderate to large earthquake in the region" (page 27-22; reiterated from page 9-50). This statement could be credited to page 6-37 of a seismic-hazard assessment (URS Corporation and Jack R. Benjamin & Associates Inc., 2008). The citation could also mention that this assessment, on its page 6-36, includes calibration in which Delta levee damage from the 1906 San Francisco earthquake is "small to moderate" for levees having "today's configuration."

The chapter lacks a summary

Like most of the DEIR/DEIS, Chapter 27 needs an informative summary of expected impacts. The existing summaries are limited to tabular entries in the Executive Summary and

text in the Highlights Brochure. A useful summary, placed up front, would build on the "overview" on page 58 of the Highlights Brochure. The summary would make clearer how the various Alternatives, including the No-Action Alternative, compare with one another in terms of effects on paleontological resources. The key comparisons include No-Action vs. Alternative 4.

The Executive Summary of the DEIR/DEIS could summarize the "significant" No-Action impact more accurately. Table ES-9 lists this impact in rows for PALEO-1 and PALEO-2, where it can be misread as a puzzling effect of BDCP actions. The table also can be misread as implying that the significant No-Action impacts would somehow be made less than significant through implementation of Alternative 9 (for impact PALEO-1) and of all Action Alternatives (for impact PALEO-2).

IV. References Cited

Canuel, E.A., Lerberg, E.J., Dickhut, R.M., Kuehl, S.A., Bianchi, T.S., and Wakeham, S.G., 2009, Changes in sediment and organic carbon accumulation in a highly-disturbed ecosystem: The Sacramento-San Joaquin River Delta (California, USA): Marine Pollution Bulletin, v. 59, page 154-163, doi:10.1016/j.marpolbul.2009.03.025.

Malamud-Roam, F., Ingram, B.L., Hughes, M., and Florsheim, J.L., 2006, Holocene paleoclimate records from a large California estuarine system and its watershed region; linking watershed climate and bay conditions: Quaternary Science Reviews, v. 25, page 1570-1598, doi:10.1016/j.quascirev.2005.11.012.

URS Corporation, and Jack R. Benjamin & Associates Inc., 2008, Delta Risk Management Strategy (DRMS), phase 1, risk analysis report, final: prepared for California Department of Water Resources, http://www.water.ca.gov/floodsafe/fessro/levees/drms/phase1_information.cfm.

CHAPTER 29: CLIMATE CHANGE

I. Overall Assessment

The Draft BDCP (and, in a less informative fashion, the DEIR/DEIS) does a good job of describing how climate change and sea-level rise might influence communities and species. The emphasis in Chapter 29 is on how the conservation measures of the Draft BDCP may enhance adaptation and resiliency to climate change and, especially, sea-level rise by providing flexibility in water-flow operations and additional conservation areas and habitat. Although any attempt to predict future climate at a relatively small regional scale is difficult at best, state-of-the-science modeling tools have been employed to project possible future conditions. Despite these efforts, climate change and sea-level rise, and their associated uncertainties, will remain. The likelihood and magnitude of these effects and uncertainties are not clearly stated or addressed.

Both the Draft BDCP and the DEIR/DEIS recognize the importance of the linkages that are created by water flows and hydrology. Synergies that result from linkages among the actions or components of the Draft BDCP, species of concern, or species not even considered, may affect the potential benefits derived from BDCP actions in enhancing adaptation and resiliency to the effects of climate change or sea-level rise, yet such synergistic effects (which may be either positive or negative) receive little attention.

From a biological viewpoint, mean climate conditions are not as important as high or low extremes and their timing. Modeling and analysis of extreme events is difficult because such occurrences are unpredictable and uncertain, yet their importance merits more attention. Moreover, the potential effects of climate change and sea-level rise on water temperatures seem not to have been considered at the same level of resolution as changes in salinities. Temperature, however, is a key to most fish growth and reproductive success.

Perhaps most importantly, the potential effects of climate change and sea-level rise *on* the effectiveness of the conservation measures themselves are not adequately considered. There is an underlying assumption that the conservation measures, if implemented, will have the desired or stated benefits or mitigation effectiveness. Because of the changing conditions, the Draft BDCP actions may not develop as anticipated. Uncertainties in the effectiveness of conservation measures due to the effects of climate change and sea-level rise should be given greater consideration.

II. Scope

Section 85320(b)(2)(C) of the California Water Code directs that the DEIR/DEIS address "[t]he potential effects of climate change, possible sea level rise up to 55 inches [140 centimeters], and possible changes in total precipitation and runoff patterns on the conveyance alternatives and habitat restoration activities considered in the [EIR]." This is the context for the treatment of climate change and sea-level rise in the DEIR/DEIS.

The DEIR/DEIS addresses three questions about climate change and sea-level rise: (1) How will the Draft BDCP activities affect climate change, via greenhouse gas emissions?; (2) How will Draft BDCP impacts on resources be affected by climate change and will the effects increase in the future — i.e., are future changes in climate likely to exacerbate project impacts?; and (3) How will the Draft BDCP activities affect the adaptability and resiliency of the Delta and its components to climate change? Question 1 is addressed in Chapter 22 on air quality and greenhouse gases. Question 2 is considered in most of the resource-focused chapters as summarized in Table 29-1 as well as in the Draft BDCP. Chapter 29 addresses only the third

question. In particular, this chapter concerns how the project Alternatives and conservation plans may enhance adaptation and resilience of the Delta system to changing rainfall, snowpack, water and air temperature, sea-level rise and intrusion, and evapotranspiration. In the context of BDCP, resiliency and adaptability mean "the ability of the Plan Area to remain stable or flexibly change, as the effects of climate change increase, in order to continue providing water supply benefits with sufficient water quality and supporting ecosystem conditions that maintain or enhance aquatic and terrestrial plant and animal species" (DEIR/DEIS page 29-3). The current unprecedented drought in California adds weight to any measures that will enhance adaptability and resilience of water use and management, so the focus of this chapter is especially timely.

Although Chapter 29 is relatively short, the overall consideration of climate change in the DEIR/DEIS and the Draft BDCP is comprehensive and voluminous, but also fragmented. Thus, to evaluate how well the DEIR/DEIS considers the broader issues of climate change and sea-level rise and their effects, we have referred to multiple sections of the DEIR/DEIS, and to understand the foundation for the statements and conclusions we have examined parts of the Draft BDCP where the details of modeling and analysis of climate change and sea-level rise and their consequences are presented.

III. Quality of Analysis

To evaluate how climate change relates to the actions envisioned in BDCP, it is first necessary to consider how it is projected to affect the Delta and its resources, independently of any of the conservation measures undertaken in the Draft BDCP (i.e., the No Action Alternative). Various sections of the Draft BDCP and the DEIR/DEIS (particularly Draft BDCP Appendix 2C and DEIR/DEIS sections 29-4 and 29-5) describe the changes expected in California and in the Delta over the coming decades. These effects will be large and pervasive, creating a dynamically changing backdrop against which any environmental effects of the Draft BDCP will be superimposed.

Overall, the effects of the climate changes expected for the Delta include, among others: (1) increased incidences of extreme hydrologic events such as atmospheric rivers (which provide significant precipitation to the Delta); (2) changing the mix and timing of rain and snow and their locations; (3) increased extinction risk of covered fish species, especially those whose ranges are located primarily in the Draft BDCP area, due to changes in critical temperatures, salinities, and flow regimes; (4) continuing emergence of nonnative species (e.g., warm-water species) as dominant components of biological communities; (5) increased risk of species invasions due to range expansions into the region; (6) changes in sea level and salinity, which may cause increased duration and frequency of inundation of the existing wetlands; and (7) somewhat higher salinities in Suisun Bay, requiring increased Delta outflows to maintain X2 at the existing standard (Draft BDCP page 5.A.2-106-107). Although all of the natural communities and covered species will be affected in some way, the focus in the DEIR/DEIS is on long-term changes in sea level and Delta inflows that "will put increasing stresses on existing levees and make management of Delta salinity increasingly difficult" (DEIR/DEIS page 3E-3) and the increased flexibility the Draft BDCP offers to control flow rates.

The potential impacts of climate change on natural communities and covered species are discussed in detail in the Draft BDCP (especially in Chapter 2, Appendix 2A, Chapter 5, and Appendix 5A). For example, the account for Delta Smelt states that "modeling results projected increases in the number of days with lethal and stressful water temperatures (especially along the Sacramento River) and a shift in thermal conditions for spawning to earlier in the year, upstream

movement of the LSZ, and decreasing habitat suitability" (Draft BDCP page 2A.1-12). These accounts, while necessarily qualitative rather than quantitative, are generally comprehensive and well-referenced.

Draft BDCP contributions to resilience and adaptability

Chapter 29 focuses on how the actions undertaken as part of the conservation measures or mitigation for BDCP might help counter some of the effects of climate change on natural communities and covered species. In essence, the DEIR/DEIS proposes that the Draft BDCP will enhance the adaptation and resilience of the Draft BDCP area by: (1) providing the flexibility in operating water flows to ameliorate conditions caused by climate change, and (2) enabling conservation efforts (CM2 – CM22) that will provide additional habitats or protection of key species that will help to offset any negative climate impacts. The benefits derive largely from the enhanced control and flexibility in managing hydrological flows into and through the Delta provided by the conveyance Alternatives and, to a lesser extent, from the increase in quantity and/or quality of habitat created by the restoration or protection measures. For example, for tricolored blackbirds "protection, restoration, and enhancement of nesting and foraging habitat will help stabilize and increase depleted populations, helping to promote resilience to adverse effects of climate change" (Draft BDCP page5.A.1-28). Appendix 5.A.1 and Table 5.A.2.0-1 of the Draft BDCP provide substantial details describing which actions can enhance resilience or adaptability to climate change and sea-level rise. The benefits, while generally based on relevant literature and logical arguments, are *presumed* (or, perhaps more accurately, hoped-for) benefits; there is no assurance that they will develop as expected, and there is no discussion of what, if anything, will or can be done if they do not develop. That is, what adaptive management measures will be taken? The conclusion is that Draft BDCP Alternatives 1A, 1B, 1C, 2A, 2B, 2C, 3, 4, and 5 would provide substantial resiliency and adaptation benefits over the No Action/No Project Alternative for dealing with the combined effect of increases in sea-level rise and changes in upstream hydrology. The other Alternatives would reduce resilience. Appendices 29A – 29C describe the approach to modeling and analyzing salinity effects, effects on reservoirs and inflows to the Delta, and effects on water and air temperatures.

The chapter explicitly does not include any discussion of impacts (although recognized and listed on pages 29-10 and 29-11) for which the Draft BDCP Alternatives produce no added resiliency or adaptation benefit or for which the benefits are minimal or cannot be documented; the emphasis is on potential benefits of the Draft BDCP.

Assessment of effects

The potential effects of climate change and, particularly, sea-level rise receive a comprehensive, detailed, and scientifically sound treatment when considered over the entirety of the DEIR/DEIS and the Draft BDCP. The effects on the key physical and biological components of the Draft BDCP area, and somewhat on the broader Delta ecosystem, are thoroughly discussed. Most of the relevant information is contained in the Draft BDCP. The DEIR/DEIS is inconsistent in the level of detail used to assess impacts of climate change and sea-level rise on these components and the information is scattered over thousands of pages, making it difficult to evaluate how they have been treated.

Any science-based assessment of climate change and its effects necessarily begins with historical data and predictive models. Modeling climate change at the regional scale is becoming

more robust, particularly when dealing with mean conditions or frequencies of extremes. The modeling approach used to assess climate change and sea-level rise in the Draft BDCP is complex, necessarily involving many assumptions and a nesting of models used in sequence to inform one another. The climate modeling is based on a modified ensemble approach, employing a quantile analysis to condense the results of the 112 downscaled model sets into a smaller set of scenarios that emphasizes mean climate conditions while preserving some of the variability among model runs (described in the DEIR/DEIS on pages 5A-D37-38). The approach intentionally uses a subset of scenarios to allow development of projections in greater detail, while sacrificing a more comprehensive assessment of uncertainties that would come from considering the full range of projection scenarios. This is a robust and appropriate approach. The criteria used to select the set of climate change scenarios for the analyses (DEIR/DEIS page 5A-A62; 5A-D33) seem sensible, and the sensitivity analysis approach used to define the boundaries for ensemble predictions (DEIR/DEIS page 5A-A64) is canonical, especially in incorporating the effects of different starting points for the simulations. The potential importance of extreme events is acknowledged but, in view of their unpredictability, they are not included in the modeling (although they could be incorporated into probabilistic modeling). Instead, any unforeseen effects of extreme events will presumably be assessed through monitoring and adaptive management. The application of results to the biological communities requires additional assumptions. Also, use of mean conditions or forecasts is far less insightful than looking at critical biological factors such as summer high temperatures, rate and timing of spring warming and fall cooling, and flow rates during critical times of the years. One extreme year can do a lot of biological damage.

The RMA Bay-Delta (2D) and the UnTRIM Bay-Delta (3D) hydrodynamic models were used to simulate climate change effects of sea-level rise on Bay-Delta tidal flows, which were combined with DSM-2 for salinity modeling. These were then combined with Draft BDCP effects to simulate future Delta hydrodynamic and salinity conditions. To bracket the range of potential changes in hydrodynamics and salinities associated with wetland restoration, model simulations were conducted for several Alternative restoration footprints. Changing the location of restoration affected the details of flows and salinities, but all of the scenarios reduced tidal amplitude and affected salinity (X2). Overall, the hydrological modeling shows that effects of Draft BDCP operations and proposed restorations are limited in comparison to the impacts of climate change and sea-level rise on upstream reservoir conditions, hydrologic flows, and salinities. Several of the outstanding areas of uncertainty are (quite appropriately) explored through scenario analysis.

Recognizing that species differ in their responses to potential climate change, the Draft BDCP develops a vulnerability score based on sensitivity (including several contributing factors) and exposure (defined by natural community types). The vulnerability analysis would allow planners and managers to design conservation actions and monitoring programs to enable them to focus on the covered species most vulnerable to the effects of climate change and the habitats that support a large number of vulnerable species (see Draft BDCP page 5.A.1-35). However, because different species respond differently to various climate changes, some will be affected by things that can be moderated and some will be affected by things that cannot be modified. For those in the first category, each operation might benefit each species a little differently; how will choices be made? Moreover, while listing the species most vulnerable to changes in climate is an important step toward prioritizing conservation actions, we should not forget that we are dealing with an ecosystem and indirect effects of climate change (changes in rates, distributions, species

interactions, food webs, etc.) are also important. Despite the attention given to developing species' vulnerability scores in the Draft BDCP, it does not figure into any of the analyses or documentations in the Draft BDCP and is not mentioned in the DEIR/DEIS.

Overall, considering the material in both the Draft BDCP and the DEIR/DEIS, the potential effects of climate change and sea-level rise on components of the Delta ecosystem and the current and proposed water operations are treated comprehensively and in considerable detail. Points are supported by relevant literature (at least in the Draft BDCP), some of it quite recent. The models are carefully reasoned and are used effectively to explore both consequences of climate change and sea-level rise and important areas of uncertainty. That said, however, there are several areas in which the presentation and analyses could be improved.

Areas of concern

There are several areas of concern with the treatment of climate change in the DEIS/DEIR that are not resolved in the coverage in the Draft BDCP.

Most importantly, although the potential effects of climate change and sea-level rise on natural communities and covered species are discussed in detail (in the Draft BDCP) and are included in the modeling of hydrodynamics and the associated tidal wetland restoration and in the discussion of reservoir operations, the possible impacts *on* the conservation measures are apparently not considered. The DEIR/DEIS includes detailed calculations of the anticipated losses of habitat (acreages) due to various Draft BDCP actions and how these losses will be balanced (in most cases exceeded) by acres of habitat (often of greater value) protected or restored. In some instances, additional measures (Avoidance or Minimization Measures or Mitigation Measures) will be required to achieve the necessary balance and avoid detrimental effects on a community or species. There is an unstated assumption that the anticipated habitat protection, restoration, and mitigation will in fact materialize. But climate change is projected to have significant effects on the amount, quality, and locations of habitat, potentially adding to the losses. The effectiveness of habitat protection and restoration may be compromised by climate change or sea-level rise, eroding (figuratively and literally) the conservation gains or benefiting less desirable species such as warm-water predators or invasive species. As a result, the anticipated balancing of new conservation areas to offset climate impacts and the Draft BDCP may not develop as planned.

It is possible that these effects are included in the calculations of the DEIR/DEIS (e.g., in Chapter 12), but we found no indications of such adjustments. Rather, it seems apparent that the potential effects of climate change and sea-level rise on the effectiveness of habitat protection, restoration, or other conservation measures are not specifically addressed in the DEIR/DEIS because the intent of this document is to evaluate whether BDCP will lead to consequences that would not otherwise have occurred (this is why the effects of climate change and sea-level rise are included in the No-Action Alternative). Draft BDCP actions will not alter climate change or sea-level rise (Chapter 23); rather, the effects of climate change and sea-level rise are projected to trump any effects of Draft BDCP actions. For example, "The results [of hydrological modeling] show that the effects on the upstream operations are primarily due to the climate change effect on the reservoir inflows, river temperatures, and the increased salinity intrusion in the Delta due to the projected sea level rise. The proposed BDCP operations did not impact the upstream reservoir conditions, both at end-of-May and end-of-September, because of the increased flexibility in the system [i.e., resilience]. The proposed restoration under BDCP has limited effect on the overall system operations" (Draft BDCP page 5A-D157). Considering that

the overall rainfall levels at reservoirs are projected to be essentially unchanged but the timing of snow and precipitation will change, there is little doubt that additional Draft BDCP conveyance and storage capacity would be useful in managing water in the Delta, but without including such adaptive management measures in modeling it will be difficult to predict the salinity and temperature levels as well as impacts on habitats downstream.

There are also considerable uncertainties associated with any potential effects of climate change and sea-level rise on Draft BDCP actions. This is used as justification for not considering these effects in the DEIR/DEIS. To ignore these potential effects on the conservation measures (primarily habitat protection and restoration) that are intended to be part of achieving net benefits from BDCP, however, may be short-sighted. It is anticipated that any failures of protection and restoration (or other actions) to realize the desired outcomes will be detected by monitoring and adjusted through adaptive management. However, this relies on how well and how quickly monitoring and adaptive management can or will be implemented. We consider this issue, and the wisdom of planning for contingencies in case things don't work out as planned, elsewhere in our report.

A second concern has to do with linkages. What happens or is done at one place and time for one species, for example, may have ripple effects that extend to other places at other times and affect other species. Climate change and sea-level rise will likely affect everything in and surrounding the Delta, everywhere, in one way or another. The scope of climate change as a driving force is broad in both space and time, although the consequences may be more localized and short-term or episodic. Consequently, considering the effects of climate change or calculating the potential benefits derived from separate Draft BDCP actions in enhancing the resiliency of each ecosystem component separately may fail to recognize the synergies that result from the linkages among the actions or components, species of concern, or species not even considered. Although the web of direct and indirect linkages among components of the Delta ecosystem are tremendously complex (and therefore plagued by uncertainties), it would be worthwhile to give them more thought, particularly because recognizing linkages and feedbacks may make management actions more effective or avoid unintended consequences. Both the Draft BDCP and the DEIR/DEIS recognize the importance of the linkages that are created by water flows and hydrology; similar attention should be given to biological, physical, and chemical linkages between aquatic and terrestrial elements or among elements of terrestrial landscapes.

A third concern is about modeling. A chain of models has been used to predict the 2025/2060 hydrology, salinity, and water temperature. As pointed out above, however, the influence of local adaptive management measures can have an upscaling effect system-wide. The models used are well studied and evaluated, but sometimes they lack critical components. For example, the CALSIM-2 runoff model does not have a good linkage to ground water, the mixing parameterizations used are not valid for very high flow rates (model calibrations may not be applied for extreme precipitations of future climate), and the DSM2 flow-salinity relations may not be valid for extreme future climate scenarios. Thus, uncertainties abound.

Finally, two additional points regarding mean conditions and temperature, and regional influences of climate change. First, there is some discussion in both the Draft BDCP and the DEIR/DEIS about the changes in mean conditions, particularly changes in mean temperature. However, what may be most important to fish (and other aquatic organisms), particularly for those species living on the edge of their thermal tolerance, are increases in the highest temperatures. The timings of the increased temperatures and of the fall cooling are also

important to aquatic organisms. Some species may benefit from the longer, warmer growing season while others will be stressed by a longer period of warmer temperatures.

Second, although Chapter 29 deals mainly with flexibility of water-flow operations and does include climate impacts on physical conditions (e.g. precipitation and sea-level rise) outside of the Draft BDCP area, it ignores potential regional influences of climate change on biological components elsewhere. For example, the survival of anadromous fishes in the ocean or during their migrations to and from the Delta will be affected by climate changes, and range expansions or distributional shifts of species in response to climate-driven habitat changes elsewhere may have impacts on species and communities within the Draft BDCP area, and on the effectiveness of conservation measures undertaken to enhance their populations or mitigate the effects of Draft BDCP actions. While such effects are couched in uncertainty, they should not be ignored.

CHAPTER 30: GROWTH INDUCEMENT AND OTHER INDIRECT EFFECTS

I. Overall Assessment

The material in this chapter is fairly comprehensive with respect to cities, but ignores how the Draft BDCP affects or does not affect the growth of agriculture, any crop changes, and any environmental changes those impacts would entail. With respect to cities, the analyses are interesting, and there is more than enough material to provide more insightful interpretation, for example with respect to uncertainties, than the authors chose to do.

II. Scope

Chapter 30 explores the extent to which the Draft BDCP might induce economic growth through: 1) tunnel construction expenditures on labor and thereby on housing, etc. in the Delta region; 2) the construction of new or better roads in the process of tunneling in the Delta; and 3) through the effects of increased water deliveries or simply increased reliability of water deliveries for municipalities and industry in the water delivery areas as well as agriculture. The latter, however, is not actually explored on the argument that the environmental impacts with respect to which crops would be planted under different scenarios and operation plans would be too speculative and therefore beyond scientific analysis (see, for example, page 111, lines 6-12).

III. Quality of Analysis

A fairly simple accounting framework was used to project population growth effects based on existing projections of population growth, per capita water use, expected improvements in efficiency, and how additional on account of the Draft BDCP, or less if no actions are taken, water could accommodate more population growth. These are highly likely to be over estimates of the population growth inducing potential of more water, or greater reliability, due to numerous other factors promoting and constraining growth including the need for improved wastewater treatment facilities, transportation limitations, etc. No error bars, not even subjective ones, are provided, though the results are presented fairly cautiously.

Construction is not likely to induce growth because little labor will be employed. Further, there is little available nearby housing in the Delta, nor special attraction to living near the job site, while the small increase in labor and need for housing would be insignificant for the larger outlying cities.

Whether or not the Draft BDCP will induce further population growth in municipal areas served by the SWP depends on which Alternative and operation plan is selected. The projected increases, and sometimes decreases, as a percent of already projected growth, are typically insignificant except for the South Coast Basin served by MWD. Here, under some plans, population increases due to increased water deliveries (for Alternative 3) could be as high as 14% of existing projected population increases and 19% of the projected population increase compared to the No-Action Alternative, where municipalities would experience reductions in water deliveries from the SWP.

The chapter explores the various possibilities of how water could induce population growth in considerable detail, considers the linkages between population growth and economic growth, and also provides a thorough investigation of municipal and county planning processes for accommodating growth while reducing environmental impacts, mostly in the South Coast Basin where the impacts could be significant.

Chapter 30 also lays out which agencies are in charge of growth and its environmental impacts, especially in the South Coast Basin, making it very clear that it is up to them to deal with the problems and not the responsibilities of DWR or USBR or other State and Federal agencies. Furthermore, the chapter is informative for local and regional planning agencies. The DWR and USBR do not have the authority to deny going forward on the Draft BDCP because of any induced growth.

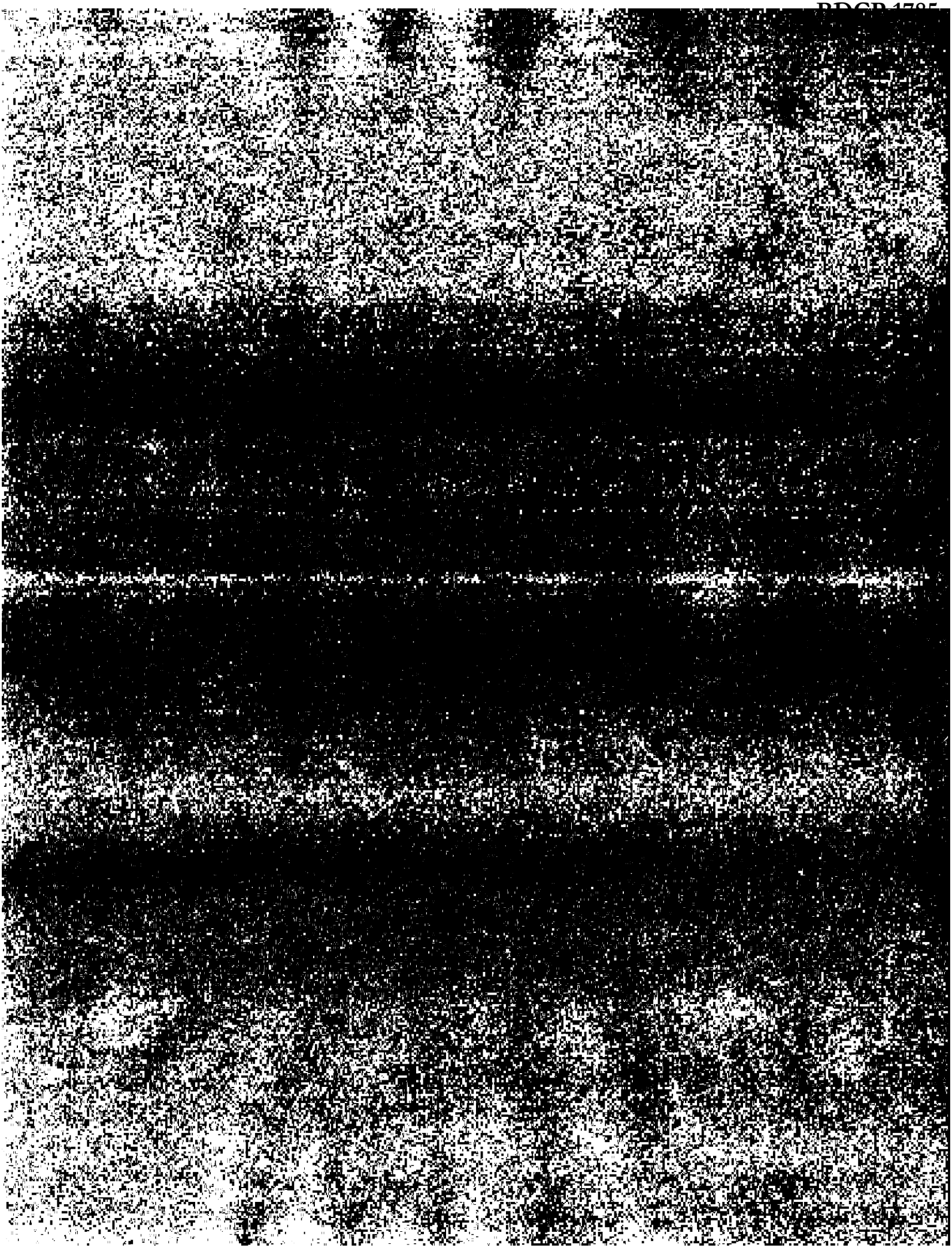

EXHIBIT E

Airport Comment Letter

February 11, 2014

Department of Airports
John Wheat
Director of Airports

County Executive
Bradley J. Hudson

County of Sacramento

February 11, 2014

Don Thomas
Senior Planner
Municipal Services Agency
Department of Water Resources
700 H Street
Sacramento, CA 95814

Subject: BDCP DEIR/DEIS Comment Letter

Mr. Thomas:

The Sacramento County Department of Airports (Department) submits the following comments regarding the draft Environmental Impact Report/Environmental Impact Statement (DEIR/DEIS) for the Bay Delta Conservation Plan (BDCP). The Department is subject to regulations and policies promulgated by the Federal Aviation Administration (FAA) for the safe operation of public use airports. FAA Advisory Circular (AC) 150/5200-33B "Hazardous Wildlife Attractants on or near Airports" (Wildlife AC) requires review of all proposed land use practices within a five-mile radius of an airport's Air Operations Area (AOA) for the potential to increase wildlife hazards. This provision applies to commercial service airports such as Sacramento International Airport (Sacramento International), as well as any airport that has received federal grant-in-aid funding for infrastructure improvements. The draft EIR/EIS Plan Area is within a five-mile radius of three airports operated by the Department: Sacramento International, Sacramento Executive, and Franklin Field airports.

One of the conditions of most concern to the FAA is the potentially synergistic effect of two or more different land uses that would not, by themselves, be considered hazardous wildlife attractants or that are located outside the separation distances identified in the Wildlife AC, when attractants are aligned in such a way as to induce wildlife movement through the airport and/or surrounding airspace. An example would be a large foraging area such as agriculture on one side of an airport and a lake or wetland on the opposite side of the airport. The Wildlife AC therefore directs airport operators to take an airport's surrounding landscape into account. Many aspects of the BDCP have the potential for increasing synergistic wildlife impacts on the County's airports, and therefore are an underlying point of reference for our comments.

The comments focus on the potential for a greater number of collisions between birds and aircraft ("bird strikes") due to the anticipated increase in wildlife habitat near County operated airports, and inadequate analysis in the draft environmental documents of the potential impacts to existing wildlife. The comments are organized by chapters, and are not listed in order of importance.

Chapter 1 – Introduction

Page 27, Line 20-21: The National Environmental Policy Act (NEPA) requires lead agencies to identify known issues of controversy. The U.S. Fish and Wildlife Service is a NEPA lead agency for the BDCP. As a signatory to the "2003 Memorandum of Agreement (MOA) Between the FAA, the U.S. Air Force, the U.S.

Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service (Service), and the U.S. Department of Agriculture (USDA) to Address Aircraft-Wildlife Strikes," the Service is aware of the FAA's concern about hazardous wildlife attractants on and near airports. One of the three activities of most concern identified in the MOA is "development of conservation/mitigation habitats or other land uses that could attract hazardous wildlife to airports or nearby areas". The signatory agencies agreed to work cooperatively to "...evaluate the situation and develop mutually acceptable solutions to reduce the identified strike probability." The DEIR/DEIS admits that even with the implementation of Mitigation Measure HAZ 8, the resulting impacts of the BDCP on increasing risk of bird-aircraft strikes will still be significant and unavoidable. At a minimum, the potential to increase bird-aircraft strikes and resulting significant impact on public safety should be listed as a known issue of controversy and considered along with the other identified issues.

Chapter 3 – Description of Alternatives

Conservation Measure 2 *Yolo Bypass Fisheries Enhancement* (CM2) will lower the Fremont Weir from 32.8 feet to a notch gate of 17.5 feet. The purpose of this measure is to increase the frequency and duration of inundation in the Yolo Bypass, thereby increasing fish habitat. The notch gate will allow for the Yolo Bypass to be inundated in dry and below average rainfall years when passive overtopping of the weir would not occur. Operation of the notch gate is designed to achieve the biological goal to "provide access to at least 7,000 acres of inundated floodplain habitat within the Yolo Bypass and Cache Slough ROA for at least 30 days in at least 70% of years." Inundation of such a large area when the surrounding land is dry, as it would be in below average rainfall years, has the potential to attract large, fish eating birds that are not normally in close proximity to Sacramento International, such as gulls, white pelicans and double-crested cormorants. Additionally, the longer period allows more opportunity for birds to prey on the fish utilizing the enhanced habitat.

Most airports in other regions of the United States experience the highest number of reported bird strikes during the summer months, but one of the two peaks in the number of reported strikes and damaging strikes near Sacramento International occurs in the winter months when the waterfowl population is greatest due to migratory patterns. CM2 will alter the flooding regime of the Yolo Bypass by increasing the duration, area and volume of Bypass inundation between mid-November and mid-May. CM2 therefore has the potential to attract hazardous wildlife into the vicinity of Sacramento International, and directly into the flight paths of the airport's two parallel runways, precisely at the time when wintering migratory waterfowl populations reach their peak. This potential effect is of concern because data published by the FAA and USDA Wildlife Services indicate that waterfowl were responsible for the highest percentage of aircraft damaged by wildlife strikes nationally between 1990 and 2011.

Chapter 11 – Fish and Aquatic Resources

Page 199, line 2-9: Every five years one million cubic yards of sediment will be removed within one mile of the Fremont Weir and during alternating years an additional one million cubic yards of sediment will be removed from the new channels, toe drain, and Tule drain. This action will have the potential to attract large flocks of birds because prey, seeds, and nutrients would be exposed. Therefore, the likelihood of bird strikes could increase during sediment removal activities at the Fremont Weir and associated channels due to increased bird activity across flight paths. It is important to note that the approach and departure flight paths for an airport are determined by the FAA, not the airport operator. Therefore, any action undertaken by another entity that causes increased wildlife activity near an airport cannot be offset by the airport.

Chapter 12 – Terrestrial Biological Resources

The DEIR/DEIS states that many species of birds will lose foraging habitat from CM2, but there will be no significant effect on nesting habitat. The potential loss of 3,500 acres of foraging habitat for many species of raptors and flocking birds and subsequent displacement of individuals was not addressed. Proposed mitigation efforts only focus on long-term conservation of foraging habitat and nesting sites, not the immediate

displacement of these individuals or where they would alternatively go to forage. The Department is concerned that destruction of grasslands in the Fremont Weir could cause displaced birds to be attracted eastward to the managed grassland at Sacramento International. Per FAA regulations, the airfield is consistently maintained as mowed short turf, which may be viewed as suitable foraging habitat by the displaced grassland species. This could have the potential to increase the presence of hazardous wildlife on the airfield, as well as adjacent farmlands. Although Department wildlife biologists actively manage the airport to reduce the likelihood of bird aircraft collisions on airport property, FAA Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants on or near Airports* (Hazardous Wildlife AC) states "increasing the intensity of wildlife control efforts is not a substitute for eliminating or reducing a proposed wildlife hazard".

Impact BIO-178 *Loss or Conversion of Habitat for Waterfowl and Shorebirds as a Result of Water Conveyance Facilities Construction* determines that there will be significant impacts on nesting birds and foraging habitat. Although Mitigation Measure 75, *Conduct Preconstruction Nesting Bird Surveys and Avoid Disturbance of Nesting Birds,* is expected to reduce the effects to nesting birds to less than significant, the displacement of foraging waterfowl during migration is not addressed. The projected footprint effect of the conveyance facilities is 5,500 acres of cultivated land. BDCP will protect 16,000 acres of currently cultivated crops and restore an additional 12,000 acres. The Department is concerned that the anticipated construction activities in the Delta and subsequent displacement of foraging waterfowl, coupled with CM2 and inundation of the Yolo Bypass, will create a synergistic effect having the potential to attract displaced waterfowl. This effect could be exacerbated due to the actions described in DEIR/DEIS Chapter 15, *Impact Recreation* 11, which will reduce hunting opportunities in the Yolo Bypass. The reduction of hunting will provide a refuge for displaced waterfowl, and a resulting greater bird strike risk near County airports.

Page 730-31, lines 33-35 and 41-43 CEQA/NEPA Effects: This discussion addresses disruption of waterfowl or shorebirds near to construction work. It specifies that preconstruction nesting inspections be conducted to minimize displacement of nesting birds, but does not address what will happen to displaced foraging migratory waterfowl. The pipeline will traverse multiple areas in the delta that hold migratory waterfowl. Construction of the proposed tunnels will displace birds around these work sites, but the DEIR/DEIS has no analysis on the potential redistribution of birds displaced from construction work as it proceeds through the delta. Within the context of CEQA, potentially significant nesting and foraging impacts could occur. Such impacts, and the potential for affecting current and projected higher numbers of aircraft operations, are not addressed.

Pg. 733-34, Line 42-3: Mitigation Measure BIO-179b *Conduct Food Studies and Monitoring to Demonstrate Food Quality of Palustrine Tidal Wetlands in the Yolo and Delta Basins.* This measures states "If studies show that the assumption of no effect was inaccurate, and the food quality goal of 1:1 compensation for wintering waterfowl food value is not met, additional acreage of protection or creation of managed wetland and management will be required." If implemented, actions to bolster the quantity of food and habitat for winter waterfowl would have potential to increase waterfowl foraging in the Yolo Bypass watershed, thereby increasing the possibility of bird strikes involving the species most likely to cause damage to aircraft. Because the majority of damaging bird strikes reported for Sacramento International occurs outside airport property, an increase in foraging habitat would have the potential to exacerbate an already tenuous situation by expanding known hazardous wildlife attractants. Increasing the aquatic habitat in such close proximity to the airport may result in the unintended synergistic effect of inducing birds foraging east of the airport to fly through the flight paths of arriving and departing aircraft to reach water west of the airport, and vice versa. If the birds cross aircraft approach and departure zones at elevations beyond the harassment techniques deployed by airport wildlife biologists, the likelihood of bird-aircraft collisions will likely increase.

Page 742, line 24-39: This section discusses indirect effects on waterfowl and shorebirds, but still only focuses on the displacement of nesting waterfowl or shorebirds. There is no discussion about the impact of

the location where the displaced waterfowl will go to, and the resulting potential for greater numbers of birds near County airports.

Chapter 13 – Land Use

The DEIR/DEIS references the 1994 Comprehensive Land Use Plan for Sacramento International. The 2013 Airport Land Use Compatibility Plan (ALUCP) for Sacramento International Airport was updated in December 2013 and should be used in any subsequent analyses.

Pg. 23 Ln. 33-34: This section states that most uses would be compatible unless water causes ground fog or attracts large numbers of birds. The FAA Wildlife AC, which is referenced in the 2013 ALUCP, considers "land uses that cause movement of hazardous wildlife onto, into, or across the airport's approach or departure airspace or air operations area[1] (AOA)" to be incompatible with airport operations. Land uses identified in the Wildlife AC as those known to attract hazardous wildlife include wetlands, aquaculture, and agriculture. The FAA recommends the following separation criteria for land use practices that attract hazardous wildlife: 5,000 feet from the AOA of airports serving piston-powered aircraft; 10,000 feet from the AOA of airports serving turbine-powered (jet) aircraft, such as Sacramento International, and five miles for all airports if the attractant could cause wildlife movement into or across the approach or departure airspace. The extended inundation of the Yolo Bypass from CM2 is within five miles of Sacramento International's AOA, with a portion even within 10,000 feet, and has the potential to affect aircraft operations with an increase in both bird activity and ground fog.

Pg. 65 Ln 12-19: This section states that some of the footprint of the plan is yet unknown, so the entire plan was not evaluated within the context of the ALUCP. Even though the exact plan footprint is unknown, portions of the Plan Area are within the Airport Influence Area, the Traffic Pattern Area, and the Secondary Approach Area, as identified in the ALUCP, and therefore should be examined.

Chapter 15 – Recreation

Pg. 105 Impact Rec. 11: Inundation of the Yolo Bypass would decrease hunting opportunities, which in turn could have the potential for increasing the number of waterfowl using the area due to reduced hunting pressure and an increase in available flooded habitat.

Chapter 19 – Transportation

SMF is outside of the transportation study area and therefore was not included in the transportation analysis. This resulted in a failure to analyze the potential impacts associated with the increased risk and likelihood of bird strikes associated with CM2-11. There is a lack of analysis on the effects that increased bird aircraft collisions could have on air traffic operations at the airports within five miles of the plan area.

Page 30, line 4-6: The DEIR/DEIS states the five mile radius encompasses some of the plan area when in fact the entire Fremont weir component of CM 2 is within the five mile radius of Sacramento International.

Chapter 22 – Air Quality and Greenhouse Gases

The DEIR/DEIS fails to analyze the CM2 project that would excavate a minimum of one million cubic yards (MCY) of sediment every other year effects on aviation. Increased particulate pollution from dust produced during the large excavation process will impact air quality and could adversely impact visibility for pilots of

[1] Any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft.

aircraft operating in the vicinity. The excavation of one MCY of soil also has the potential to attract large flocks of birds because prey, seeds, and nutrients would be exposed. This would have the potential to increase the likelihood of bird strikes during periods of sediment removal.

Chapter 23 – Noise

The DEIR/DEIS only studied the impact of noise on waterfowl near Mayberry Farms (308 acres). It did not analyze the thousands of acres that may be impacted throughout the Delta and in the Yolo Bypass during excavation of sediment and displacement of foraging waterfowl.

Chapter 24 – Hazards and Hazardous Materials

Sacramento International currently ranks first within the FAA's Western Pacific Region and within the top ten nationally in the number of reported bird strikes. Notch operation of the Fremont Weir and subsequent inundation of the Yolo Bypass during mid-November through mid-May would coincide with the period during which the majority of damaging bird strikes occur, particularly near Sacramento International. Most damaging strikes are caused by waterfowl, which would be the most likely species to be attracted to the inundated Yolo Bypass. The bird strike data analyzed in the DEIR/DEIS was a national search of all strikes from 1990-2008 as recorded on the FAA Strike Database. Reliance solely on this database can yield misleading results because it does not provide sufficient details about the seasonality of local bird strikes and the contributory factors, nor is it representative of the true level of activity as bird strike reporting is not mandatory. FAA estimates only 30-40% of bird strikes are actually reported.

Using data from all of the County airports near the plan area reveals that November through January are the months most likely to incur strikes. The FAA strike database includes 1,479 strikes recorded from the airports that are within a five-mile radius of the plan area. Additional analysis needs to be conducted using the strike data from the airports that will be affected in and near the plan area. The large tracts of agriculture near SMF already attract substantial number of hazardous wildlife. The Department is concerned that the land use changes contemplated in the project will exacerbate this situation.

Page 36 Line 41-45: Impact HAZ-8 *Increased Risk of Bird–Aircraft Strikes During Implementation of Conservation Measures That Create or Improve Wildlife Habitat.* The analysis states that increases in aircraft and bird collisions under NEPA would be adverse and under CEQA would be significant and unavoidable. It goes on to propose consultation with airports and the Service to reduce risk. Such consultation should include discussions now with the FAA, and identification of methods of active harassment and/or removal of hazardous wildlife that would be implemented within the proposed conservation areas within the FAA-recognized five-mile airport radius in the event the BDCP conservation measures precipitate an increase in hazardous wildlife. The airport will not be able to provide assistance in harassment due to permitting restrictions that restrict airport biologists to conducting wildlife control on airport property.

Page 71-72: This section acknowledges the potential for an increase in hazardous wildlife and that such risks will continue to be adverse with plan implementation. Measure HAZ 8 specifies consultation with airports only after plans are finalized to determine ways to reduce impacts to aircraft operations. The late initiation of consultation with airports may limit the number and effectiveness of measures available to decrease hazardous wildlife attractants from the project, potentially resulting in an irreversible increase in hazardous wildlife on and near County-operated airports.

Page 71 Line 37-38: The FAA wildlife strike database is now current through September 2013. Given the significant change in the number of reported strikes from the timeframe used in the DEIR/DEIS (January 1990 – August 2008), it is recommended that updated data be used future analyses. Additionally, the information analyzed included data from the entire country, which is not reflective of data for the potentially affected

airports. The DEIR/DEIS states that the majority of strikes occur between July and October; however when data from the just the five airports mentioned in the Plan is reviewed it is evident that most strikes occur from June – August and November – January.

Page 72 Line 31-34: When discussing measures to reduce hazards in Wildlife Hazard Management Plans (WHMP), it is unclear if the statement is for WHMPs in general or refers to a specific airport's plan. Sacramento International's WHMP does not promote filling of wetlands as a habitat modification practice. The use of a radar-based alert system is also not a management practice per Sacramento International's WHMP. Radar-based wildlife detection and alert systems have thus far been shown to produce potentially useful analytical data, but in practice are largely incapable of enabling an aircraft to evade a wildlife collision.

Page 72 Line 35-37: Mitigation Measure HAZ 8 involves consultation with the airports; however only after "site-specific locations and design plans are finalized", which is oftentimes too late to implement proposed changes. Involving airports and other regulatory agencies earlier in the process would allow for issues to be addressed while there is still an opportunity for design revisions to be made without creating delays.

The main tenet of Sacramento County's wildlife management program is habitat modification. Land is managed with the goal of minimizing the attractiveness of airport property; however, because it is impossible to deter all wildlife, active harassment and removal efforts are conducted by qualified biologists pursuant to an annually renewing depredation permit obtained from the Service. Given that a goal of the BDCP is to improve habitat, it is recommended that the acquisition of a depredation permit be considered to allow the harassment of migratory birds to minimize the risk of bird-aircraft strikes.

Page 72 Line 40: Correction needed – Last sentence mentions CM3 – CM11, but it should be CM2 – CM11.

Chapter 25 – Public Health

No mention of the potential for increased bird strikes and potential for loss of life is made. The CEQA and NEPA analysis shows adverse and significant and unavoidable increases in bird strikes resulting from the project. Consultation alone will do nothing to diminish the impacts, especially if it occurs after project designs are finalized as proposed in Mitigation Measure HAZ 8. In order to adequately address the increases, active engagement of airports, the FAA and other regulatory agencies should occur earlier in the design process, as well as consideration of obtaining a federal depredation permit to allow harassment of migratory birds.

Chapter 29 – Climate Change

29.6.1.2 Climate change could result in sea level rise and destruction of the remaining marsh outside levees throughout the Delta. The potential loss in habitat specifically to waterfowl could displace unknown numbers of waterfowl until the restoration projects are completed. There seems to be no analysis on where displaced waterfowl would go. There is the potential that the increased inundation of the Yolo Bypass would provide suitable habitat for the displaced birds and increase the concentration of waterfowl in the vicinity of Sacramento International during the peak of waterfowl migration. This result could increase the aviation hazard of bird strikes with air traffic in and out of the airport.

Chapter 31 – Other CEQA/NEPA Required Sections

Mitigation measure HAZ 8 acknowledges that the impact from the project on increasing risk of bird strikes is adverse (NEPA) and significant and unavoidable (CEQA); however, consultation with the FAA and airport operators to determine the best management practices to reduce the level of risk will occur only after plans are finalized. This provision has the potential to limit the number and type of suitable practices available for discouraging hazardous wildlife near airports.

Impact BIO-179 *Loss or Conversion of Habitat for Wintering Waterfowl as a Result of Implementation of Conservation Components* and Mitigation Measure BIO-179b *Conduct Food Studies and Monitoring to Demonstrate Food Quality of Palustrine Tidal Wetlands in the Yolo and Delta Basins,* note that the Yolo Watershed will lose 2,600 acres of wetlands. The mitigation measure will study where there is a loss in food production. If it is determined that the loss results in a reduction in the food available to waterfowl, additional acres will be protected or creation of managed wetlands will occur in the Yolo Watershed. This could attract waterfowl to the Yolo Bypass even when it is not inundated. Creation of managed wetlands within the five-mile radius of Sacramento International would constitute an increased attractant to waterfowl, which would result in an increase in the potential of aircraft bird collisions with air traffic from SMF.

The Department appreciates the opportunity to provide the above comments. Enclosed is an exhibit depicting the proposed expansion of the Yolo Bypass inundation area (BDCP Conservation Zone 2), combined with typical flight tracks of aircraft arrivals and departures at Sacramento International. If you have any questions, please contact me at 874-0482 or Senior Natural Resource Specialist Jeff Prentice at 531-2830.

Sincerely,

J. Glen Rickelton

J. Glen Rickelton
Manager
Planning and Environment

Enclosure: BDCP Conservation Zone 2 Flight Track Overlay

C: John Wheat, Director of Airports
Leonard Takayama, Deputy Director – Special Projects
Greg Rowe, Senior Environmental Analyst – Planning and Environment (P&E)
Julie Car, Environmental Planner/Biologist – P&E
Jeffrey Prentice, Senior Natural Resource Specialist – P&E
Camille Garibaldi, Environmental Protection Specialist – Federal Aviation Administration

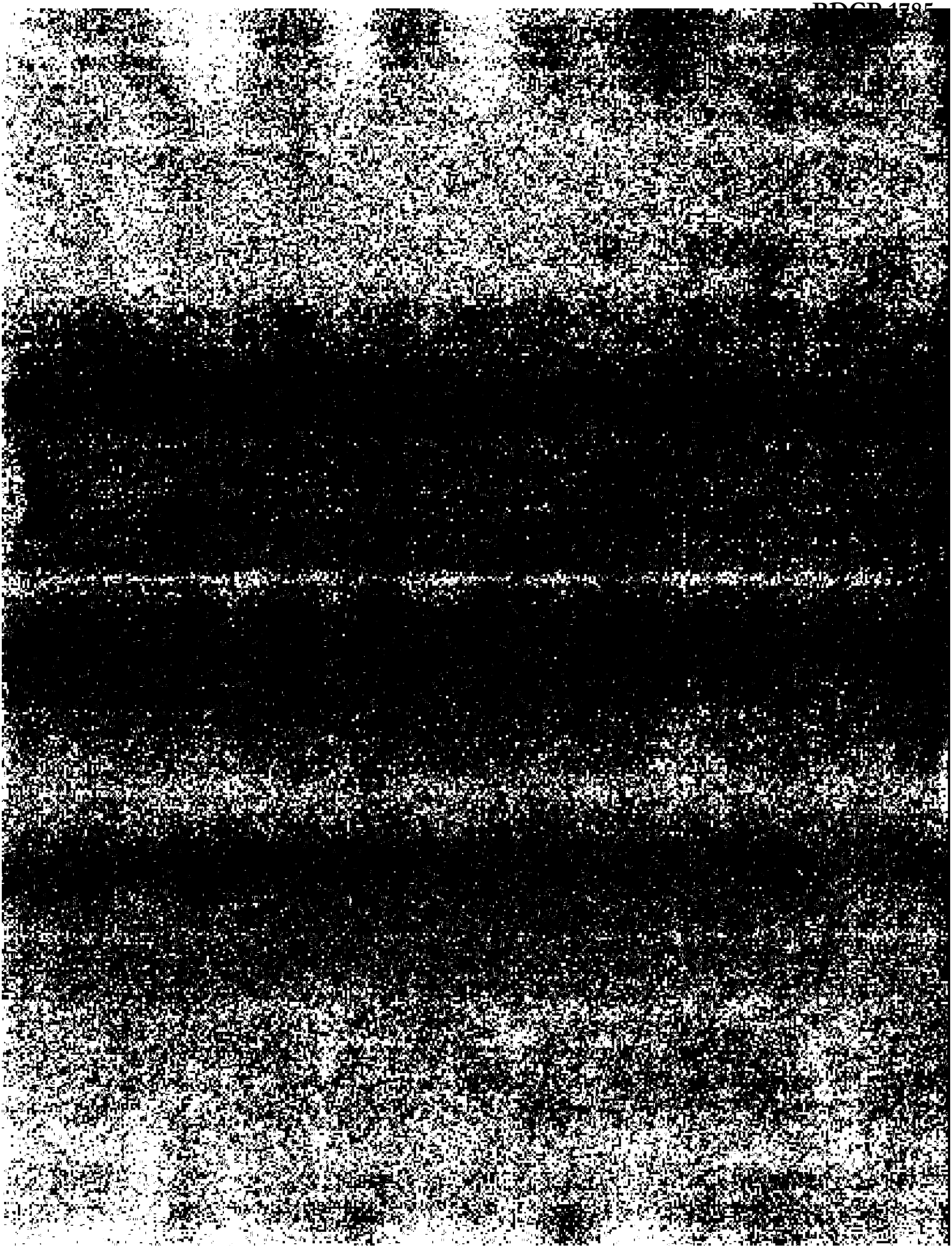

EXHIBIT F

DSC LETTER

July 11, 2013

DELTA STEWARDSHIP COUNCIL
A California State Agency

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July 11, 2013

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Executive Officer
Christopher M. Knopp

Mr. Russell Stein
Chief, Environmental Management, DHCCP
Department of Water Resources
901 P Street
Sacramento, CA 94326-0001

Subject: Responsible Agency Comments
2013 Administrative Draft
Bay Delta Conservation Plan Environmental Impact Report/Environmental Impact Statement

Dear Russ:

This letter presents the attached comments by the staff of the Delta Stewardship Council (DSC), working with our Arcadis consultant team, on the 2013 administrative draft of the Bay Delta Conservation Plan (BDCP) EIR/S.

Our review of the draft has been guided by two principles. The first is the Delta Plan's recognition of the BDCP's importance as an element of the plan's comprehensive approach to furthering the achievement of the co-equal goals. The Delta Plan recommends successful completion of the BDCP by the end of 2014. The Delta Plan recognizes the importance of addressing the Delta conveyance problems and recovering Delta fish and wildlife by restoring habitat and reducing other stressors on the ecosystem. A BDCP that successfully fulfills the Delta Reform Act's requirements will address these goals. We want to assist in completing an EIR/S that contributes to a successful BDCP.

The second principle guiding our review is an appreciation of the EIR/S's important role in the administrative record that will support decisions about the BDCP, recognizing that one day the Delta Stewardship Council may be relying on that record should the BDCP's approval be appealed to the DSC. With that in mind, our review examined how thoroughly the EIR/S reflects key CEQA provisions and the unique EIR/S requirements specified in the Delta Reform Act; as well whether the EIR/S provided information that could contribute to determinations about the BDCP's conformance with the Natural Communities Conservation Act (NCCPA). These requirements often overlap, but we've tried not to repeat comments made in one area even though they may apply to other areas. We've tried to organize the comments consistent with these Acts' requirements.

I want to start off acknowledging the impressive scope and depth of analysis and evaluation of the BDCP and its alternatives presented in the draft. You and your team have made substantial progress since the 2012 administrative draft. Thanks, too, for taking the time to meet with DSC staff and its consultants to present aspects of the draft documents and answer our questions. Since the 2013 draft documents represent a work-in-process, some of our comments may already be addressed and will soon be included in the forthcoming public draft of the EIR/S. Other comments, however, reiterate suggestions made in our prior letters about the EIR/S's scoping or prior administrative drafts, but which the EIR/S still doesn't fully address (Phil Isenberg to Mark Cowin – April 21, 2010; Joseph Grindstaff to Mark Cowin – June 28, 2010; Joseph Grindstaff to Mark Cowin November 15, 2010; Joseph Grindstaff to Russell Stein – April 18, 2012). The Delta Independent Science Board's comment letters of June 23, 2013, May 13, 2013, and June 12, 2012 also include thoughtful suggestions that ought to be addressed by appropriate revisions in the EIR/S's public draft. Where relevant, this letter considers our prior comment letters and those provided by the Independent Science Board, especially its June 24, 213 comments to the Council and Department of Fish and Wildlife.

Finally, some of our comments may reflect our own evolving understanding of the information and analysis in the EIR/S. We have not reviewed all the documents completely. Once we have additional time to review the BDCP and the public draft EIR/EIS/ we may supplement these comments or provide additional details. Where you believe we misunderstand what the EIR/S is trying to convey or how it addresses an issue we think needs attention, we hope you'll be able to meet with us again to help us better understand how the EIR/S addresses our concerns. We look forward to continued consultation with the Department and its BDCP partners about the BDCP and its EIR/S, as the Delta Reform Act provides (Water Code 85320(c)).

Note that our comments on the administrative draft EIR/S are presented as a responsible agency, and they will not have a pre-decisional effect on possible future appeals of DFW's determination related to the BDCP (Water Code Section 85320(e)). The comments have not been approved by our Council, and so reflect only views of our staff and consultants. We look forward to further discussions with you on the draft EIR/S and other elements of the proposed BDCP conservation plan in the future. Please contact Carl Lischeske, P.E., at (916) 445-5891, if you would like to discuss our comments.

Sincerely,

Dan Ray
Chief Deputy Executive Officer

Attachment

REVIEW COMMENTS
2013 ADMINISTRATIVE DRAFT
BAY DELTA CONSERVATION PLAN
ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL IMPACT STATEMENT
Prepared by the
DELTA STEWARDSHIP COUNCIL

INTRODUCTION

This document presents comments prepared by Delta Stewardship Council's (DSC) staff and consulting team on the 2013 administrative draft of the Environmental Impact Report/Environmental Impact Statement (EIR/S) for the Bay Delta Conservation Plan (BDCP).

As a general matter, we found the scope and depth of the DSC's compilation and analyses of environmental information about the BDCP overwhelmed us. We share the Independent Science Board's June 24 plea for summaries at the opening of each chapter and readable comparisons of the alternatives' environmental impacts, including tables that compare alternatives' effects in terms of readily understood measures such as water exports, reverse-flow days, losses or gains attributable to changes in water deliveries, or farmland removed from production. We had previously raised this issue in our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S.

DELTA REFORM ACT REQUIREMENTS

The Delta Reform Act, in Water Code Sec 85320 (c)-(e), gives the DSC four responsibilities with respect to BDCP's preparation:

1. It is a responsible agency in development of the EIR/S.
2. It is to be consulted by DWR during the BDCP's development.
3. If the BDCP is approved by the Department of Fish and Wildlife's (DFW) as meeting the requirements of law, the DFW's determination may be appealed to the Council.
4. If the BDCP meets the Delta Reform Act's requirements, the DSC shall incorporate the approved BDCP in the Delta Plan.

The BDCP will not be incorporated into the Delta Plan and its public benefits will not be eligible for state funding if it does not meet the Delta Reform Act's requirements (Water Code Section 85320(b)).

We looked for but could not find a description of these roles, especially the DSC's potential appellate role and its responsibility to incorporate the BDCP, once approved,

into the Delta Plan, in the EIR/S's project description, which ought to include a description of how the DSC, as a responsible agency, intends to use the EIR/S.

In addition, if the EIR/S will provide programmatic or project level environmental documentation for projects that may be covered actions covered by provisions of the Delta Plan (Water Code 85057.5, the Council's appellate review should also be acknowledged (Water Code 85225.1).

The Delta Reform Act also lays out specific requirements regarding the BDCP's EIR/S (Water Code Section 85320(b) (2) (A-G). We emphasized the importance of these requirements in our June 28, 2010 scoping comments on the BDCP's EIR. The draft EIR/S's Appendix 3I begins to address compliance with these Delta Reform Act requirements, but only in a brief and simplistic manner. It relies on the reader's efforts to search for and review significant portions of both the EIR/S as well as the Effects Analysis (EA). We ask that the public draft EIR/S include a more specific and robust discussion, accompanied by meaningful tables or figures, explaining where in the EIR/S one may find the information and analysis required by Water Code Section 85320(b) (2) (A-G) and, when it is relevant, how that information can be used when considering the BDCP's compliance with the NCCPA (Chapter 10 of Division 3 of Fish and Game Code).

Conveyance alternatives and diversion rates: The EIR/S assesses a diverse array of rates of diversion and conveyance alternatives. Care should be taken to assure that the review and analysis of each alternative is "comprehensive" as required by Water Code Section 85320(b) (2). Your agencies should consider how this standard interacts with NEPA's requirement that all alternatives must be analyzed and presented to similar levels of detail.

Flow Criteria: We previously raised the issue of flow criteria in our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S. The Delta Reform Act requires that the EIR/S include a comprehensive analysis of a "reasonable range of flow criteria, rates of diversion, and other operational criteria required to satisfy the criteria for approval as [an NCCP] and other operational requirements and flows necessary for recovering the Delta and restoring fisheries under a reasonable range of hydrologic conditions, which will identify the remaining water available for export and other beneficial uses." The Water Code also directs the State Water Resources Control Board (SWRCB) to develop new flow criteria for the Delta's ecosystem necessary to protect public trust resources and to better inform planning decisions in the BDCP.

In 2010, the SWRCB prepared its report "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" presenting its technical assessment of flow and operational requirements to provide fishery protection under existing conditions.

We previously emphasized the importance of taking into account the flow criteria in our June 28, 2010 scoping comments on the BDCP's EIR. We understand that the flow criteria presented in the SWRCB 2010 report have no regulatory affect, and are aimed primarily at public trust issues for fish and wildlife, rather than also balancing those issues with other beneficial uses that may be in the public interest. Nevertheless, it would be helpful if the EIR/S, perhaps in Section 2 or in Section 3.2, explains how the 2010 flow criteria have been used, as the Delta Reform Act intended, in "informing planning decisions for the ... Bay Delta Conservation Plan" (Water Code 585086(c)(1)). After reviewing the chapters identified in Appendix 3I, it is not apparent how the EIR/S used the SWRCB 2010 flow criteria in its review and analysis. Consideration of the SWRCB's flow criteria has been a point of contention in preparation of the Delta Plan, and should be addressed directly in the BDCP's EIR/S.

A unique requirement of the Delta Reform Act is the requirement for the BDCP's EIR to comprehensively review and analyze the "operational requirements and flows necessary for recovering the Delta ecosystem and restoring fisheries under a reasonable range of hydrologic conditions [that] will identify the remaining water available for export and other beneficial uses" (Water Code 85320(b)(2)(A)). We could not find such an analysis in the EIR/S or its supporting material. This is an atypical requirement of an EIR/S, and probably warrants conversation with us and the relevant trustee agencies about how best to address it. One approach, if the BDCP agencies accept the premise that the SWRCB's flow criteria identify the flows necessary for recovering the Delta ecosystem and restoring fisheries under a reasonable range of hydrologic conditions, could be consideration of an alternative that applies those criteria to assess the remaining water available for other beneficial uses and exports and provides conveyance facilities for the latter. Alternatively, the EIR/S could provide its own assessment of the flows necessary for recovering the Delta and restoring fisheries under a reasonable range of hydrologic conditions, and consider an alternative capable of conveying the flows available for export while leaving sufficient water other beneficial uses. In this way, EIR/S would demonstrate its review and analysis of a full range of flow criteria, from full contract deliveries to full protection of the Delta ecosystem, its fisheries, and in-Delta beneficial uses, which would, bound a "reasonable range." It could be that evaluation of alternatives that the BDCP agencies conclude are not reasonable extends only as far Chapter 3's screening of alternatives for further study, or these alternatives may warrant more comprehensive analysis and consideration of its impacts in Chapters 5 (water supply), 6 (surface water), 8 (water quality), and 11 (fish and aquatic resources). Clear explanations should be provided when alternative flow criteria are rejected as unreasonable and therefore screened from full consideration. Our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S also emphasized the importance of demonstrating how the screening criteria affected the range of alternatives considered.

Operational Criteria: We previously raised the issue of operational criteria in our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S. To carry out the Delta Reform Act's requirement to consider a reasonable range of 'other operational criteria"(Water Code 85320(b)(2)(A), it would be helpful if the EIR/S clearly described: 1) how and why operational scenarios were developed; 2) the basis for the range of flows included in the proposed Decision Tree; 3) the criteria used to apply scenarios to the various project alternatives; 4) how the various operational scenarios contribute to meeting the coequal goals; 5) what the operational scenarios mean in the comparison of alternatives, and 6) what is proposed for near-term interim operations. The EIR/S should show how operational scenarios employ an adaptive range within an adaptive management framework that is linked the BDCP goals and objectives.

In addition, we recommend that the EIR/S should discuss how the range of flow criteria, rates of diversion, and other operational criteria could be influenced by development of new surface and groundwater storage projects that are currently under consideration.

Climate Change: The Delta Reform Act requires that BDCP's EIR/S comprehensively review and analyze the potential effects of climate change (including possible sea level rise up to 55 inches and possible changes in total precipitation and runoff patterns) on the conveyance alternatives and habitat restoration activities considered in the EIR/S. Chapter 29 represents BDCP's general compliance with this requirement. The EIR/S's section 29.6 could be improved to provide a better understanding of how BDCP will increase resiliency and adaptability to climate change in support of its stated conclusions. For example, the EIR/S states that "by adding a wider variety of water management options and restoring habitat on a large scale, the BDCP can help buffer negative effects of temperature, thereby adding resiliency to increased water temperatures" (page 29-20). What exactly will buffer the negative effects of temperature?

The terms resiliency, resilience, adaptability, adaptation and adaptive capacity are used frequently and, in some instances, interchangeably. The EIR/S, in particular Chapter 29 and the Glossary (Chapter 35), would benefit from clear definition and use of these terms. This also applies to the explanation of why a particular conservation measure (CM) or alternative improves the resiliency or adaptability of the system. Section 29.6.2.1 should be rephrased to avoid current circular reasoning that Alternatives 1-5 will improve water supply reliability by "providing a more reliable water supply."

Chapter 29 discusses sea level rise and climate change impacts on through-Delta conveyance. It does not, however, assess whether these impacts may affect the long term capacity of the preferred alternative to convey waters for export from the Delta if rising seas and related changes in Delta water quality limit diversions from existing south of Delta diversion facilities, essentially limiting most exports to what could be

conveyed through an isolated conveyance system. This possibility merits discussion. Section 29.6 of the EIR/S would also benefit from improved discussion on how new conveyance will provide more flexibility to deal with the effects of climate change and sea level rise in operations of the State Water Project and Central Valley Project.

In addition, the EIR/S says that providing "alternative" habitat will make the ecosystem more resilient and adaptable (p 29-18). However, "alternative" habitat may be conducive to introduced predators such as bass and striped bass or to non-native invasive species, which could adversely affect the resilience of the species of concern. The EIR/S would be improved by clarifying this issue or citing prior studies to support this claim. The EIR/S also states that some restoration-related CMs will add to resiliency of the system through opportunities for migration of species upland (as sea level rises). Because these potential benefits may be offset if rising sea levels flood restored marshes, the EIR/S should analyze the impacts of altered water levels on the qualitity and value of restored habitat.

Although the permit is for 50 years, the proposed conveyance facilities will most likely have a much longer life. Chapter 29 does not explain how CM 1 may be affected by the effects of sea level rise and changes in precipitation and runoff patterns in and beyond the late long term, nor does it describe how CM 1 may be adapted to these changes.

Water Supply Reliability and Resilience: The Delta Reform Act requires the BDCP's EIR/S to comprehensively review and analyze "the resilience and recovery of Delta conveyance alternatives in the event of catastrophic loss caused by earthquake or flood or other natural disaster." The National Infrastructure Advisory Council defines infrastructure resilience as: "the ability to reduce the magnitude and/or duration of disruptive events. The effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event." Please consider the application of this definition to these sections.

Delta Levees: The EIR/S does not assess the resilience and recovery of conveyance facilities or conveyance operations impacted by levee failure. We previously noted the importance of addressing the improvement of Delta levees in our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S. Chapter 6 states that Delta levees are currently at risk of failure from factors such as overtopping, under- and through-seepage, subsidence, animal burrows, and earthquake loading. The risks of levee failure will increase in the future as sea level rises and subsidence continues. Levee failures would severely impact water supply reliability, and would be catastrophic to Delta communities. The resulting flooding would inundate homes, farms, and infrastructure in the Delta (including proposed conveyance facilities), causing significant environmental, social, cultural, and economic impacts.

Except for making improvements to levees that are disturbed by construction activities, there is no provision to strengthen levees in the Delta for either static conditions or earthquake loading. Because the proposed conveyance facilities represent critical infrastructure for the state, the risks posed by levee failure and the ability of the facilities to recover from levee failure should be clearly described in Chapters 5 (water supply) , 6 (surface water), and 8 (water quality).

In addition, levees surrounding islands in the western Delta help prevent saline water from moving into the central Delta. If the levees in the western Delta fail, water quality in the central Delta will be adversely impacted. What impacts do levee failures pose to: 1) through-Delta conveyance, including the quality of Delta water available for export; and 2) to habitat restoration? In the event of a major earthquake in the Delta, how will levees perform? If levees along the freshwater corridor or the western islands fail, how difficult will it be to restore them to condition that would allow resumption of exports from south Delta pumping facilities, and how long will conveyance operations and/or water quality be affected before full recovery?

Sea level rise will raise water levels in the Delta, yet neither chapter 3 nor chapter 29 of the EIR/S acknowledges the need to increase the height of levees and adapt facilities to accommodate this change. As we suggest in our remarks under "CEQA analysis" below, it seems proper to consider an alternative that improves water supply reliability and improves resilience in the event of an earthquake or flood by strengthening levees along the current corridor conveying freshwater to the export pumps, in combination with the pipelines of the preferred alternative. Other ongoing efforts to strengthen, improve, and maintain other Delta levees, such as those recommended in the Delta Plan, could be included in the Cumulative Effects Analysis (Section 4.2.4.2).

A potential measure to mitigate these risks is recommended in the Delta Plan. The plan recommends (WR R4) that water suppliers that receive water from the Delta watershed should include an expanded water supply reliability element, starting in 2015, as part of the update of an urban water management plan, agricultural water management plan, or integrated water management plan. The expanded water supply reliability element would detail how water suppliers are reducing reliance on the Delta and improving regional self-reliance through investments in local and regional programs and projects, and should document the expected outcome for a measurable reduction in reliance on the Delta and improvement in regional self-reliance. At a minimum, these plans should include a plan for possible interruption of Delta water supplies for up to 36 months due to catastrophic events impacting the Delta, evaluation of the regional water balance, a climate change vulnerability assessment, and an evaluation of the extent to which the supplier's rate structure promotes and sustains efficient water use. The EIR/S should consider how this mitigation could be implemented through provisions of contracts with water suppliers serviced through the BDCP's conveyance facilities.

Flood Management. The EIR/S could also benefit from more clearly carrying out the Delta Reform Act's requirements to consider potential effects on Sacramento River and San Joaquin River flood management. We noted the importance of addressing this issue in our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S. Because the proposed conveyance facilities represent critical infrastructure for the state, the risks posed by flooding and the ability of the facilities to recover following a major flood should be clearly described. Chapter 3 states that new and reconstructed levees will be designed "to provide the same level of flood protection as the existing levee." Intake structures are proposed with "top deck elevation aligning with the top of the adjacent levee to maintain flood protection" and the "top of walls would be at the flood protection elevation" for sedimentation basins and solids handling facilities. Chapter 3 also states: "All construction and modifications will comply with applicable state and federal flood management, engineering, and permitting requirements." More useful would be a fuller explication, developed in consultation with the Central Valley Flood Protection Board, DWR's Flood Maintenance Division, and local reclamation districts, of how Sacramento River and San Joaquin River flood management may be affected by locating BDCP diversion facilities and ecosystem restoration projects within the State Plan of Flood Control's facilities. This ought to also include both assessment of flood management effects from enhancing channel margins and restoring levees along the Sacramento and San Joaquin rivers and their distributaries, as proposed in Section 3.6.2.6. Effects of other habitat restoration conservation measures on these facilities ought to be evaluated. Effects of the project on flood conveyance capacities and flood project maintenance duties could be described, as should implications for other future management of the flood management facilities on these rivers.

While conveyance facilities will be protected from the design flood, the resilience of facilities to larger flood events ought to also be discussed. Much recent attention has been focused on "atmospheric rivers", and the resulting large floods (floods larger than the 0.5 percent flood) that are possible in the Delta, and may be more likely with climate change. Questions the EIR/S should consider include: 1) At what level of flooding in the Delta will proposed facilities become inoperable (including the existing Banks and Jones pumping plants)? 2) In the event of a major flood in the Delta, how difficult will it be to restore the facilities and how long will conveyance facilities be out of operation? 3) What does climate change and sea level rise mean to the flood risk faced by conveyance facilities in the Delta? 4) If new facilities are designed to provide the same level of flood protection as the existing levee, how will the new facilities be adapted to account for the increased Delta water levels that may accompany sea level rise?

Evaluation of implications of the BDCP for the California Central Valley Flood Protection Plan ought also to be reviewed and analyzed. The flood plan provides for two levels of

flood risk, protection from the 0.5-percent flood (200-year flood) for urban areas, and protection from the 1-percent flood (100-year flood) for rural areas. To what level will proposed conveyance facilities be protected (i.e., what is the design flood)? If proposed facilities will be designed to meet current levels of flood protection in the Delta, what is the flood risk posed to this critical new infrastructure (i.e., what magnitude of flooding will inundate some or all of the new conveyance facilities)? Will improvement to other flood management facilities be required for the BDCP's conveyance facilities to be eligible for assistance through FEMA's Hazard Mitigation Program, the Army Corps of Engineers' PL 84-99 program, or emergency response and recovery programs? These are among the questions that ought to be considered in the EIR/S's analysis of this issue.

Finally, if new facilities are designed "to provide the same level of flood protection as the existing levee," how will new facilities be adapted to account for the increased water levels in the Delta that may accompany sea level rise? These issues should be discussed in the description of alternatives (section 3.5), in section 6.3.1.1 in the context of surface water impacts and flood management, and in section 29.6.1 with respect to climate change, sea level rise, and hydrology changes.

Mitigation Responsibilities: The Delta Reform Act requires that "construction of a new Delta conveyance facility shall not be initiated until the persons or entities that contract to receive water from the State Water Project and the federal Central Valley Project or a joint powers authority representing those entities have made arrangements or entered into contracts to pay for the costs of ... mitigation, including mitigation required pursuant to Division 13 (commencing with Section 21000 of the Public Resources Code), required for the construction, operation, and maintenance of any new Delta water conveyance facility" (Water Code Section 85089 (A)). Accordingly, BDCP mitigation measures proposed in the EIR/S ought to be clearly specified and their linkages to impacts of construction, operation, and maintenance of the conveyance facilities of the preferred alternative should be plainly identified, so that the financial implications to the water contractors or others are apparent and can be considered in the BDCP's finance plan. Open ended pledges or vaguely described commitments to avoid or reduce conveyance facilities' adverse effects may sow the seeds of future conflicts.

NCCPA REQUIREMENTS

Water Code Section 85320(b) (1) (A) requires that the flow criteria, rates of diversion, and other operational criteria considered in the BDCP's EIR/S 'satisfy the criteria for approval of natural communities conservation plan". The EIR/S's Section 3.2.1.3 could be strengthened by a more explicit, readily understood assessment of this topic. Documentation of how the flow criteria, rates of diversion, and other operational criteria

considered in the BDCP's EIR satisfy this requirement would be an important contribution of the EIR/S to the administrative record supporting decisions about the BDCP. We had previously raised this issue in our April 2012 comments on that edition of the BDCP's administrative draft EIR/S.

Among the factors that complicate this analysis is that the success of CM 1 will depend on and be influenced by implementation of the other CMs of the BDCP. The anticipated impacts of CM 1 and BDCP's ability to meet the requirements of CEQA, the Endangered Species Act (ESA), and NCCPA are inextricably linked to the anticipated effects of the other CMs, particularly near-term impacts of CMs 3-8 and 10. Chapters 11 and 12 of the EIR/S would be significantly improved by providing specific descriptions of the impacts of flow and restoration actions on protection and recovery of covered species. This probably deserves more discussion among our agencies.

Baseline Description: To determine if BDCP will meet its biological goals and objectives, an improved description of baseline conditions, which should be quantitative when possible, is needed in sections 3D.2.1 and 3D.2.3. It is not clear whether baseline conditions include restoration actions that are already being implemented pursuant to the current BIOPS, the CVPIA, or other programs, in contrast to benefits derived solely from the proposed BDCP's conservation measures. An explanation of how the EIR/S builds off the differing considerations of a baseline provided by CEQA, NEPA, ESA, and the NCCPA could help clarify how the EIR/S baseline was compiled. Metrics for baseline estimates of species abundance and distribution, and quantitative estimates for habitat types that will be affected by BDCP would aid evaluation of proposed BDCP actions.

CEQA REQUIREMENTS

Scope of Analysis: Our April 2012 letter asked how the BDCP will respond to the state's policy about reducing reliance of the Delta. Some, including our own Independent Science Board, suggest the EIR's scope ought to be expanded to consider measures to reduce reliance on the Delta exports through improved water use efficiency, conjunctive use, or local water supply projects, measures to improve surface or groundwater storage. Others advocate that it include wide-ranging programs to improve Delta levees.

We suggest these matters be addressed through the EIR/S's assessment of cumulative impacts or/and in its examination of candidate mitigation measures. For example, the Delta Plan recommends completion of surface water storage investigations for proposed surface storage projects, including evaluation of potential additional benefits of integrating operations of new storage with proposed Delta conveyance. In addition, the DSC has urged DWR to identify projects throughout California that could be

implemented within the next five to ten years to expand existing surface and groundwater storage facilities, create new storage, improve operation of existing Delta conveyance facilities, and enhance opportunities for conjunctive use programs and water transfers in support of the coequal goals. There are at least five storage projects currently under consideration including raising Shasta and Los Vaqueros dams, Sites and Temperance Flats reservoirs, and Delta Wetlands. The Delta Plan also recommends interim priorities for state investment in the Delta's levees. The California Water Plan assesses how statewide water conservation and efficiency and diversification of local water supplies through desalination, water reclamation, storm water capture, and other alternative supplies may contribute to water supplies. These plans, other reasonably foreseeable projects, and their implications for the BDCP can be more explicitly considered in the EIR/S' cumulative impact analysis. We previously emphasized the importance of discussing how storage project's could impact flows into the Delta as well as operations of the BDCP and the reliability of Delta water supplies in our April 2012 letter commenting on that edition of the BDCP's administrative draft EIR/S.

In some cases, actions to improve storage or to reduce reliance on the Delta may also warrant consideration as measures to mitigate BDCP alternatives' impacts on water supplies, water quality, or other values, even if they are outside the alternative projects considered in the EIR/S. Such consideration could build off the Delta Plan EIR/S's evaluation of these actions, allowing the BDCP to draw more fully on the full portfolio of measures available to address the state's co-equal goals for the Delta.

On the other hand, improving levees along corridor conveying freshwater through the Delta from the Delta cross channel to the existing export pumps would seem to be consistent with the BDCP's objectives of improving the conveyance system so that it is more resilient in the event of earthquakes and floods, anticipates the effects of sea level rise, and minimizes the potential for public health and safety impacts resulting from a major earthquake that causes breaching of Delta levees. A project that improves levees along the freshwater conveyance corridor, as recommended in the Delta Plan, combined with the preferred project's tunnels may better achieve the BDCP's objectives than one that relies on the tunnels alone. We would like to discuss with you opportunities to evaluate such a combined approach to attaining the EIR's objectives.

Restoration Alternatives: CEQA requires addressing alternatives identified for consideration in meaningful detail before screening, and providing explanations for their selection or elimination. As noted in Chapter 3 (page 3-3), "CEQA and NEPA require that an EIR and EIS include a detailed analysis of a reasonable range of alternatives to a proposed project." While the EIR/S presents a range of alternatives for CM 1, there is no equivalent range provided for other conservation measures (page 3-2). The EIR/S

presents only one measure each for CMs 2-22, except for minor modifications in Alternatives 5 and 7.

An alternative conservation measure that could warrant consideration is action to provide a more natural Delta flow regime, particularly as a feature Alternative 8. A more natural flow regime might also lessen the BDCP's impacts on in-Delta water quality reported in the EIR/S. Considerable scientific research and evaluation confirms the value more natural flows could provide to the Delta ecosystem. Some suggest enhanced flow may also provide more reliable benefits to the ecosystem than marsh restoration, the benefits of which are less certain and not yet well documented. A more natural flow regime need not be attained solely by reducing Delta exports if opportunities can be found to enhance Delta inflows through either water transfers or through releases from new surface storage projects now under study. Due consideration, of course, would need to be paid to protection of existing water rights and the need to avoid impacts to upstream water users, consistent with the Natural Resources Agency's policy expressed in February 6, 2013 letter from Secretary Laird and the SWRCB's chairman to the North State Water Alliance.

Another approach to evaluating alternative conservation measures may be to emphasize restoration of tidal marsh at Suisun Marsh, while deemphasizing restoration that converts farmlands at other locations. Could such an alternative reduce unmitigable impacts to farmland, make fuller use of existing public lands for restoration before private property is acquired, or allow mitigation of lost waterfowl hunting recreation through enhancement of waterfowl production at Sherman or Twitchell Islands? Would the hydrodynamics of restored tidal marsh in Suisun Marsh dampen saltwater intrusion into the Delta, thereby mitigating adverse water quality impacts of other BDCP features? If available data is suitable for such analysis, it could help refine the selection of a preferred BDCP alternative.

Meaningful Evaluation of Alternatives: Chapter 12 in the EIR/S should clearly show that unintended and potentially adverse consequences of proposed CMs have been considered and evaluated. For example, the EIR/S describes positive effects of habitat restoration in the impact analysis without also considering that the proposed actions could result in adverse impacts from: 1) increases in invasive non-native species; 2) changes associated with suspended sediment dynamics; 3) effects on existing downstream tidal wetlands; and 4) extended herbicide applications

The EIR/S would be improved by providing a convenient means to compare alternatives against each other for their abilities to, among other things: 1) achieve ecosystem restoration objectives; or 2) achieve water supply reliability objectives. We concur in the Independent Science Board's suggestion that the EIR/S include a summary evaluation of alternatives and a table to facilitate comparison of each alternative relative to the

goals and objectives of the proposed BDCP project actions as they relate to CEQA, ESA, and NCCPA.

Detail of Alternatives: Currently, the BDCP's Effects Analysis (EA) is limited to the preferred project alternative. The EIR/S states "CEQA does not require the alternatives to be evaluated at the same level of detail as the proposed project" (page 3-4, lines 18-29). On the other hand, CEQA does require: "sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project" (Section 15126.6(d)). The EIR/S only compares the preferred alternative to existing conditions and the no action alternative; it does not enable meaningful comparison between all alternatives. Because the EA is limited to the preferred project, the EIR/S should include a meaningful way to compare other alternatives, even if only on a qualitative basis.

Since the EA is intended to simulate future conditions and account for impacts of the project, it is appropriate to consider CM 1 at a project-level of detail. The EA conclusions must well supported, however, recognizing that the overall effects of the proposed project will also be influenced by: 1) alternative operations scenarios in the decision tree; and 2) the impacts of CMs 3-9 and 10, which have thus far been identified at a programmatic level. In addition, we concur in the Independent Science Board's concerns that the independent science review of EA ought to occur prior to the release of the public review draft of the EIR/S, or that the EIR/S review period ought to be sufficiently long to allow agencies to consider the independent science review as they comment on the EIR/S.

The EIR/S would be improved by considering habitat restoration experience gained from previous projects (both successful and unsuccessful) as a basis for how proposed BDCP conservation measures may be expected to perform.

Analysis of Near-Term CMs: While it is reasonable to defer project-specific analysis for early-long-term and late-long-term projects (Table 3-4) to a later date as proposed in the EIR/S, a large amount of restoration work for CMs 3-2-10 and 10 is scheduled for implementation in the same time period as construction of the proposed conveyance. It seems reasonable for the EIR/S to explain section 3.3.2 of the EIR/S how and when near-term CMs 2-10 will be similarly addressed and evaluated with a project-specific EIR/S. This concern was also raised by the Delta Independent Science Board (ISB) in its recent comment letter, as well as the Council's April 2012 letter on that edition of the BDCP administrative draft EIR/S. The ISB indicated that the difference in the level of analysis appears to give unequal weight to the coequal goals. An approach worthy of consideration might also be a staged EIR/S as described in EIR Guidelines Section 15167, in which the BDCP EIR/S provides programmatic evaluation of these CMs but acknowledges the need for subsequent environmental documents of specific projects.

Delta Plan Conflicts: CEQA requires analysis of policy and planning context in which a project is proposed, including inconsistencies between the proposed project and applicable regional plans, such as the Delta Plan (Sec'y for Resources Guidelines 15125(d)). The EIR/S should include such an assessment of any inconsistencies between the Delta Plan's policies and recommendations and the BDCP. Because the Delta Reform Act requires that, if successfully approved, the BDCP shall be incorporated into the Delta Plan, the Delta Plan may need revision when the BDCP is incorporated into it to eliminate any inconsistencies. Identification of those conflicts would be an important first step in assessing potential environmental impacts of such changes, which the BDCP's EIR/S ought to identify and evaluate so that the DSC can rely on it when the BDCP is incorporated in the Delta Plan (see notes above under DELTA REFORM ACT REQUIREMENTS about intended use of the EIR/S by the DSC).

Significant Impacts and Mitigation Measures: CEQA Sections 12126.2 and 15126.4 require discussion of the significant environmental impacts of the proposed project, and of the mitigation measures proposed to minimize those impacts. In some cases, however, identification of feasible and enforceable mitigation measures is postponed until further evaluation and consultation with Delta water purveyors (see for example, mitigation measures WQ-7a, 7b, and 7c). This may not meet CEQA section 15126.4(a)(1)(B), which requires that "formulation of mitigation must not be deferred to a future time." As an alternative, the EIR/S could offer measures that "specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way." As we noted earlier, clearer description of proposed mitigation measures will also aid in assignment of mitigation costs in conformance with Water Code 85089(a).

The EIR/S would also benefit from a clear explanation of what is considered to be a "feasible" mitigation measure considering the significant scope, expense, social impact, and technical difficulty of the proposed BDCP's 50-year plan. What might seem "capable of being accomplished in a reasonable period of time taking into account economic, environmental, legal, social or technological factors" – CEQA's definition of feasible -- may be quite different for a multibillion dollar, 50-year project with the BDCPs social impact and legal and technical difficulty than for typical projects assessed under CEQA. The extent and scale of BDCP's proposed actions necessitates applying a comparable scale and level of effort for the proposed mitigation necessary to offset identified impacts.

Particular attention should be paid to impacts that affect achievement of the state's co-equal goals for the Delta of a more reliable water supply and protection, enhancement, and restoration of the Delta ecosystem (Public Resources Code 29702(a). Also important are impacts that affect the unique values of the Delta as an evolving place, which are to be protected as the co-equal goals are achieved. The Delta Plan's

Chapter 5 identifies these unique values as including the Delta's geography of low-lying islands and tracts, shaped by waterways, tides, levees and water controls; its rural heritage characterized by farms and small towns; its agricultural economy; and its opportunities for outdoor recreation. We highlight several sections of the impact assessment below where the EIR/S can be improved to better assess effects on these goals and values and measures to avoid or reduce them.

Water Resources: The Delta Reform Act requires special attention to water quality impacts, requiring in Water Code Section 85320(b) (2) (G) that the EIR include a comprehensive review and analysis of "the potential effects of each Delta conveyance alternative on Delta water quality". Under the preferred alternative, the proposed north Delta diversions from the Sacramento River would result in San Joaquin River flows comprising a larger proportion of the water in the estuary. Because San Joaquin River flows contribute poorer quality water (higher levels of salinity, pesticides, selenium, and other contaminants), modeling results indicate that implementation of the preferred alternative would result in significant water quality impacts in the Delta (e.g., exceeding existing Bay-Delta Water Quality Control Plan [WQCP] objectives). The modeling shows water quality changes for locations in the west and central Delta where flows would become more saline because of: 1) reductions in Sacramento River flow; 2) a higher percentage of San Joaquin River flow; and 3) the impacts of sea level rise. The EIR/S indicates that salinity standards would be exceeded at existing monitoring sites on a more frequent basis after the north Delta diversions begin operation.

Many of the water quality impacts described in the EIR/S are considered significant and unavoidable. For example, all four operational scenarios in the decision tree (Alternative 4, Scenarios H1-H4) would result in substantially increased chloride concentrations in the Delta such that the frequency of exceeding the 150 mg/l Delta WQCP objective would approximately double. In addition, the frequency of exceeding WQCP chloride objectives would increase in the San Joaquin River at Antioch and at Mallard Slough. Substantial long-term degradation would occur at Antioch and at the Contra Costa Canal Pumping Plant resulting in significant adverse effects on municipal and industrial water supply beneficial uses (page 8-414). Water quality for other in-Delta water users may also degrade as a result of BDCP.

The adverse water quality conditions that would occur due to the proposed north Delta diversions result in exceeding existing water quality objectives for multiple constituents including bromide and chloride, and for electrical conductivity. Because these impacts may affect the reliability of water supplies on which in Delta-users depend, Chapter 5 of the EIR/S should identify how the water quality changes affect the quantity of water available to supply in-Delta municipal and agricultural users (e.g., Contra Costa County, Solano County, City of Antioch, Delta water agencies, etc.), including estimates of the

quantity of water that may be degraded in quality. It should also estimate the extent of expected changes in low salinity habitat, quantifying these changes if feasible. In addition, the EIR/S should identify specific and effective mitigation methods available to avoid or reduce these impacts.

The EIR/S water quality impact analysis relies on modeling that assumes the project will not create new sources of constituents that will influence water quality, and bases water quality projections on altered mixing of Delta source waters. Section 8.3.1 of the EIR/S should recognize, however, that additional characterization of water quality impacts beyond the limited qualitative assessment performed to date may be warranted for proposed BDCP restoration actions. The proposed restoration actions would likely result in release of various constituents during construction and throughout their establishment period that will affect water quality. These constituents and their effects should be identified, particularly those in proposed restoration areas that would be subject to frequent tidal inundation or floodwater flows. Information gained from previous studies in areas near and down-gradient from large scale restoration actions (e.g., previous water quality monitoring efforts) should be used in the EIR/S analysis to identify the various types of water quality constituents that could be released due to proposed restoration measures as well as their associated impacts.

Section 8.3.3 of the EIR/S should provide more detailed evaluation of potential impacts from conversion of uplands, agricultural lands, or pasture lands to marshland. These conversions would cause a significant die-off in mostly non-native vegetation that would, upon breakdown by bacteria, release nutrients and potentially other materials into overlying waters. Changes in water salinity and the hydrologic regime will also affect soils, some of which may have high nutrient levels, legacy pesticides, (and, possibly pathogens) from decades of agricultural use. These constituents would be expected to leach from the soils into overlying waters in response to inundation-induced changes in soil chemistry.

Accelerated breakdown of organic matter both above and below-ground could result in higher oxygen demands in water and soils, leading to possible episodes of oxygen depletion in overlying waters. Die-off of vegetation and bare soil surfaces from construction of tidal channels and from excavations to lower intertidal elevations would also be expected to exacerbate turbidity and suspended sediment concentrations. Additional analysis is needed to better characterize the nature and extent of these water quality impacts and to identify effective mitigation measures.

Many of the currently proposed water quality mitigation measures are non-specific, are not clearly enforceable, and are deferred to the future, which may not meet CEQA requirements. The project impacts and mitigation discussion in Chapter 8 of the EIR/S (pages 8-412 through 8-430) highlights this issue. For example, mitigation measure

WQ-11 states: "proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions, followed by development and implementation of the actions, if determined to be necessary." The EIR/S should include additional options for more effective mitigation that would directly offset the projected impacts. For example, mitigations could be offered such as providing alternative water supplies, reducing diversions, releasing more flows from reservoirs, including releases from reservoirs proposed for construction in the future, or restoring, where feasible, western Delta and San Francisco Bay tidal marshes and channels to dampen the movement of high salinity tidal into the Delta.

Biological Resources Evaluation: Fish and wildlife impacts are also of especial importance, partly because of the high standards which the project must meet to be approved as an NCCP and HCP. The Delta Reform Act also requires special attention to these effects, requiring in Water Code Section 85320(b) (2) (D) that the EIR include a comprehensive review and analysis of "the potential effects on migratory fish and aquatic resources". In Chapters 8 and 11, the EIR/S would be improved by addressing several potentially significant adverse effects of the proposed project, including those associated with reduced downstream sediment transport (suspended sediment loads and associated turbidity) that would occur as a result of the proposed north Delta diversions. The EIR/S should also address potential impacts caused by reduced flushing of Sacramento River water, which would increase both hydraulic residence times and the potential production of microcystis, a harmful algal bloom. Increased residence times could also lead to warmer temperatures and potentially adverse fluctuations in dissolved oxygen levels, promoting habitat conditions less favorable to Delta smelt as well as other covered fish species.

The EIR/S impact analysis does not currently compare the anticipated ecological benefits of the proposed project relative to existing baseline estimates for both abundance and distribution of species and habitat types in the plan area. For example, the extent and distribution of low-salinity habitat under existing conditions should be compared to anticipated changes in low-salinity habitat. These ecological baseline estimates serve as useful points of comparison to evaluate anticipated versus actual outcomes on an ongoing basis as a measure of performance.

The EIR/S impact analysis could be improved by:

1. Providing improved justification for eliminating Fall X2 from the CEQA baseline. As presented, the explanation for removing Fall X2 from the CEQA baseline for existing conditions is confusing and not well supported.

2. Distinguishing restoration actions that are either in progress or have been previously committed to (e.g., RPAs required by previous Bio Ops) in contrast to habitat

restoration activities that are solely associated with proposed BDCP project actions (e.g., BDCP's incremental portion of the Yolo Bypass restoration project described in CM 2).

3. Describing upstream effects of climate change, for example potential reservoir re-operation that may be required to address upstream effects of climate change on salmonids.

4. Explaining the modeling results that show a population decline of longfin smelt, a threatened species, compared with current operating conditions. The EIR/S would benefit from an improved analysis of the potential impacts of north Delta diversions on the population growth projections for Longfin smelt.

5. Providing modeling results showing a comparable analysis for both the early long term (ELT) and late long term (LLT) conditions. The current modeling results discussed in the impact analysis are primarily focused on LLT conditions; a comparable analysis of both impacts and benefits associated with ELT actions should also be included.

Delta as a Place: The following six sections of these comments address the "Delta as a Place". Constructing and operating the proposed BDCP conveyance and restoration measures will significantly and adversely affect important attributes of the Delta's regional character, including values that the Delta Plan describes as contributing to the Delta as a distinctive and special place. The Delta Plan anticipates that changes to these attributes will occur, and may be necessary to achieve the co-equal goals, but seeks to accommodate these changes while preserving the fundamental characteristics and values that contribute to the Delta's special qualities and that distinguish it from other places. The proposed mitigation measures, in some instances, may not reduce impacts to less-than-significant; the EIR/S would be greatly improved by: 1) recognizing that collective impacts from a variety of proposed actions will adversely affect the Delta's agricultural, social, and economic character; and 2) by offering additional mitigation measures to better offset adverse impacts.

1. **Construction Footprint.** Construction activities will result in numerous impacts, which are described in various places throughout the EIR/S. However, as currently presented in the EIR/S, the scale of collective impacts to the Delta over ten or more years of construction is not well conveyed. Given that the collective construction impacts will affect the Delta over the 50-year permit, the EIR/S should aggregate the description of impacts associated with construction activities of all CMs in one location, and summarize them in a table with respect to time. In this aggregation, the EIR/S should discuss the overall construction footprint, including construction activities, project-related traffic and congestion, noise, and other impacts, and

compare each project alternative for all CMs involving construction; this would enable improved evaluation of direct physical impact and indirect effects associated with each alternative.

Similarly, the extent of areas that would potentially be restored to marsh or riparian habitat or where earthwork modifications to support construction and operation of all CMs would occur should be clearly identified in chapter 6. These impacts are currently shown at a programmatic level.

2. **Tunnel Muck.** The preferred alternative will produce about 35 million cubic yards of tunnel muck as a result of tunnel boring operations. The muck will be a plastic mix consisting of soil cuttings and conditioning agents (e.g., water, air, bentonite, foaming agents, polymers/biopolymers, etc.). Before the muck can be reused, it must be managed by drying and by possible physical or chemical treatment. The EIR/S, however, states that tunnel muck will be deposited essentially untreated within designated muck storage areas. There is a host of possible beneficial re-uses for reconditioned tunnel muck throughout the Delta – for example, levee repair and strengthening, fill to reverse island subsidence, fill for constructing restoration measures, and general building and engineered fills of all types. Could reconditioning tunnel muck for beneficial re-use be *before storage* be a reasonable mitigation measure?

3. **Groundwater Impacts.** For canal options, the documents indicate that groundwater levels could be lowered in a four-mile wide corridor along the Sacramento River near the proposed north Delta intakes (Chapter 7). This same lowering of groundwater levels, however, does not appear to happen for tunnel alternatives. What is the explanation for this apparent discrepancy?

4. **Agriculture.** According to the EIR/S, most impacts to agriculture will remain "significant and unavoidable" under CEQA. The commitment to providing appropriate mitigation for these effects should be strengthened. This would begin with more detailed assessment of CM 1's impacts on particular farms and farming operations, each of which has unique attributes of size, ownership, crop type, tenancy, ancillary uses, history and other features that deserve consideration as mitigation measures are developed. The EIR/S indicates that construction of BDCP CMs will cause many significant and adverse direct and indirect impacts to agriculture. For example, Impact ECON-3 comprises a clear change in the agricultural character that defines the Delta region. Farmland will be permanently converted to non-agricultural uses by: 1) construction and operation of conveyance facilities; 2) disruption of agricultural infrastructure; 3) degraded in-Delta water quality; and 4) implementation of restoration measures. The long-term footprint of

quality; and 4) implementation of restoration measures. The long-term footprint of construction and the disruption to infrastructure are subsequently expected to indirectly impact agriculture by increasing production costs (ECON 6) and by generating a regional decline in agricultural employment and income by $4.8 million (ECON 1, Table 16-42).

The EIR/S states that BDCP proposed actions will have a major regional economic impact, which should be described in either chapter 14 or 16 in sufficient detail to enable meaningful comparison of alternatives. For example, are their expected increases in production costs? What is the regional significance of the $4.8 million decline in agricultural related income and the associated loss of jobs? What does the loss of a particular crop mean for the viability of that crop in the region as a whole? What are the specific impacts to high value crops (e.g., vineyards) and to heirloom crops that characterize the Delta (e.g., pears and asparagus)?

Though the EIR/S identifies the total amount and production value of farmland and infrastructure affected by project construction, this assessment does not appear to include changes in crop acreage resulting from degraded water quality or from implementing CMs (page 16-44, ECON-18). This likely underestimates the overall impact to the regional economy because restoration measures will convert significant amounts of farmland to non-agricultural uses and reduce crop yields. In the discussion of impacts, the EIR/S should 1) describe project footprints for CMs to assess and evaluate the economic impact to crop production based on an evaluation of current cropping patterns; and 2) evaluate the expected crop losses (and revenue) caused by operations.

The EIR/S does not discuss the secondary effects that would be caused from location-specific activities. For example, the EIR/S does not identify where project impacts may affect a larger amount of land caused by fragmenting parcels, by making adjacent parcels unproductive, or by losses of particular or unique agricultural infrastructure. In particular, chapter 14 of the EIR/S should describe impacts to Delta agriculture that result from loss of important agricultural infrastructure such as processing facilities, slaughterhouses, or dairies. Impact ECON-9 acknowledges says that disproportionate impacts may occur, but the discussion should include evaluation of these effects and how these may, in turn, affect the region. While some losses are directly quantified, secondary effects should also be identified and evaluated.

As described above, water quality may be degraded for in-Delta users and increased salinity may impair crop yields. The EIR/S's chapter 14 should describe the quality and quantity of agricultural lands impacted by water quality changes, and include

mitigation for degraded water quality. Specifically, how many acres of farmland may be impacted by degraded water quality?

Implementing BDCP will significantly alter the agricultural character and regional economy, and the EIR/S projects a future demographic shift in the Delta region as a result (Chapter 16). Proposed mitigation measure AG-1 is intended to maintain overall regional agricultural character, but not to protect specific lands or mitigate specific impacts. As described above, we encourage you to consider a combination of mitigation measures that are meaningful at both the regional and the farm level. Where easements to preserve farmlands are proposed to compensate for unavoidable conversion of other farm lands, they should emphasize preservation of sites where development threats are higher, such as the Delta's secondary zone, rather than areas where development threats are low and the easements contribute less to reducing cumulative threats to farmland. The EIR/s discussion of Agricultural Land Stewardship Plans should describe how necessary actions and land conservation will be funded.

In addition, we encourage you to consider as potential mitigation measures the Delta Plan's recommendations for supporting the Delta's agricultural economy. The Delta Plan (DP R8) recommends that local governments and economic development organizations, in cooperation with the Delta Protection Commission and the Delta Conservancy, encourage value-added processing of Delta crops in appropriate locations. This recommendation is intended to grow and diversify the Delta's agricultural economy. Similarly, DP R9 recommends support for agritourism, particularly in and around Delta legacy communities. This recommendation is intended to provide additional income to farmers, aid in marketing the Delta brand, and enhance the Delta as tourism destination. The Delta Investment Fund authorized by the Delta Reform Act (Public Resources Code 29778.5) may be useful as an element of such mitigation.

If the EIR will inform terminations of Williamson Act contracts, the EIR/S should show that: 1) the location is not based primarily on the lower cost of acquiring land in an agricultural preserve; and 2) for agricultural land converted, no other land exists within or outside the preserve where it is reasonably feasible to locate the public improvement (Sections 51921(a) and (b)). This Williamson Act requirement is frequently overlooked, and has resulted in unexpected delays in implementing restoration actions elsewhere.

Finally, the EIR/S should consider how housing used by farm laborers may be affected by an influx of construction workers during CM 1's construction. Suitable housing for farm workers is in short supply, and its loss may adversely affect farming.

5. **Recreation.** The ten or more years of conveyance and habitat construction will result in the long-term reduction of recreational opportunities and experiences in the Delta both on land and in water (Impact ECON 5, REC 2 and 3). Traffic delays, disturbance, noise, and water quality impacts may reduce visits to, or prevent access to specific recreational sites. This, in turn, may cause local recreation-related businesses to suffer or close from reduced spending, which results in a decline in regional recreational-related economic activity. Though the proposed mitigation measures offer noise abatement programs, new access roads, alternative waterways, and other activities to minimize disturbances, the impacts of construction activities on recreation are still significant.

As described earlier, the EIR/S should consider possible increases in microcystis, a harmful algal bloom, which may adversely affect water-related recreation activities.

Recreation needs of project's construction workforce should be considered when forecasting impacts. The EIR/S ought also to consider whether housing for construction workers may include extended use of the Delta's recreational vehicle resorts, which may displace people seeking recreational opportunities in the Delta.

Chapter 15 of the EIR/S should provide explicit mitigation measures for the significant and unavoidable recreation impacts caused by limiting access to recreation sites or boating sites. We encourage you to consider as potential mitigation measures the Delta Plan's recommendations for encouraging recreation and tourism. For example, DP R11 asks water management and ecosystem restoration agencies to provide recreational opportunities, including visitor-serving business opportunities, at new facilities and habitat whenever feasible and to protect existing recreational facilities, using California State Parks' *Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh* and the Delta Protection Commission's *Economic Sustainability Plan* as guides. The EIR/S's mitigation measures should also reflect Department of Water Resources' responsibilities to provide recreation associated with the State Water Project and other projects constructed in cooperation with the United States (Water Code 11910-11). Mitigation recommendations should avoid unspecific and unenforceable measures, such as 'the BDCP project proponents will also work with DPR to determine if some of the constructed elements of CM1 could incorporate elements of the DPR's proposal'.

Cultural Resources: The entire Delta region is rich in cultural resources. The Delta Protection Commission's (DPC) feasibility report for the California Delta National Heritage Area surveys many of these resources, and characterizes their unique values. Both the DPC's study and California State Parks' *Recreation Proposal for the Delta* acknowledge the value created by the Delta's combination of agricultural,

historic, and cultural attributes. While the EIS identifies specific sites of cultural value, it would also be useful to consider whether areas significantly affected by construction of CM 1 or by habitat restoration actions may quality for consideration as significant cultural landscapes under the Secretary of the Interior's *Guidelines for the Treatment of Cultural Landscapes.*

The EIR/S identifies major impacts to archeologically significant sites from the proposed BDCP, most of which are considered significant and unavoidable. The EIR/S states that many important resources that will likely be negatively affected by construction are expected to be in the project footprint. Since not all important historical, cultural, or archeological resources have been identified to date, only programmatic mitigation is offered. The EIR/S states this is because of project site inaccessibility, and the inventory itself may harm or destroy the resource. However this is also likely because locations and footprints of restoration measures have not yet been identified. The EIR/S should consider the impact of CM 1's footprint on potential cultural resources and ensure that sufficient mitigation is provided.

Community Character: The socioeconomic analysis in the EIR/S describes significant impacts from construction and implementation of BDCP that may alter the character of the Delta. The EIR/S states that there will be significant changes in community character caused by: 1) declining property values; 2) building abandonment near construction activities with associated sales tax loss; and 3) changes in the agricultural landscape, regional economy, labor, and employment (impact AG1, 2, and ECON-1 and 3). The EIR/S states that "adverse social effects could also arise as a result of declining economic stability in communities closest to construction effects and those most heavily influenced by agricultural and recreational activities." Actions should be offered to reduce or mitigate adverse impacts in Chapter 16.

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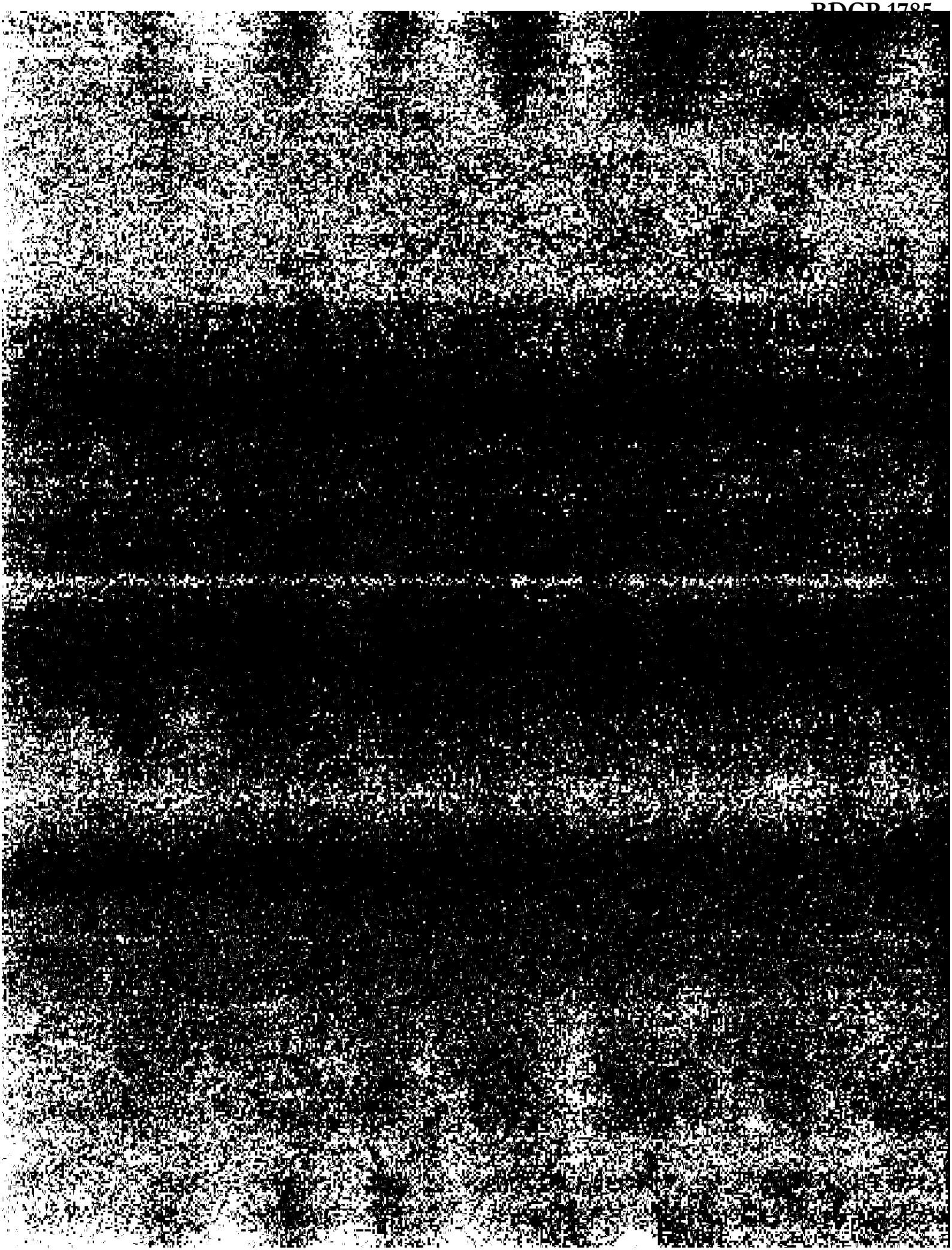


EXHIBIT G

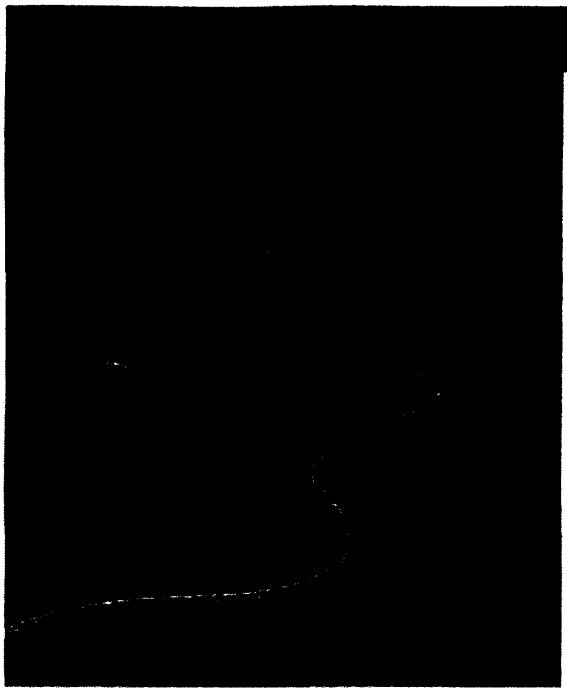
Economic Sustainability Plan
Executive Summary

January 19, 2012

Economic Sustainability Plan for the Sacramento-San Joaquin River Delta

Executive Summary

DELTA PROTECTION COMMISSION



The Delta is a dynamic environment with rich natural and productive resources.

The Sacramento-San Joaquin River Delta is a unique place of economic, environmental, historic and cultural significance. The land and water resources of the Delta support significant agricultural and recreation economies, and the Delta also has an important role as an infrastructure hub for water, energy, and transportation. The region's rich history boasts of bustling, river-based commerce before the automobile age, and its cultural uniqueness includes the only rural town in America built by early Chinese immigrants. As the largest estuary on the west coast of the Americas, the Delta also is a place of striking natural beauty and ecological significance that is struggling with serious environmental degradation problems. Although surrounded by growing cities, the Delta remains a highly-productive agricultural area with rural charms, landscapes, and waterscapes not found elsewhere in California.

In recent years, there has been great concern over increasing environmental degradation in the Delta and over court decisions that reduced the quantity of water delivered to southern California through the state and federal water project intakes in the south Delta to protect endangered fish. Combined with additional concerns about the stability of the Delta's levee system, these concerns led the California legislature to pass the Delta Reform Act of 2009. The Act created the Delta Stewardship Council and charged it with developing a Delta Plan to achieve the coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem."

Recognizing the potential impact of the Delta Plan on the people and economy of the Delta, the Delta Reform Act stated that the coequal goals of water supply reliability and restoring the Delta ecosystem "shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place." Among the measures to address this goal, the Delta Protection Commission was tasked with developing this Economic Sustainability Plan to inform the Delta Stewardship Council's development of the Delta Plan.

The concept of economic sustainability and the objective to "protect and enhance the unique cultural, recreational, natural resources, and agricultural values of the California Delta as an evolving place," can be interpreted in different ways. In economic terms, most stakeholders agreed that a minimum requirement is to maintain the economic value of the entire Delta economy in the future, and many believed in a stronger interpretation of enhancement of every key economic sector. The Fifth Staff Draft of the Delta Stewardship Council's Delta Plan uses performance measures that follow this stronger interpretation of economic sustainability where growth in one sector is not a substitute for deterioration in another sector. The peer review panel for the ESP found this to be too strong, and

recommended that sustainability should allow for substitution between sectors. In contrast, some non-Delta water interests take a narrower view, and claim that "evolving place" means that the Delta is in a state of inevitable decline and only a handful of "unique" values need to be protected.

The Plan interprets sustainability as maintaining and enhancing the economic prosperity of the Delta, and specifically considers the potential of recreation and tourism to offset possible declines to agriculture. Regardless of the interpretation of economic sustainability, it is clear that the Stewardship Council must consider the Delta economy when preparing the Delta Plan. In addition, most stakeholders agree that the Delta Reform Act requires the protection of the cultural and historical heritage and the long-term economic viability of the Delta's historical Legacy Communities.

The Economic Sustainability Plan (ESP) measures the key elements of the Delta economy, develops strategies to enhance the economy, and analyzes the impacts of several important proposals for the Delta Plan on the region's economic sustainability. The analysis in this Economic Sustainability Plan shows that it is possible to protect and enhance the Delta economy and be consistent with the coequal goals. The ESP finds that a large investment in strengthening the Delta's levee and emergency response systems is a cost-effective approach to improving water supply reliability, economic sustainability in the Delta, and reliable energy, transportation, and water infrastructure that serves statewide interests. The ESP also finds that most proposals for ecosystem restoration can be consistent with economic sustainability.

THE ECONOMY AND INFRASTRUCTURE OF THE DELTA: BASELINE, TRENDS, AND STRATEGIES FOR IMPROVEMENT

The boundaries of the Legal Delta are shown in Figure A. The Delta Protection Act of 1992 defined the Delta boundaries including the Primary and Secondary Zone and created the Delta Protection Commission, charging it with developing a Land Use and Resource Management Plan for the Primary Zone. The majority of the Delta's 738,000 acres of land is in the rural and agricultural Primary Zone. The population of the Primary Zone is approximately 12,000 and has remained steady in the nearly 20 years since the passage of the Delta Protection Act.

The Legal Delta, including both the Primary Zone and Secondary Zone, contains significant portions of five counties, Contra Costa, Sacramento, San Joaquin, Solano and Yolo, and a small rural corner of Alameda County. The Delta includes parts of several large cities including Antioch, Pittsburg, Stockton, Sacramento, Tracy, and West Sacramento. The legal Delta has a population of 571,000, according to the 2010 Census, which has increased by about 200,000 people—more than 50 percent—in the 20 years since the 1990 Census. All of the population growth, and virtually all of the Delta's urbanized land, is located within the Delta's Secondary Zone.

The Primary Zone economy is export-oriented and creates jobs and income far in excess of the population and workforce that resides in the Primary Zone. The Secondary Zone and the counties surrounding the Delta supply the Primary Zone economy with a workforce, services, manufacturing, and transportation that add value to the agricultural, energy, and other resource-based output of the Delta.

The ESP calculated measures of industry concentration for the Legal Delta with measures of both employment and output, and identified three clear areas of relative concentration: 1) Agriculture; 2) Transportation, Warehousing, and Utilities; and 3) Construction, Housing, and Real Estate. All of these areas are potentially impacted by the Delta Plan. Since there is great interest in recreation and tourism as an economic driver in the Delta, it is significant to note that the tourism-oriented Arts, Entertainment, and Recreation sector tied with Information and Management for the lowest concentration of the 21 industries analyzed in the Legal Delta. However, water-based recreation in the Delta is a significant economic driver, and as discussed in Chapter 8, most of its economic impact is in the retail and hospitality sector.

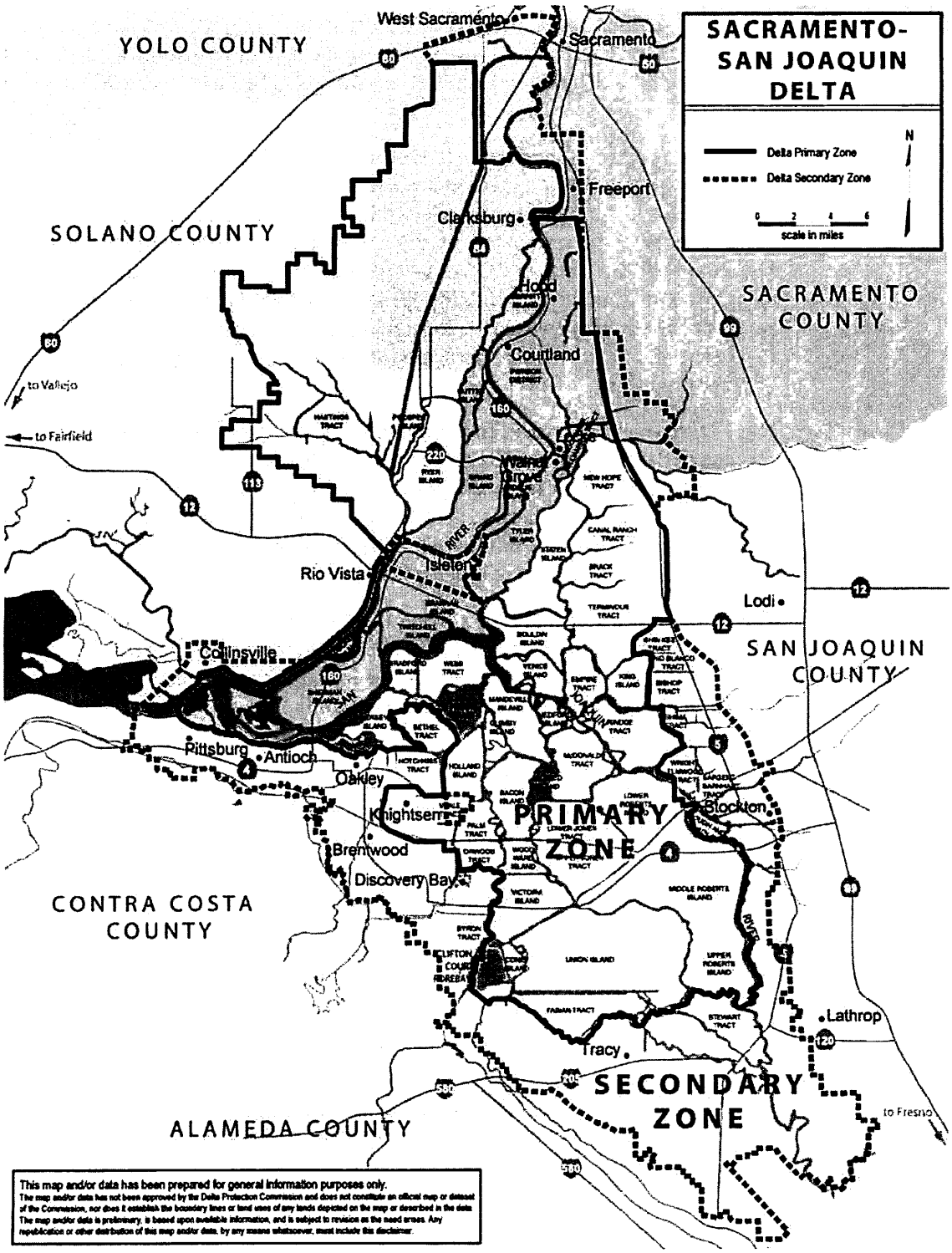
The Delta Reform Act of 2009 and the Delta Protection Act of 1992 are primarily concerned with the natural resources of the Delta and the economic activity sustained by those resources, such as agriculture and outdoor recreation. In addition, the resources of the Delta support significant water, energy, and transportation infrastructure that serves the Delta, regional, and state economies, and an important commercial and recreational salmon fishery throughout the state. Indeed, an important economic cluster in the Delta is Transportation, Warehousing, and Utilities, and their development is directly dependent on maintaining and enhancing the Delta as a regional transportation and energy hub. The ESP conducted a closer analysis of three important areas for the Delta's economic sustainability: agriculture; recreation and tourism; and infrastructure. The remainder of this section looks more closely at the baseline, trends, and strategies for enhancing these areas of the Delta economy.

DELTA AGRICULTURE

Agriculture is the dominant land use in the Delta. Farmland makes up about two-thirds of the area of the Delta, and nearly 80 percent of all Delta farmland is classified as Prime Farmland, the highest quality designation given by the California Farmland Mapping and Monitoring Program. In contrast, less than 20 percent of all farmland in California is Prime Farmland.

Corn and alfalfa occupy the greatest acreage in the Delta, whereas processing tomatoes and wine grapes generate the most crop revenue. These crops have important links to three value-added manufacturing sectors in the region: wineries, canneries, and dairy products. Asparagus and pears are historically high-value crops in the Delta and continue to be significant contributors, although acreage of both has decreased. The majority of

Figure A: Map of Primary and Secondary Zones of the Sacramento-San Joaquin Delta



pumpkins and blueberries grown in California come from the Delta and reflect the variety of products. Total agricultural revenues in the Delta were estimated at $795 million in 2009, including $702 million in crop revenue and $93 million from animals and animal products.

Nearly 80 percent of Delta farmland is used for lower-value field and grain crops, pasture, and grazing lands. These lands are important to supporting animal agriculture in the Delta and the larger region, most notably the California dairy industry where scarcity and costs of forage crops has become a challenge. Animal agriculture is less prevalent in the Delta than in other areas of the San Joaquin Valley, but milk is still the fifth most valuable agricultural commodity produced in the Delta, and animal production generates about 12 percent of Delta farm revenue. In contrast, milk is the most valuable agricultural product in San Joaquin County and other nearby areas in the San Joaquin Valley, and the Delta is an important source of local feed.

High-value vineyards, truck, and deciduous crops generate close to 70 percent of crop revenue in the Delta on about 20 percent of the Delta's farmland, and account for 80 percent of the economic impact of Delta agriculture when value-added manufacturing such as canneries and wineries are included. Like other areas in the Central Valley, Delta agriculture is expected to continue a gradual trend towards higher-value crops over time, increasing the contribution of Delta agriculture to the regional economy.

The economic impact analysis estimates that Delta crop and animal production has an economic impact of roughly 9,700 jobs, $683 million in value added, and $1.4 billion in output in the five Delta counties. Across all of California, the economic impact of Delta agriculture is approximately 13,000 jobs, $819 million in value added, and $1.6 billion in output.[1]

As seen in Table A, when related value-added manufacturing such as wineries, canneries, and dairy products are included with the impact of Delta agriculture, the total economic impact of Delta agriculture is roughly 13,200 jobs, $1.059 billion in value-added, and $2.647 billion in economic output in the five Delta counties. Including value-added manufacturing, the statewide impact of Delta agriculture is about 25,000 jobs, $2.135 billion in value-added, and $5.372 billion in economic output. Additional details and analysis of Delta agriculture can be found in Chapter 7 of the Economic Sustainability Plan.

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[1] The economic impact analysis of agriculture, recreation, and tourism utilizes the IMPLAN model to calculate what are commonly known as the "ripple" effects on other industries such as the purchase of inputs in the local economy and local consumer spending supported by the income. Jobs are reported as annual monthly averages and will vary by season. Value added measures total regional income generated by the activity and is comparable to gross domestic product. Output sums the total revenue of enterprise which is higher than the value added or income created by the enterprise.

Table A: Total Economic Impacts of Delta Agriculture and Recreation and Tourism*

5-COUNTY IMPACTS					
Agriculture	13,179	$593,975,736	$1,059,453,520	$2,647,124,544	Table 13 p.125
Recreation & Tourism	3,064	$104,320,642	$175,862,370	$329,229,232	Table 36 p.174
CALIFORNIA IMPACTS					
Agriculture	25,125	$1,252,216,824	$2,135,095,400	$5,372,014,752	Table 14 p.126
Recreation & Tourism	5,317	$208,104,490	$353,312,020	$654,415,364	Table 37 p.174

*For additional details on economic impacts see the listed source tables and associated discussions.

DELTA RECREATION AND TOURISM

Recreation is an integral part of the Delta economy, generating roughly 12 million visitor days of use annually and approximately $250 million dollars in visitor spending in the Delta each year. Of the roughly 12 million visitor days spent in the Delta each year, approximately 8 million days are for resource-related activities (e.g., boating and fishing), 2 million days are for right-of-way-related and tourism activities (e.g., bicycling and driving for pleasure), and 2 million days are for urban parks-related activities (e.g., picnicking and organized sports).

Boating and fishing have the biggest economic impact, and are estimated to generate nearly 80 percent of the recreation and tourism spending in the Delta, including significant expenditures on lodging, meals, supplies, marina services, and fuel. In addition to visitor spending, non-trip spending such as boat purchases and marina rentals are estimated at roughly $60 million annually for total recreation-related spending of $312 million annually in the Delta. As seen in Table A above, Delta recreation and tourism supports over 3,000 jobs in the five Delta counties. These jobs provide about $100 million in labor income and a total of $175 million in value added to the regional economy. Across all of California, Delta recreation and tourism supports over 5,300 jobs, and contributes about $353 million in value added.

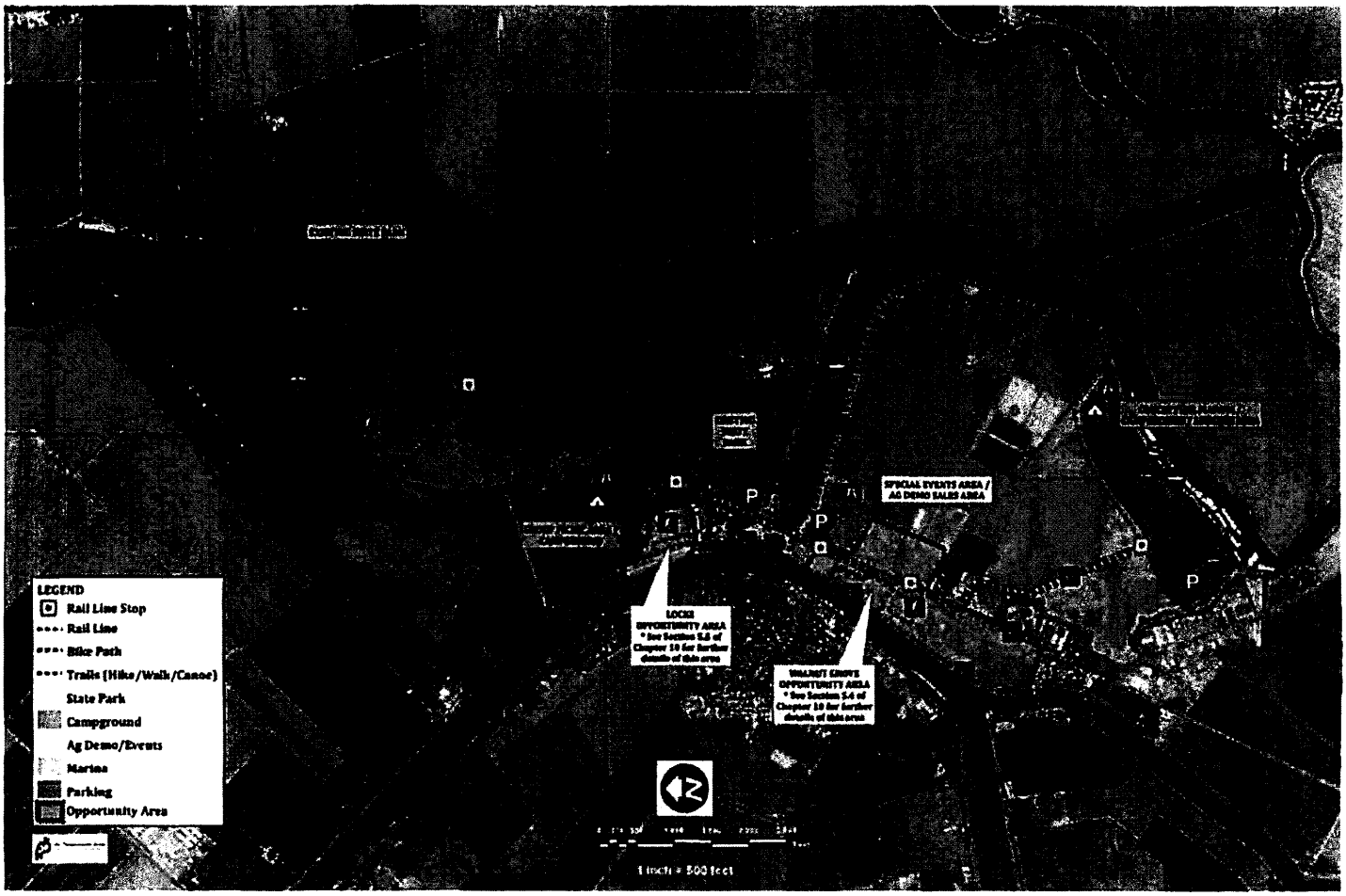
Despite significant population growth in the market area, the available data suggests that boating and fishing activity in the Delta has grown little in the past 20 years. Boat registrations, employment at marinas and boating-related industries, and the number of marinas are virtually unchanged over the past two decades. This trend could reflect concerns about water and fishing quality in the Delta, and could also be influenced by the poor economy, high fuel prices, and broader trends in boating and fishing participation across the nation.

While boating and water recreation will remain the largest piece of the Delta recreation industry, land-based activities such as agritourism, wine tasting, wildlife watching, historic and cultural tourism, bicycling, and driving for pleasure are likely to drive future growth in Delta recreation. The majority of visitors to the Delta are from Northern

California, an area with great population growth potential but also with nearby locations with successful land-based recreation and tourism economies that compete with the Delta for visitors. The residents of a dozen counties around the Delta represent the principal market for future growth in Delta visitation. This market area has a population of approximately 11.9 million people, and projections indicate this figure could grow by about 50 percent or 5.7 million people by 2050.

Because of slow expected growth in boating recreation and the relatively small base of land-based tourism in the Delta, we project Delta recreation and tourism will grow more slowly than the regional population. If resource quality and recreational facilities are maintained and improved so that the Delta retains its current level of competitiveness as

Figure B: Conceptual Proposal for Walnut Grove/Locke/Delta Meadows Focal Point Complex



a recreation destination, visitation could increase by 3.4 million visitor days and in-Delta spending could increase by nearly $80 million, roughly 35 percent, over 40 years.

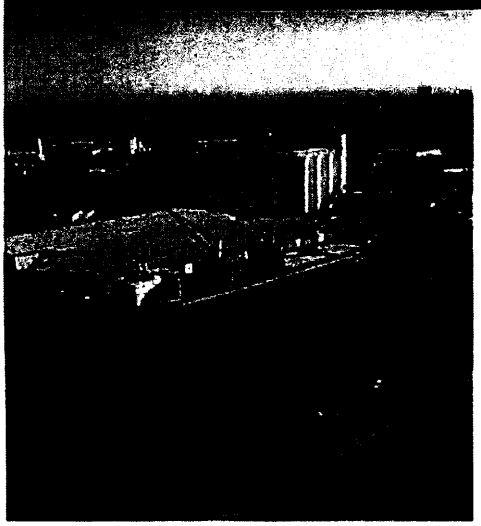
A plan for the enhancement of recreation in the Delta centers on five location-based strategies: specific waterways, points of interest, focal point complexes, natural habitat areas, and urban edge areas that surround the Delta. Recreation development in the Delta should be coordinated, consistent, branded, and marketed. A National Heritage Area could be an effective means to brand and coordinate strategies to enhance resource-based recreation, agritourism, and historical and cultural tourism.

Figure B is a conceptual illustration of what a viable focal point complex could look like in the historic area of Walnut Grove and Locke. The figure shows coordinated development of a public park at Delta Meadows with a private sector catalyst development in a modern marina and recreation facility that is tied together with a network of non-motorized trails that include revitalized, historic commercial districts of the Legacy Communities. Successful execution of this type of plan would require improved flood control and a facilitator to encourage and coordinate the public and private investments. Additional details on recreation and tourism enhancement strategies are in Chapter 8 of the Economic Sustainability Plan.

DELTA INFRASTRUCTURE SERVICES

The Delta is a critical infrastructure hub for the regional and state economy. While the Delta's importance to the state water system is well-known, its importance to energy, transportation, and in-Delta municipal and industrial water supplies is less appreciated. As discussed in Chapter 5 and mapped in Appendix D, all of these infrastructure services are vulnerable to floods, earthquakes, and sea-level rise, and require the continued maintenance and enhancement of the Delta's levee system.

The Delta is an important energy resource for California. The Delta contains the largest natural gas production field in California, as well as its largest natural gas storage facility below McDonald Island in the central Delta. In addition to heating and cooking, natural gas fuels the majority of California's electricity supply, and natural gas power plants in the five Delta counties, many within the legal Delta, produce 20 percent of California's natural gas-powered electricity. Major electricity transmission lines in the Delta interconnect California with the Pacific Northwest and carry roughly 10 percent of the state's summer electricity load. Gasoline and aviation fuel pipelines crossing the Delta supply large portions of Northern California and Nevada. Besides these energy resources, wind and solar resources are being studied for further development. Taken together, the Delta's contribution to the state's energy network is comparable to its contribution to the state water system.



The Port of West Sacramento on the Sacramento Deep Water Channel, which with the Port of Stockton and the Port of Oakland form the M-580 Marine Highway

The Delta also contains increasingly important parts of the inter-regional transportation network that supports the regional and in-Delta economy. As east-west transportation corridors to the north and south of the Delta become increasingly congested and constrained, the demand for through-Delta transportation is growing rapidly. The ports of Stockton and Sacramento are focal points of regional economic development and rely on through-Delta shipping channels. The ports' marine highway corridor project will increase and diversify the water freight that moves through the Delta and relieve air pollution and traffic in the region. Traffic data shows large increases on highways in the Secondary Zone, as well as through the middle of the Primary Zone on State Route 12, and smaller but significant increases on State Route 4 in the Primary Zone. Through-Delta railways are also an important link in the transportation system.

The Secondary Zone of the Delta and the surrounding counties also draw a significant portion of their municipal and industrial water supplies from the Delta. Changes to Delta water quality—whether an increase in salts or organic carbon—have important effects on urban water supplies in and around the Delta. Significant deterioration of in-Delta water quality could increase water treatment costs by tens of millions of dollars each year and require hundreds of millions of dollars in capital investment in advanced treatment facilities for utilities serving Delta urban areas.

TWO KEY ISSUES FOR ECONOMIC SUSTAINABILITY IN THE DELTA

DELTA LEVEES AND ECONOMIC SUSTAINABILITY

Since the early 20th century, the current-day Delta levee system has provided flood control that allows productive agricultural and urban uses of land, channels water for urban and agricultural uses, protects critical infrastructure, and creates a desirable setting for boating and water-based recreation in an environment unique in California. The levee system is the foundation on which the entire Delta economy is built. Therefore, a sustainable Delta economy requires a sustainable levee system.

It has been the goal of the state and the federal government, working through the Department of Water Resources (DWR), the U.S. Army Corps of Engineers (USACE), and the local reclamation districts, to meet the Delta-specific PL 84-99 standard since 1982 when DWR and USACE produced a joint report on the Delta levees, which recommended the basis for this standard. If effectively used, funds currently in the pipeline should bring the Delta levees close to achieving this goal. When these funds have been expended, more than $698 million will have been invested in improvements to the Delta levees since 1973. These improvements have created significantly improved Delta levees through modern

engineering and construction, making obsolete the historical data that is still sometimes used for planning or predicting rates of levee failure.

Three approaches can help all jurisdictions and planners further reduce the risks resulting from the failure of the Delta levees. These approaches are: (1) build even more robust levees, (2) improve both regular maintenance and monitoring and flood fighting and emergency response following earthquakes, and (3) improve preparedness for dealing with failures after they occur. With regard to the first approach, the big question is not whether they should be improved to the Delta-specific PL 84-99 standard. Indeed, the independent review panel for the ESP agreed that PL 84-99, not HMP, is the minimum responsible levee standard. Instead, the key question is which levees should be improved to a higher standard in order to support and enhance various in-Delta, regional, state and federal interests, and to address hazards posed by not only floods, but also earthquakes and sea-level rise. Our conclusion is that these improvements would be advantageous on 300 to 600 miles of Delta levees, not only for flood control and protection against earthquakes and sea-level rise, but because they also would allow for planting vegetation on the water side of the levees—an essential component of Delta ecosystem repair. These further-improved levees would have wider crowns to provide for two-way traffic and could easily be further widened at selected locations to allow the construction of new tourist and recreational facilities out of the statutory floodplain.

Improvement of most Delta "lowland" levees, the levees that protect lands below sea-level, and selected other levees to this higher standard would cost $1 to $2 billion in base construction costs over the cost of reaching the PL 84-99 standard. Including vegetation and habitat enhancement, total program costs might be in the order of $4 billion, similar to the cost projected by the PPIC (2007) in their "Fortress Delta" alternative. While the billions of dollars required to build levees to this higher standard is a large investment, it is a cost-effective joint solution that simultaneously reduces risk to all Delta infrastructure. While a $12 billion investment in isolated conveyance may allow for somewhat larger water exports, it doesn't protect other critical infrastructure, and billions in additional investments would still be required to protect highways, energy, and other water and transportation infrastructure. Just as a species by species approach may be an inefficient and ineffective way to protect ecosystems, a system by system approach is an inefficient and ineffective way to protect the state's infrastructure. Chapter 5 contains a detailed assessment of the Delta levee system.

SUSTAINABLE LEGACY COMMUNITIES: WHERE THE CHALLENGES AND STRATEGIES COME TOGETHER

Economic opportunities and constraints facing the Delta's Legacy Communities mirror those in the broader Primary Zone. The current economies of the Legacy Communities are agriculturally based, providing support services and limited workforce housing for the Primary Zone's largest industry as well as some housing for retirees and service

and professional workers who commute into nearby urban areas such as Sacramento. Despite the current base in agriculture and rural bedroom and retirement communities, much of the revitalization strategies for Legacy Communities are based on growing their appeal as destinations for recreation and tourism. This includes promoting the emerging agritourism sector—including wine and local foods—as an economic development theme.

However, a strict and multi-layered regulatory framework places limits on economic development opportunities within the Delta's Legacy Communities. The aging and occasionally sub-standard building stock needs improvement, potentially utilizing redevelopment of existing buildings and/or a limited amount of new development in order to accommodate visitor- and local-serving enterprises. New investment is especially important because the existing base of hospitality- and tourism-related enterprises is very limited and insufficient to attract and capture significant tourist activity. The most developed recreation and tourism enterprises in the Delta are campgrounds and marinas that serve water-based recreation; these are mostly located outside the Legacy Communities and often outside the Primary Zone.

An already burdensome regulatory environment has been made significantly worse by the recent remapping of FEMA flood zones. All of the Legacy Communities along the Sacramento River have either been or are in the final process of being remapped into the 100-year floodplain. The requirements of this designation can make major property investments financially infeasible, and many stakeholders are concerned that the flood zone designation could cause the Legacy Communities to slowly wither away. It is clear that the economic sustainability of the Legacy Communities is dependent on levee and flood-control investments as well as other strategies to address the constraints of flood zone designation.

Despite these challenges, the Legacy Communities have significant historical, cultural, and economic values and the potential to become attractive destinations for visitors and support a more prosperous, higher quality of life for residents. Chapter 10 includes more detailed visions and strategies for Legacy Communities, including case studies of Walnut Grove, Locke, and Clarksburg.

Recreational boating is popular throughout the Delta

IMPACT OF WATER SUPPLY AND ECOSYSTEM RESTORATION PROPOSALS ON THE DELTA ECONOMY

Current proposals for new water supply and ecosystem restoration projects have serious implications for economic sustainability in the Delta. The isolated conveyance and many habitat restoration proposals are being developed in the Bay Delta Conservation Plan (BDCP), and the Economic Sustainability Plan relies on the November 2010 draft of the BDCP to describe these proposals. In addition, other proposals regarding Delta levees, land use regulation, and economic development have been made by the Delta Stewardship Council, Department of Water Resources, the Public Policy Institute of California (PPIC), and the Delta Vision Strategic Plan.

Figure C summarizes the estimated impacts of the proposed actions. In Figure C, red shading indicates a negative effect of $20 million or more annually, orange is negative effect of less than $20 million annually, yellow represents little or no effect, and green are economic benefits. Three proposals—isolated conveyance, 65,000 acres of tidal marsh, and six-island open water area—have negative effects in all three critical areas of the economy, with a negative impact exceeding $20 million in at least one area. These proposals are clearly incompatible with economic sustainability at their current levels.

Overall, Delta agriculture would be the most affected sector with total impact of BDCP proposals ranging from $62 to $227 million dollars in revenue per year, an 8% to 29% decline in Delta agriculture. This estimate does not include losses from permanent flooding of islands advocated by some, or the risk that a large capacity conveyance could be used to increase water exports and degrade water quality beyond current standards. The majority of Delta policy proposals considered would also have negative impacts on infrastructure services, and recreation and tourism impacts are a mix of potentially positive and negative effects. The effects of all these proposals are analyzed in detail in Part 2 (Chapters 6 through 9).

THE CO-EQUAL GOALS, COST-BENEFIT ANALYSIS, AND ECONOMIC SUSTAINABILITY

The co-equal goals, economic sustainability for the Delta, and cost-benefit analysis have been put forward as guiding frameworks for the recommendations from this report by the Delta Stewardship Council and the independent review panel of the ESP. It is important to understand that there are conflicts between these frameworks, and therefore it is impossible to construct a set of recommendations that is best from all viewpoints. The primary objective is to provide recommendations that are consistent with the co-equal goals and economic sustainability as envisioned in the Delta Reform Act of 2009 so they can be incorporated into the Delta Plan. However, it also important to note that cost-benefit analysis is the traditional, scientifically accepted approach to analyzing these types of issues, and that such an analysis would be enormously informative to the Delta Plan.

Figure C: Summary of Impacts of Policy Scenarios

Proposals/Impacts	Agriculture	Recreation & Tourism	Infrastructure Services
1. Isolated Conveyance (~1 mi/15,000 acres)			
2. Habitat Proposals			
a) Yolo Bypass Fishery Enhancements			
b) San Joaquin River Floodplain Restoration			
c) 65,000 acres of tidal marsh restoration			
d) "Natural Communities" Protection: 32,000 acres of easements and 8,000 acres rangeland conversion		Wildlife viewing could generate new recreation visits, although spending is low for this activity	Minimal impact
3. Six Island Open Water Scenario			
4. DSC Covered Actions (RC) Portfolio			
5. Delta Vision Economic Development Scenario			

[redacted]

While there is no comprehensive cost-benefit analysis of current proposals for the Delta, it is important to note that the recently released DRMS Phase 2 analysis is a comprehensive cost-benefit analysis of a limited, and somewhat out-of-date group of scenarios. The findings from DRMS phase 2 have tremendous implications for the Delta and the approach to the levee system and conveyance. Below are some key findings from the DRMS Phase 2[2]:

- Improving levees had the highest benefit-cost ratio of any Delta risk reduction strategy, including isolated water conveyance that was assumed to cost only $4.9 billion.
- Water exports account for only 20% of the economic costs from a large earthquake event that would flood between 10 and 30 Delta islands.
- Water exports account for less than 2% of the economic costs of more-common flood events due to high water and storms.
- Water exports account for 0% of the loss of life from any type of flood hazard event.

While the DRMS Phase 2 report evaluated upgrading all Delta levees to the PL 84-99 standard, it did not evaluate further upgrading levees to a seismically resistant standard as recommended in the ESP. However, the August 20, 2007 preliminary draft of DRMS Phase 2 did consider an "Improved Levees" scenario that included seismic upgrades of 100 miles of south Delta levees. The results reported in the preliminary draft found that a scenario with seismic upgrades to levees had lower costs and 40% higher risk reduction benefits than the peripheral canal scenario. Consistent with the conclusions in the ESP, the preliminary draft of DRMS Phase 2 found seismic upgrades to levees improved water supply reliability. Despite seismic upgrades to only 100 miles of levees, the preliminary draft found the improved levee scenario reduced the water supply impact of the largest earthquake by two-thirds while simultaneously protecting other valuable infrastructure and Delta property.[3]

These findings have enormous implications for risk management in the Delta, and highlight some of the potential conflicts between cost-benefit analysis and the co-equal goals. Both the preliminary and final draft of DRMS Phase 2 found improving levees has the highest economic benefit per dollar invested and lowest total cost. Levee upgrades perform well in cost-benefit analysis of Delta options, because they reduce risk in all areas including water conveyance, other infrastructure, and in-Delta property. In contrast,

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[2] These findings are not what is highlighted by the Department of Water Resources in the Executive Summary of DRMS phase 2, but are easily found and calculated from the results tables in the analysis.

[3] A copy of the preliminary draft was requested in a December 15, 2011 letter to the Department of Water Resources (DWR). DWR responded quickly, the January 9, 2012 transmission letter states: "Please note the information dates back to 2007 and is stamped as preliminary. It was also not part of the DRMS Phase 2 public draft, because it was not further considered for in-depth analysis in Phase 2. Therefore, I do not recommend using this information for either planning or design purposes. With these caveats in mind, we hope you still find the attached information useful." A complete copy of the correspondence and material provided by DWR is included in Appendix N of the ESP.

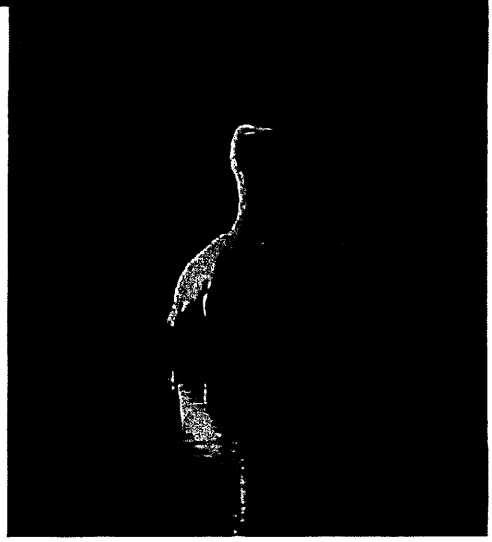
isolated conveyance only protects water exports which DRMS clearly identifies as a minority of the economic risks.

With respect to the co-equal goals, the ESP recommends a set of actions that would dramatically change the Delta from its current state, and is consistent with the co-equal goals of the Delta Reform Act. The ESP would significantly improve water supply reliability by creating a seismically resistant levee system with enhanced emergency response that effectively addresses the risk of catastrophic, long-term interruption of water deliveries, the most important goal of water supply reliability. The ESP recommends many actions to improve the Delta ecosystem, including actions that support the Delta economy and even some actions that have significant costs for the Delta economy. The ESP presents a positive view of the Delta's economic future with strategies that are informed and realistic about the challenges it faces. Because of its lower implementation cost and compatibility with Delta economic interests, the ESP is also a more feasible and realistic alternative to achieving the coequal goals than plans built around large, isolated water conveyance facilities such as the BDCP.

The Delta Stewardship Council and others are very interested in the potential for gains in the recreation economy to offset potential losses in agriculture. It is important to be realistic about this potential and understand current trends. Over the past twenty years, the trend for recreation in the Delta has been flat despite rapid population growth in the surrounding region. Delta agriculture has grown in value, and shares many of the same strong growth prospects as agriculture in the rest of the state. This is in strong contrast to the 1980s when agriculture was a struggling industry and boating was growing fast. In the 1980s, it might have been reasonable to project these trends would continue and recreation would supplant agriculture as the economic driver in the Delta. As discussed in the ESP, this transition did not occur over the past 20 years when conditions were more favorable than they are today. Given the history of the past 20 years and current economic and demographic trends, a transition to a recreation economy should be viewed as far less likely today than it was 25 years ago. Thus, it would be irresponsible to develop Delta plans that count on a reversal of this pattern and dramatic growth in recreation and tourism.

Despite these cautions, it is important to note that the ESP does show that there is significant potential to grow and enhance the Delta's recreation and tourism sectors. Improving recreation assets can not only provide economic benefits, but also enhance the quality of life in the Delta and people outside the Delta who could take advantage of these opportunities. However, growing recreation and tourism requires strategic investment and reinvestment in facilities, improved flood control, and scaling back some of the water supply and habitat proposals that conflicts with recreation and tourism. A loss of agriculture on the low end of the range of potential BDCP impacts, about 10%, could potentially be offset by growth in other areas and consistent with economic sustainability in the Delta. Proposals that would reduce the capacity of conveyance and

reduce habitat acreage goals by 70-80 percent (i.e. 3,000 cfs conveyance, about 25,000 acres of habitat restoration, one small flooded island) were not evaluated formally, but could be consistent with economic sustainability if combined with substantive actions to improve recreation and tourism, enhance legacy communities, support value-added opportunities in agriculture, and provide adequate flood control to support public safety and encourage the needed investments.



White Egrets are a common sight throughout the Delta.

RECOMMENDATIONS FOR ECONOMIC SUSTAINABILITY IN THE DELTA

The recommendations are organized around eight topics. Considering the recommendations together, the overall strategy is consistent with economic sustainability in the Delta and the coequal goals of increased water supply reliability and ecological restoration. Chapter 12 includes more detailed descriptions and discussion of the proposed recommendations.

LEVEES AND PUBLIC SAFETY RECOMMENDATIONS

- Improve and maintain all non-project levees to at least the Delta-specific PL 84-99 standard.
- Improve most "lowland" levees and selected other levees to a higher Delta-specific standard that more fully addresses the risks due to earthquakes, extreme floods, and sea-level rise, allows for improved flood fighting and emergency response, provides improved protection for legacy communities, and allows for growth of vegetation on the water side of levees to improve habitat.
- The Delta Levee Subventions and Special Projects Program should continue to be supported.
- Transfer to a regional agency with fee assessment authority on levee beneficiaries responsibility for allocating funds for the longer-term improvement of Delta levees and the maintenance of regional emergency preparedness, response, and recovery systems developed jointly with the Delta counties and state and federal governments.
- In addition to providing funding for longer-term levee improvements, provide on-going funding for regular levee maintenance and expanded emergency preparedness, response, and recovery.
- Reduce or eliminate regulatory impediments to action by the creation of a one-stop permitting system for selected activities within the Delta including dredging, levee construction, and ecosystem restoration.
- Fully and expeditiously implement the recommendations contained in the SB27 Sacramento-San Joaquin Delta Multi-Hazard Coordination Task Force report.
- Formally identify the Delta region as the geographic basis for integrated response, mutual aid, decision making, and information sharing processes during major floods.

GENERAL RECOMMENDATIONS FOR ECONOMIC SUSTAINABILITY

- Designate a regional agency to implement and facilitate economic development efforts. The main tasks of this entity are: marketing and branding, permitting and regulatory assistance, planning and coordination, and strategically managing the Delta Investment Fund as described in Section 1 of Chapter 11.
- Economic impacts of habitat creation and development of facilities for export water supply should be fully mitigated.
- Land use planning and regulation must be clear and consistent across agencies.

RECOMMENDATIONS FOR THE ECONOMIC SUSTAINABILITY OF AGRICULTURE

- Maintain and enhance the value of Delta agriculture.
- Limit the loss of productive farmland to urbanization, habitat, and flooding to the greatest practical extent.
- Protect Delta water quality and water supplies for agriculture.
- Support growth in agritourism.
- Support local value-added processing of Delta crops.

RECOMMENDATIONS FOR ECONOMIC SUSTAINABILITY OF RECREATION AND TOURISM

- Protect and enhance private enterprise-based recreation with support from state and local public agencies.
- Focus recreation development in five location-based concepts:
  - Enhance Delta waterways
  - Develop dispersed points of interest and activity areas
  - Create focal point destination complexes with natural areas, parks, Legacy Communities, marinas, historic features, and trails
  - Expand public access to natural habitat areas
  - Create recreation-oriented buffers at Delta urban edges
- Implement Economic Sustainability Plan through specific strategies such as consistency planning and regulation refinement, coordination among state and local agencies, obtaining strategic levee protection for Legacy Communities and key recreation areas, designating a marketing and economic development facilitator, and providing key funding for catalyst projects and agencies.

RECOMMENDATIONS FOR INFRASTRUCTURE

- Planning of levee investments must fully consider the economic value of infrastructure services along with all other benefits.

- All owners and operators of infrastructure that depend on Delta levees must contribute to levee system investment and maintenance.
- Protect and improve Delta water quality and supply for agricultural, municipal and industrial uses.
- Ensure that future development of infrastructure in the Delta is aligned with economic sustainability strategies.
- Support expansion and development of the ports.

RECOMMENDATIONS FOR HABITAT AND ECOSYSTEM IMPROVEMENTS

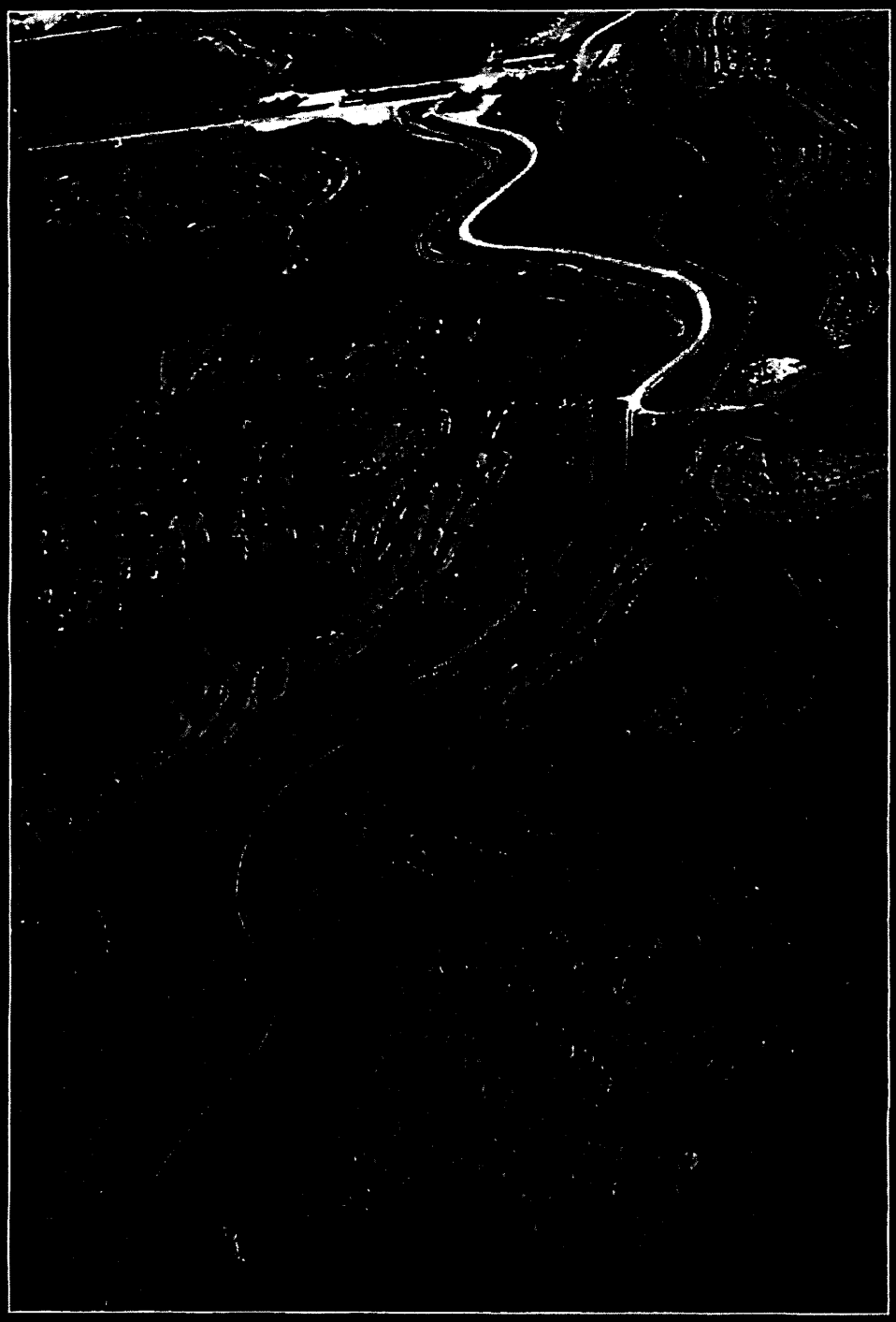
- Emphasize strategies with little or no conflict with the Delta economy such as increased fresh water flows, growth of vegetation on enlarged levees, restoration of mid-channel berms, and reactivation of upstream floodplains.
- Expanded and enhanced flood bypasses can be consistent with economic sustainability if agencies work with local stakeholders to minimize and mitigate economic impacts.
- Tidal marsh habitat plans should be significantly reduced.
- Increased open-water habitat in the Delta is not recommended.
- Include recreation facility development in habitat enhancement plans when possible.
- Habitat restoration should start on State-owned land and only occur on private lands with willing sellers consistent with local land use plans.

RECOMMENDATIONS FOR WATER SUPPLY RELIABILITY

- Continuing the through-Delta conveyance is important to economic sustainability in the Delta and can be consistent with water supply reliability within and outside the Delta.
- A dual conveyance plan with a large, 15,000 cfs isolated conveyance facility has large conflicts with Delta economic sustainability and has high risk for Delta stakeholders.
- Options to large isolated conveyance must be fully and consistently evaluated.

RECOMMENDATIONS FOR RESEARCH AND MONITORING

- Conduct a comprehensive and credible cost-benefit analysis to analyze Delta alternatives.
- New recreation data is needed and should be updated regularly.
- Maintain an Economic Sustainability Scoreboard to track progress.
- The Delta Science Program should sponsor more engineering and economic studies in addition to ecological research.
- Increase alignment among the various research and planning initiatives.



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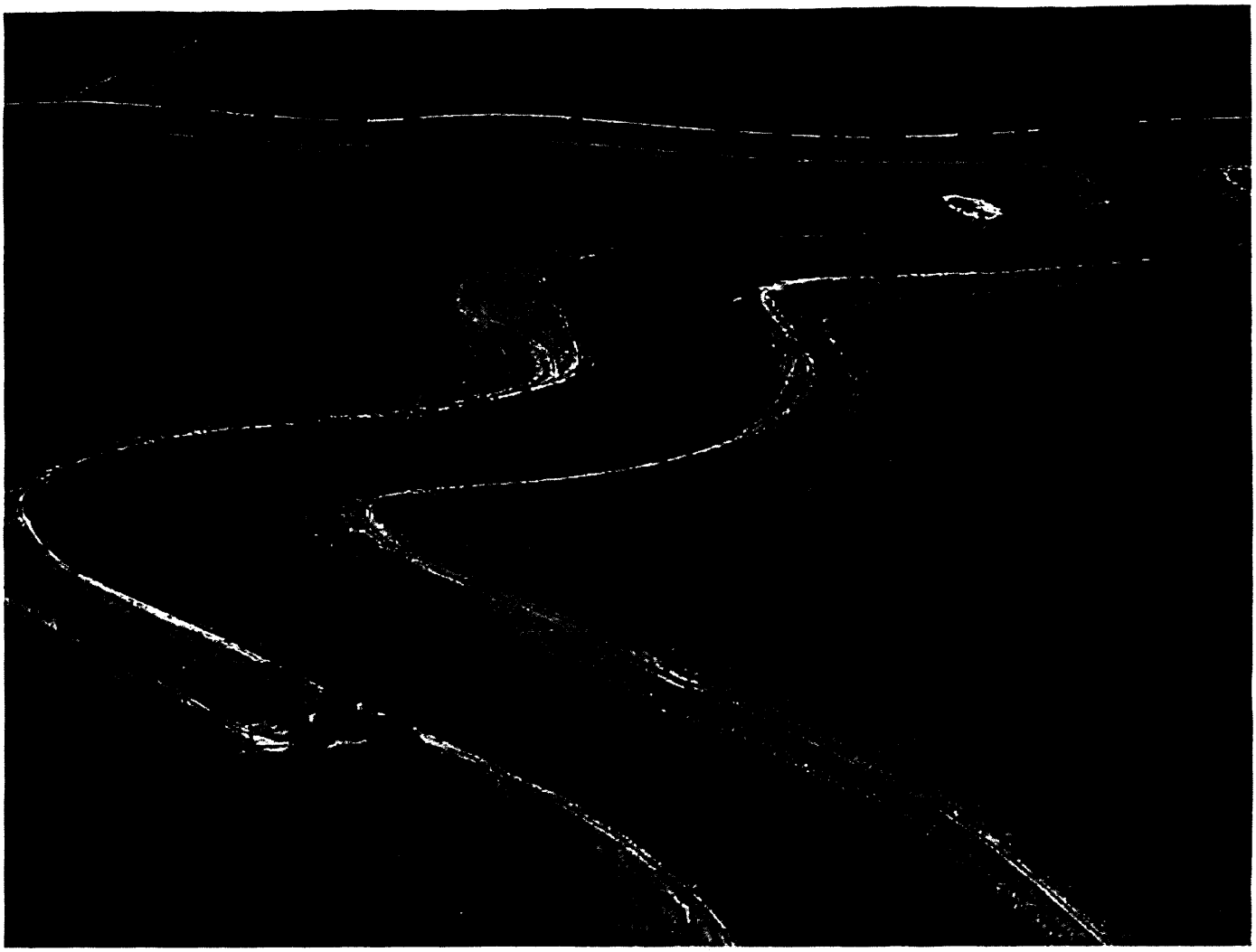
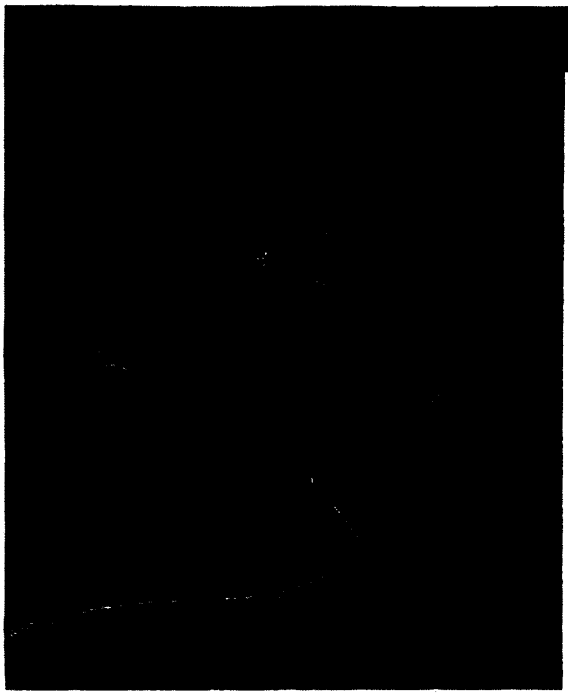


Economic Sustainability Plan for the Sacramento-San Joaquin River Delta

Executive Summary

DELTA PROTECTION COMMISSION



The Delta is a dynamic environment with rich natural and productive resources.

The Sacramento-San Joaquin River Delta is a unique place of economic, environmental, historic and cultural significance. The land and water resources of the Delta support significant agricultural and recreation economies, and the Delta also has an important role as an infrastructure hub for water, energy, and transportation. The region's rich history boasts of bustling, river-based commerce before the automobile age, and its cultural uniqueness includes the only rural town in America built by early Chinese immigrants. As the largest estuary on the west coast of the Americas, the Delta also is a place of striking natural beauty and ecological significance that is struggling with serious environmental degradation problems. Although surrounded by growing cities, the Delta remains a highly-productive agricultural area with rural charms, landscapes, and waterscapes not found elsewhere in California.

In recent years, there has been great concern over increasing environmental degradation in the Delta and over court decisions that reduced the quantity of water delivered to southern California through the state and federal water project intakes in the south Delta to protect endangered fish. Combined with additional concerns about the stability of the Delta's levee system, these concerns led the California legislature to pass the Delta Reform Act of 2009. The Act created the Delta Stewardship Council and charged it with developing a Delta Plan to achieve the coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem."

Recognizing the potential impact of the Delta Plan on the people and economy of the Delta, the Delta Reform Act stated that the coequal goals of water supply reliability and restoring the Delta ecosystem "shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place." Among the measures to address this goal, the Delta Protection Commission was tasked with developing this Economic Sustainability Plan to inform the Delta Stewardship Council's development of the Delta Plan.

The concept of economic sustainability and the objective to "protect and enhance the unique cultural, recreational, natural resources, and agricultural values of the California Delta as an evolving place," can be interpreted in different ways. In economic terms, most stakeholders agreed that a minimum requirement is to maintain the economic value of the entire Delta economy in the future, and many believed in a stronger interpretation of enhancement of every key economic sector. The Fifth Staff Draft of the Delta Stewardship Council's Delta Plan uses performance measures that follow this stronger interpretation of economic sustainability where growth in one sector is not a substitute for deterioration in another sector. The peer review panel for the ESP found this to be too strong, and

recommended that sustainability should allow for substitution between sectors. In contrast, some non-Delta water interests take a narrower view, and claim that "evolving place" means that the Delta is in a state of inevitable decline and only a handful of "unique" values need to be protected.

The Plan interprets sustainability as maintaining and enhancing the economic prosperity of the Delta, and specifically considers the potential of recreation and tourism to offset possible declines to agriculture. Regardless of the interpretation of economic sustainability, it is clear that the Stewardship Council must consider the Delta economy when preparing the Delta Plan. In addition, most stakeholders agree that the Delta Reform Act requires the protection of the cultural and historical heritage and the long-term economic viability of the Delta's historical Legacy Communities.

The Economic Sustainability Plan (ESP) measures the key elements of the Delta economy, develops strategies to enhance the economy, and analyzes the impacts of several important proposals for the Delta Plan on the region's economic sustainability. The analysis in this Economic Sustainability Plan shows that it is possible to protect and enhance the Delta economy and be consistent with the coequal goals. The ESP finds that a large investment in strengthening the Delta's levee and emergency response systems is a cost-effective approach to improving water supply reliability, economic sustainability in the Delta, and reliable energy, transportation, and water infrastructure that serves statewide interests. The ESP also finds that most proposals for ecosystem restoration can be consistent with economic sustainability.

THE ECONOMY AND INFRASTRUCTURE OF THE DELTA: BASELINE, TRENDS, AND STRATEGIES FOR IMPROVEMENT

The boundaries of the Legal Delta are shown in Figure A. The Delta Protection Act of 1992 defined the Delta boundaries including the Primary and Secondary Zone and created the Delta Protection Commission, charging it with developing a Land Use and Resource Management Plan for the Primary Zone. The majority of the Delta's 738,000 acres of land is in the rural and agricultural Primary Zone. The population of the Primary Zone is approximately 12,000 and has remained steady in the nearly 20 years since the passage of the Delta Protection Act.

The Legal Delta, including both the Primary Zone and Secondary Zone, contains significant portions of five counties, Contra Costa, Sacramento, San Joaquin, Solano and Yolo, and a small rural corner of Alameda County. The Delta includes parts of several large cities including Antioch, Pittsburg, Stockton, Sacramento, Tracy, and West Sacramento. The legal Delta has a population of 571,000, according to the 2010 Census, which has increased by about 200,000 people—more than 50 percent—in the 20 years since the 1990 Census. All of the population growth, and virtually all of the Delta's urbanized land, is located within the Delta's Secondary Zone.

The Primary Zone economy is export-oriented and creates jobs and income far in excess of the population and workforce that resides in the Primary Zone. The Secondary Zone and the counties surrounding the Delta supply the Primary Zone economy with a workforce, services, manufacturing, and transportation that add value to the agricultural, energy, and other resource-based output of the Delta.

The ESP calculated measures of industry concentration for the Legal Delta with measures of both employment and output, and identified three clear areas of relative concentration: 1) Agriculture; 2) Transportation, Warehousing, and Utilities; and 3) Construction, Housing, and Real Estate. All of these areas are potentially impacted by the Delta Plan. Since there is great interest in recreation and tourism as an economic driver in the Delta, it is significant to note that the tourism-oriented Arts, Entertainment, and Recreation sector tied with Information and Management for the lowest concentration of the 21 industries analyzed in the Legal Delta. However, water-based recreation in the Delta is a significant economic driver, and as discussed in Chapter 8, most of its economic impact is in the retail and hospitality sector.

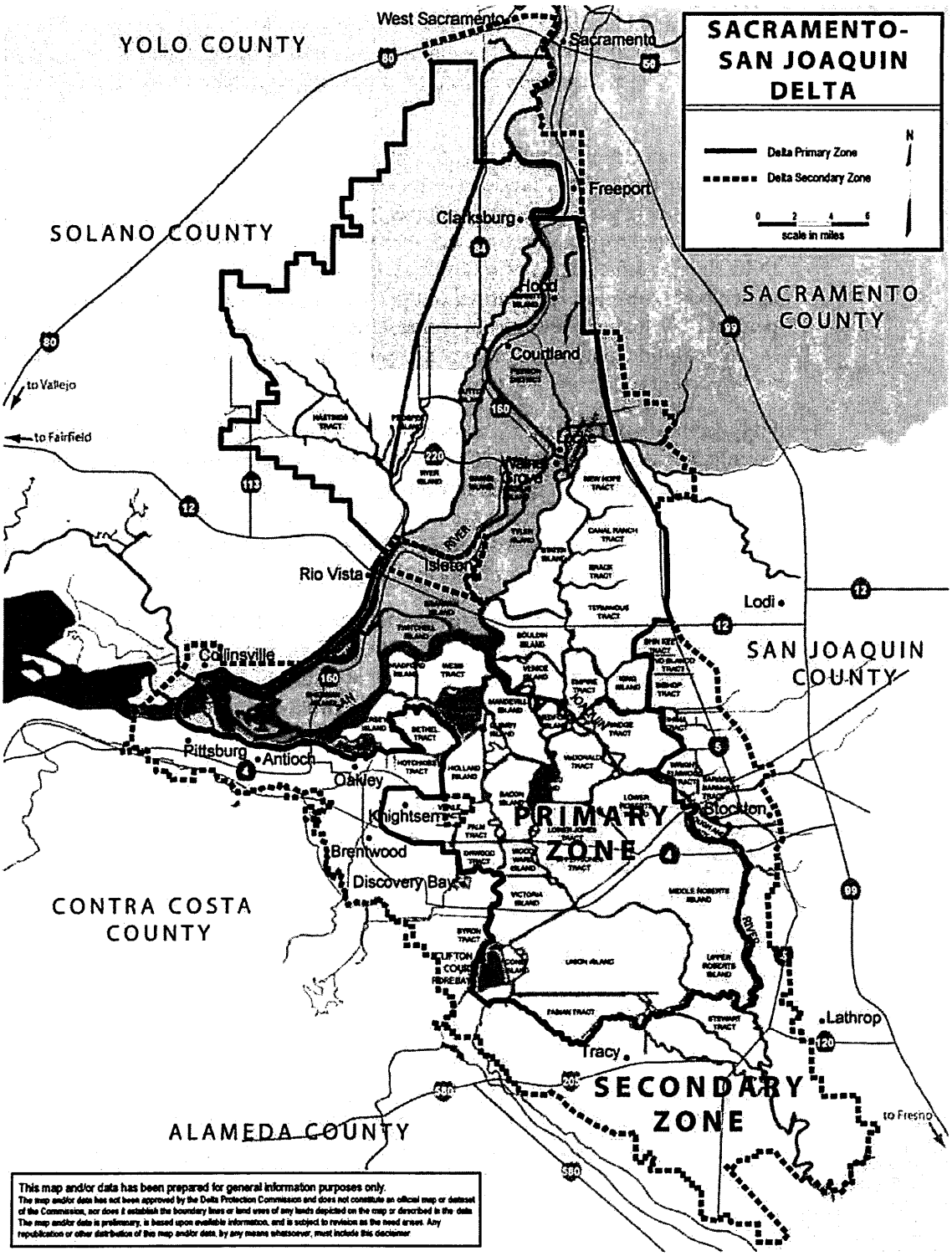
The Delta Reform Act of 2009 and the Delta Protection Act of 1992 are primarily concerned with the natural resources of the Delta and the economic activity sustained by those resources, such as agriculture and outdoor recreation. In addition, the resources of the Delta support significant water, energy, and transportation infrastructure that serves the Delta, regional, and state economies, and an important commercial and recreational salmon fishery throughout the state. Indeed, an important economic cluster in the Delta is Transportation, Warehousing, and Utilities, and their development is directly dependent on maintaining and enhancing the Delta as a regional transportation and energy hub. The ESP conducted a closer analysis of three important areas for the Delta's economic sustainability: agriculture; recreation and tourism; and infrastructure. The remainder of this section looks more closely at the baseline, trends, and strategies for enhancing these areas of the Delta economy.

DELTA AGRICULTURE

Agriculture is the dominant land use in the Delta. Farmland makes up about two-thirds of the area of the Delta, and nearly 80 percent of all Delta farmland is classified as Prime Farmland, the highest quality designation given by the California Farmland Mapping and Monitoring Program. In contrast, less than 20 percent of all farmland in California is Prime Farmland.

Corn and alfalfa occupy the greatest acreage in the Delta, whereas processing tomatoes and wine grapes generate the most crop revenue. These crops have important links to three value-added manufacturing sectors in the region: wineries, canneries, and dairy products. Asparagus and pears are historically high-value crops in the Delta and continue to be significant contributors, although acreage of both has decreased. The majority of

Figure A: Map of Primary and Secondary Zones of the Sacramento-San Joaquin Delta



pumpkins and blueberries grown in California come from the Delta and reflect the variety of products. Total agricultural revenues in the Delta were estimated at $795 million in 2009, including $702 million in crop revenue and $93 million from animals and animal products.

Nearly 80 percent of Delta farmland is used for lower-value field and grain crops, pasture, and grazing lands. These lands are important to supporting animal agriculture in the Delta and the larger region, most notably the California dairy industry where scarcity and costs of forage crops has become a challenge. Animal agriculture is less prevalent in the Delta than in other areas of the San Joaquin Valley, but milk is still the fifth most valuable agricultural commodity produced in the Delta, and animal production generates about 12 percent of Delta farm revenue. In contrast, milk is the most valuable agricultural product in San Joaquin County and other nearby areas in the San Joaquin Valley, and the Delta is an important source of local feed.

High-value vineyards, truck, and deciduous crops generate close to 70 percent of crop revenue in the Delta on about 20 percent of the Delta's farmland, and account for 80 percent of the economic impact of Delta agriculture when value-added manufacturing such as canneries and wineries are included. Like other areas in the Central Valley, Delta agriculture is expected to continue a gradual trend towards higher-value crops over time, increasing the contribution of Delta agriculture to the regional economy.

The economic impact analysis estimates that Delta crop and animal production has an economic impact of roughly 9,700 jobs, $683 million in value added, and $1.4 billion in output in the five Delta counties. Across all of California, the economic impact of Delta agriculture is approximately 13,000 jobs, $819 million in value added, and $1.6 billion in output.[1]

As seen in Table A, when related value-added manufacturing such as wineries, canneries, and dairy products are included with the impact of Delta agriculture, the total economic impact of Delta agriculture is roughly 13,200 jobs, $1.059 billion in value-added, and $2.647 billion in economic output in the five Delta counties. Including value-added manufacturing, the statewide impact of Delta agriculture is about 25,000 jobs, $2.135 billion in value-added, and $5.372 billion in economic output. Additional details and analysis of Delta agriculture can be found in Chapter 7 of the Economic Sustainability Plan.

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[1] The economic impact analysis of agriculture, recreation, and tourism utilizes the IMPLAN model to calculate what are commonly known as the "ripple" effects on other industries such as the purchase of inputs in the local economy and local consumer spending supported by the income. Jobs are reported as annual monthly averages and will vary by season. Value added measures total regional income generated by the activity and is comparable to gross domestic product. Output sums the total revenue of enterprise which is higher than the value added or income created by the enterprise.

Table A: Total Economic Impacts of Delta Agriculture and Recreation and Tourism*

5-COUNTY IMPACTS					
Agriculture	13,179	$593,975,736	$1,059,453,520	$2,647,124,544	Table 13 p.125
Recreation & Tourism	3,064	$104,320,642	$175,862,370	$329,229,232	Table 36 p.174
CALIFORNIA IMPACTS					
Agriculture	25,125	$1,252,216,824	$2,135,095,400	$5,372,014,752	Table 14 p.126
Recreation & Tourism	5,317	$208,104,490	$353,312,020	$654,415,364	Table 37 p.174

*For additional details on economic impacts see the listed source tables and associated discussions.

DELTA RECREATION AND TOURISM

Recreation is an integral part of the Delta economy, generating roughly 12 million visitor days of use annually and approximately $250 million dollars in visitor spending in the Delta each year. Of the roughly 12 million visitor days spent in the Delta each year, approximately 8 million days are for resource-related activities (e.g., boating and fishing), 2 million days are for right-of-way-related and tourism activities (e.g., bicycling and driving for pleasure), and 2 million days are for urban parks-related activities (e.g., picnicking and organized sports).

Boating and fishing have the biggest economic impact, and are estimated to generate nearly 80 percent of the recreation and tourism spending in the Delta, including significant expenditures on lodging, meals, supplies, marina services, and fuel. In addition to visitor spending, non-trip spending such as boat purchases and marina rentals are estimated at roughly $60 million annually for total recreation-related spending of $312 million annually in the Delta. As seen in Table A above, Delta recreation and tourism supports over 3,000 jobs in the five Delta counties. These jobs provide about $100 million in labor income and a total of $175 million in value added to the regional economy. Across all of California, Delta recreation and tourism supports over 5,300 jobs, and contributes about $353 million in value added.

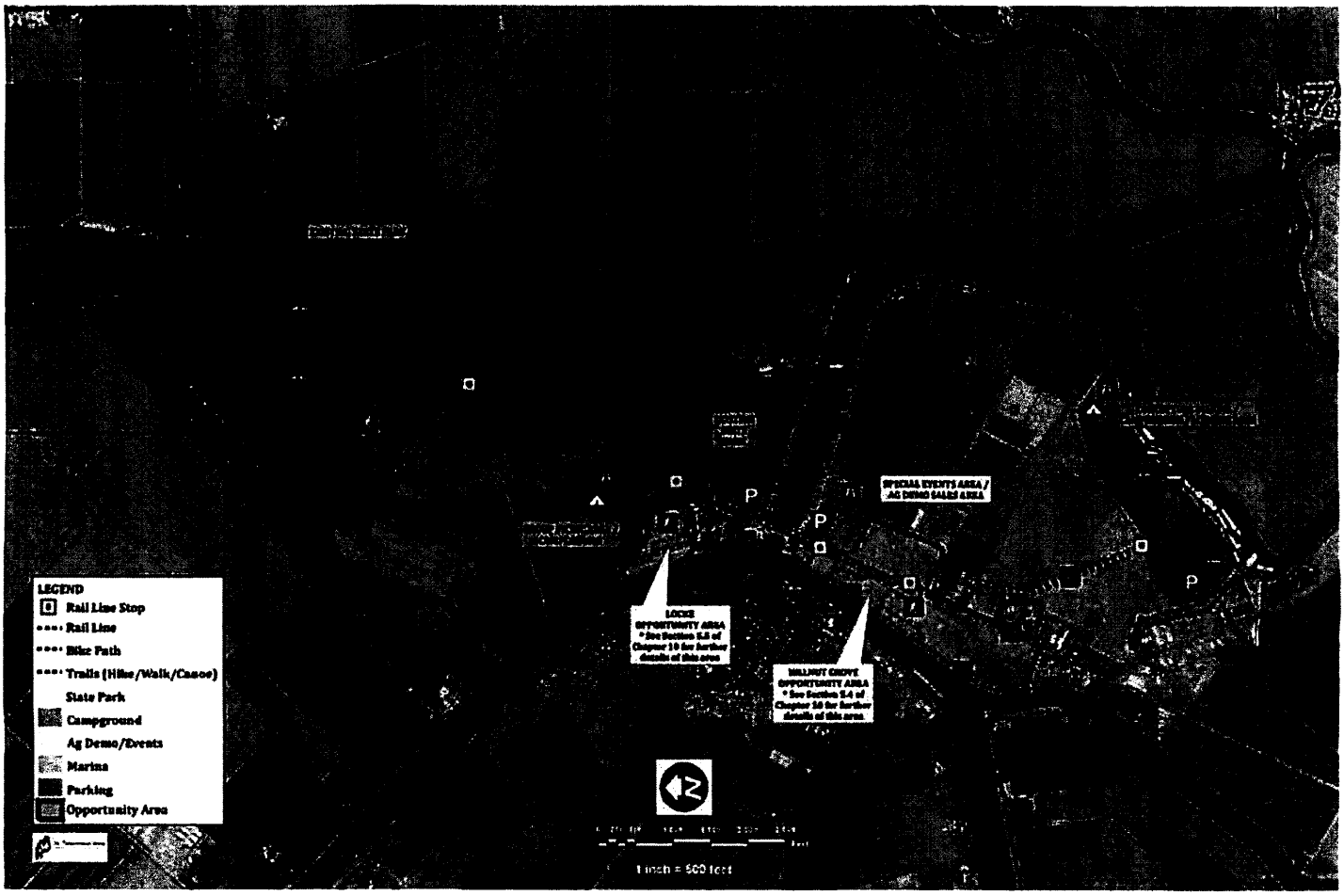
Despite significant population growth in the market area, the available data suggests that boating and fishing activity in the Delta has grown little in the past 20 years. Boat registrations, employment at marinas and boating-related industries, and the number of marinas are virtually unchanged over the past two decades. This trend could reflect concerns about water and fishing quality in the Delta, and could also be influenced by the poor economy, high fuel prices, and broader trends in boating and fishing participation across the nation.

While boating and water recreation will remain the largest piece of the Delta recreation industry, land-based activities such as agritourism, wine tasting, wildlife watching, historic and cultural tourism, bicycling, and driving for pleasure are likely to drive future growth in Delta recreation. The majority of visitors to the Delta are from Northern

California, an area with great population growth potential but also with nearby locations with successful land-based recreation and tourism economies that compete with the Delta for visitors. The residents of a dozen counties around the Delta represent the principal market for future growth in Delta visitation. This market area has a population of approximately 11.9 million people, and projections indicate this figure could grow by about 50 percent or 5.7 million people by 2050.

Because of slow expected growth in boating recreation and the relatively small base of land-based tourism in the Delta, we project Delta recreation and tourism will grow more slowly than the regional population. If resource quality and recreational facilities are maintained and improved so that the Delta retains its current level of competitiveness as

Figure B: Conceptual Proposal for Walnut Grove/Locke/Delta Meadows Focal Point Complex



a recreation destination, visitation could increase by 3.4 million visitor days and in-Delta spending could increase by nearly $80 million, roughly 35 percent, over 40 years.

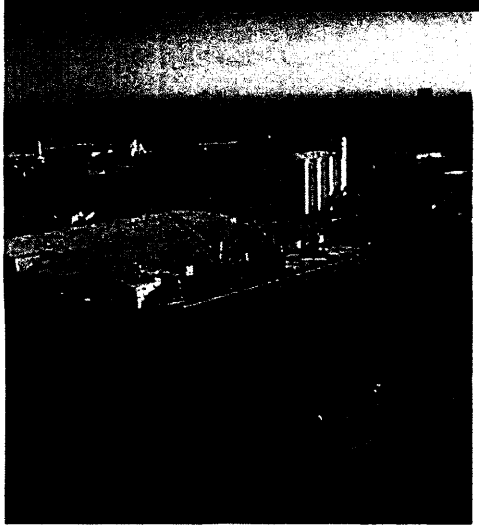
A plan for the enhancement of recreation in the Delta centers on five location-based strategies: specific waterways, points of interest, focal point complexes, natural habitat areas, and urban edge areas that surround the Delta. Recreation development in the Delta should be coordinated, consistent, branded, and marketed. A National Heritage Area could be an effective means to brand and coordinate strategies to enhance resource-based recreation, agritourism, and historical and cultural tourism.

Figure B is a conceptual illustration of what a viable focal point complex could look like in the historic area of Walnut Grove and Locke. The figure shows coordinated development of a public park at Delta Meadows with a private sector catalyst development in a modern marina and recreation facility that is tied together with a network of non-motorized trails that include revitalized, historic commercial districts of the Legacy Communities. Successful execution of this type of plan would require improved flood control and a facilitator to encourage and coordinate the public and private investments. Additional details on recreation and tourism enhancement strategies are in Chapter 8 of the Economic Sustainability Plan.

DELTA INFRASTRUCTURE SERVICES

The Delta is a critical infrastructure hub for the regional and state economy. While the Delta's importance to the state water system is well-known, its importance to energy, transportation, and in-Delta municipal and industrial water supplies is less appreciated. As discussed in Chapter 5 and mapped in Appendix D, all of these infrastructure services are vulnerable to floods, earthquakes, and sea-level rise, and require the continued maintenance and enhancement of the Delta's levee system.

The Delta is an important energy resource for California. The Delta contains the largest natural gas production field in California, as well as its largest natural gas storage facility below McDonald Island in the central Delta. In addition to heating and cooking, natural gas fuels the majority of California's electricity supply, and natural gas power plants in the five Delta counties, many within the legal Delta, produce 20 percent of California's natural gas-powered electricity. Major electricity transmission lines in the Delta interconnect California with the Pacific Northwest and carry roughly 10 percent of the state's summer electricity load. Gasoline and aviation fuel pipelines crossing the Delta supply large portions of Northern California and Nevada. Besides these energy resources, wind and solar resources are being studied for further development. Taken together, the Delta's contribution to the state's energy network is comparable to its contribution to the state water system.



The Port of West Sacramento on the Sacramento Deep Water Channel, which with the Port of Stockton and the Port of Oakland form the M-580 Marine Highway

The Delta also contains increasingly important parts of the inter-regional transportation network that supports the regional and in-Delta economy. As east-west transportation corridors to the north and south of the Delta become increasingly congested and constrained, the demand for through-Delta transportation is growing rapidly. The ports of Stockton and Sacramento are focal points of regional economic development and rely on through-Delta shipping channels. The ports' marine highway corridor project will increase and diversify the water freight that moves through the Delta and relieve air pollution and traffic in the region. Traffic data shows large increases on highways in the Secondary Zone, as well as through the middle of the Primary Zone on State Route 12, and smaller but significant increases on State Route 4 in the Primary Zone. Through-Delta railways are also an important link in the transportation system.

The Secondary Zone of the Delta and the surrounding counties also draw a significant portion of their municipal and industrial water supplies from the Delta. Changes to Delta water quality—whether an increase in salts or organic carbon—have important effects on urban water supplies in and around the Delta. Significant deterioration of in-Delta water quality could increase water treatment costs by tens of millions of dollars each year and require hundreds of millions of dollars in capital investment in advanced treatment facilities for utilities serving Delta urban areas.

TWO KEY ISSUES FOR ECONOMIC SUSTAINABILITY IN THE DELTA

DELTA LEVEES AND ECONOMIC SUSTAINABILITY

Since the early 20th century, the current-day Delta levee system has provided flood control that allows productive agricultural and urban uses of land, channels water for urban and agricultural uses, protects critical infrastructure, and creates a desirable setting for boating and water-based recreation in an environment unique in California. The levee system is the foundation on which the entire Delta economy is built. Therefore, a sustainable Delta economy requires a sustainable levee system.

It has been the goal of the state and the federal government, working through the Department of Water Resources (DWR), the U.S. Army Corps of Engineers (USACE), and the local reclamation districts, to meet the Delta-specific PL 84-99 standard since 1982 when DWR and USACE produced a joint report on the Delta levees, which recommended the basis for this standard. If effectively used, funds currently in the pipeline should bring the Delta levees close to achieving this goal. When these funds have been expended, more than $698 million will have been invested in improvements to the Delta levees since 1973. These improvements have created significantly improved Delta levees through modern

engineering and construction, making obsolete the historical data that is still sometimes used for planning or predicting rates of levee failure.

Three approaches can help all jurisdictions and planners further reduce the risks resulting from the failure of the Delta levees. These approaches are: (1) build even more robust levees, (2) improve both regular maintenance and monitoring and flood fighting and emergency response following earthquakes, and (3) improve preparedness for dealing with failures after they occur. With regard to the first approach, the big question is not whether they should be improved to the Delta-specific PL 84-99 standard. Indeed, the independent review panel for the ESP agreed that PL 84-99, not HMP, is the minimum responsible levee standard. Instead, the key question is which levees should be improved to a higher standard in order to support and enhance various in-Delta, regional, state and federal interests, and to address hazards posed by not only floods, but also earthquakes and sea-level rise. Our conclusion is that these improvements would be advantageous on 300 to 600 miles of Delta levees, not only for flood control and protection against earthquakes and sea-level rise, but because they also would allow for planting vegetation on the water side of the levees—an essential component of Delta ecosystem repair. These further-improved levees would have wider crowns to provide for two-way traffic and could easily be further widened at selected locations to allow the construction of new tourist and recreational facilities out of the statutory floodplain.

Improvement of most Delta "lowland" levees, the levees that protect lands below sea-level, and selected other levees to this higher standard would cost $1 to $2 billion in base construction costs over the cost of reaching the PL 84-99 standard. Including vegetation and habitat enhancement, total program costs might be in the order of $4 billion, similar to the cost projected by the PPIC (2007) in their "Fortress Delta" alternative. While the billions of dollars required to build levees to this higher standard is a large investment, it is a cost-effective joint solution that simultaneously reduces risk to all Delta infrastructure. While a $12 billion investment in isolated conveyance may allow for somewhat larger water exports, it doesn't protect other critical infrastructure, and billions in additional investments would still be required to protect highways, energy, and other water and transportation infrastructure. Just as a species by species approach may be an inefficient and ineffective way to protect ecosystems, a system by system approach is an inefficient and ineffective way to protect the state's infrastructure. Chapter 5 contains a detailed assessment of the Delta levee system.

SUSTAINABLE LEGACY COMMUNITIES: WHERE THE CHALLENGES AND STRATEGIES COME TOGETHER

Economic opportunities and constraints facing the Delta's Legacy Communities mirror those in the broader Primary Zone. The current economies of the Legacy Communities are agriculturally based, providing support services and limited workforce housing for the Primary Zone's largest industry as well as some housing for retirees and service

and professional workers who commute into nearby urban areas such as Sacramento. Despite the current base in agriculture and rural bedroom and retirement communities, much of the revitalization strategies for Legacy Communities are based on growing their appeal as destinations for recreation and tourism. This includes promoting the emerging agritourism sector—including wine and local foods—as an economic development theme.

However, a strict and multi-layered regulatory framework places limits on economic development opportunities within the Delta's Legacy Communities. The aging and occasionally sub-standard building stock needs improvement, potentially utilizing redevelopment of existing buildings and/or a limited amount of new development in order to accommodate visitor- and local-serving enterprises. New investment is especially important because the existing base of hospitality- and tourism-related enterprises is very limited and insufficient to attract and capture significant tourist activity. The most developed recreation and tourism enterprises in the Delta are campgrounds and marinas that serve water-based recreation; these are mostly located outside the Legacy Communities and often outside the Primary Zone.

An already burdensome regulatory environment has been made significantly worse by the recent remapping of FEMA flood zones. All of the Legacy Communities along the Sacramento River have either been or are in the final process of being remapped into the 100-year floodplain. The requirements of this designation can make major property investments financially infeasible, and many stakeholders are concerned that the flood zone designation could cause the Legacy Communities to slowly wither away. It is clear that the economic sustainability of the Legacy Communities is dependent on levee and flood-control investments as well as other strategies to address the constraints of flood zone designation.

Despite these challenges, the Legacy Communities have significant historical, cultural, and economic values and the potential to become attractive destinations for visitors and support a more prosperous, higher quality of life for residents. Chapter 10 includes more detailed visions and strategies for Legacy Communities, including case studies of Walnut Grove, Locke, and Clarksburg.

Recreational boating is popular throughout the Delta

IMPACT OF WATER SUPPLY AND ECOSYSTEM RESTORATION PROPOSALS ON THE DELTA ECONOMY

Current proposals for new water supply and ecosystem restoration projects have serious implications for economic sustainability in the Delta. The isolated conveyance and many habitat restoration proposals are being developed in the Bay Delta Conservation Plan (BDCP), and the Economic Sustainability Plan relies on the November 2010 draft of the BDCP to describe these proposals. In addition, other proposals regarding Delta levees, land use regulation, and economic development have been made by the Delta Stewardship Council, Department of Water Resources, the Public Policy Institute of California (PPIC), and the Delta Vision Strategic Plan.

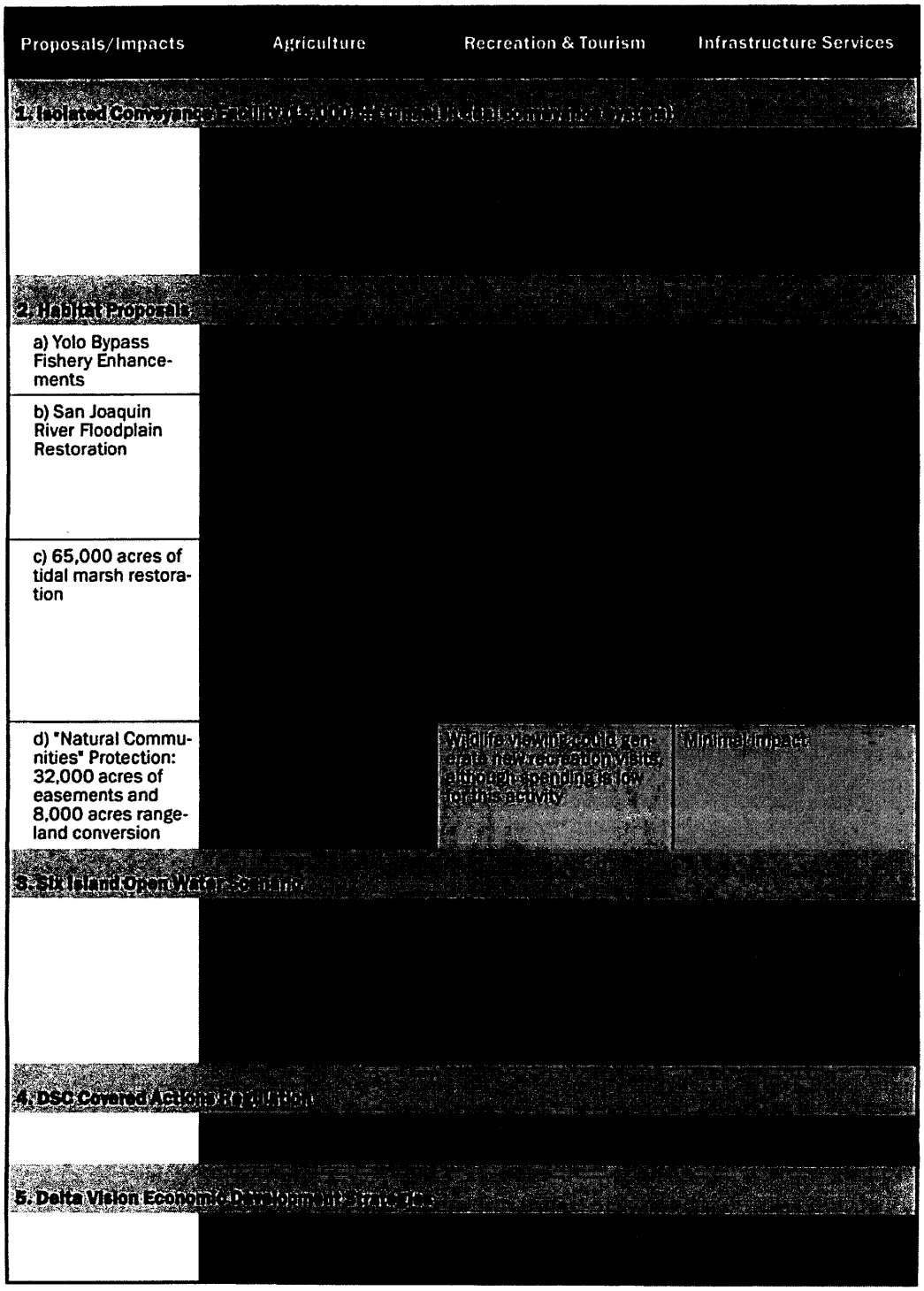
Figure C summarizes the estimated impacts of the proposed actions. In Figure C, red shading indicates a negative effect of $20 million or more annually, orange is negative effect of less than $20 million annually, yellow represents little or no effect, and green are economic benefits. Three proposals—isolated conveyance, 65,000 acres of tidal marsh, and six-island open water area—have negative effects in all three critical areas of the economy, with a negative impact exceeding $20 million in at least one area. These proposals are clearly incompatible with economic sustainability at their current levels.

Overall, Delta agriculture would be the most affected sector with total impact of BDCP proposals ranging from $62 to $227 million dollars in revenue per year, an 8% to 29% decline in Delta agriculture. This estimate does not include losses from permanent flooding of islands advocated by some, or the risk that a large capacity conveyance could be used to increase water exports and degrade water quality beyond current standards. The majority of Delta policy proposals considered would also have negative impacts on infrastructure services, and recreation and tourism impacts are a mix of potentially positive and negative effects. The effects of all these proposals are analyzed in detail in Part 2 (Chapters 6 through 9).

THE CO-EQUAL GOALS, COST-BENEFIT ANALYSIS, AND ECONOMIC SUSTAINABILITY

The co-equal goals, economic sustainability for the Delta, and cost-benefit analysis have been put forward as guiding frameworks for the recommendations from this report by the Delta Stewardship Council and the independent review panel of the ESP. It is important to understand that there are conflicts between these frameworks, and therefore it is impossible to construct a set of recommendations that is best from all viewpoints. The primary objective is to provide recommendations that are consistent with the co-equal goals and economic sustainability as envisioned in the Delta Reform Act of 2009 so they can be incorporated into the Delta Plan. However, it also important to note that cost-benefit analysis is the traditional, scientifically accepted approach to analyzing these types of issues, and that such an analysis would be enormously informative to the Delta Plan.

Figure C: Summary of Impacts of Policy Scenarios



While there is no comprehensive cost-benefit analysis of current proposals for the Delta, it is important to note that the recently released DRMS Phase 2 analysis is a comprehensive cost-benefit analysis of a limited, and somewhat out-of-date group of scenarios. The findings from DRMS phase 2 have tremendous implications for the Delta and the approach to the levee system and conveyance. Below are some key findings from the DRMS Phase 2[2]:

- Improving levees had the highest benefit-cost ratio of any Delta risk reduction strategy, including isolated water conveyance that was assumed to cost only $4.9 billion.
- Water exports account for only 20% of the economic costs from a large earthquake event that would flood between 10 and 30 Delta islands.
- Water exports account for less than 2% of the economic costs of more-common flood events due to high water and storms.
- Water exports account for 0% of the loss of life from any type of flood hazard event.

While the DRMS Phase 2 report evaluated upgrading all Delta levees to the PL 84-99 standard, it did not evaluate further upgrading levees to a seismically resistant standard as recommended in the ESP. However, the August 20, 2007 preliminary draft of DRMS Phase 2 did consider an "Improved Levees" scenario that included seismic upgrades of 100 miles of south Delta levees. The results reported in the preliminary draft found that a scenario with seismic upgrades to levees had lower costs and 40% higher risk reduction benefits than the peripheral canal scenario. Consistent with the conclusions in the ESP, the preliminary draft of DRMS Phase 2 found seismic upgrades to levees improved water supply reliability. Despite seismic upgrades to only 100 miles of levees, the preliminary draft found the improved levee scenario reduced the water supply impact of the largest earthquake by two-thirds while simultaneously protecting other valuable infrastructure and Delta property.[3]

These findings have enormous implications for risk management in the Delta, and highlight some of the potential conflicts between cost-benefit analysis and the co-equal goals. Both the preliminary and final draft of DRMS Phase 2 found improving levees has the highest economic benefit per dollar invested and lowest total cost. Levee upgrades perform well in cost-benefit analysis of Delta options, because they reduce risk in all areas including water conveyance, other infrastructure, and in-Delta property. In contrast,

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[2] These findings are not what is highlighted by the Department of Water Resources in the Executive Summary of DRMS phase 2, but are easily found and calculated from the results tables in the analysis.

[3] A copy of the preliminary draft was requested in a December 15, 2011 letter to the Department of Water Resources (DWR). DWR responded quickly, the January 9, 2012 transmission letter states: "Please note the information dates back to 2007 and is stamped as preliminary. It was also not part of the DRMS Phase 2 public draft, because it was not further considered for in-depth analysis in Phase 2. Therefore, I do not recommend using this information for either planning or design purposes. With these caveats in mind, we hope you still find the attached information useful." A complete copy of the correspondence and material provided by DWR is included in Appendix N of the ESP.

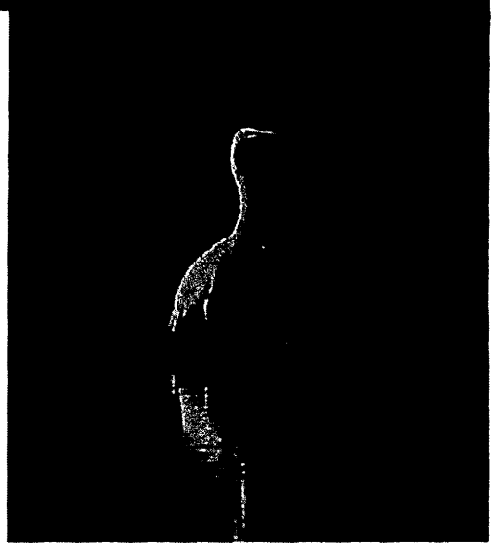
isolated conveyance only protects water exports which DRMS clearly identifies as a minority of the economic risks.

With respect to the co-equal goals, the ESP recommends a set of actions that would dramatically change the Delta from its current state, and is consistent with the co-equal goals of the Delta Reform Act. The ESP would significantly improve water supply reliability by creating a seismically resistant levee system with enhanced emergency response that effectively addresses the risk of catastrophic, long-term interruption of water deliveries, the most important goal of water supply reliability. The ESP recommends many actions to improve the Delta ecosystem, including actions that support the Delta economy and even some actions that have significant costs for the Delta economy. The ESP presents a positive view of the Delta's economic future with strategies that are informed and realistic about the challenges it faces. Because of its lower implementation cost and compatibility with Delta economic interests, the ESP is also a more feasible and realistic alternative to achieving the coequal goals than plans built around large, isolated water conveyance facilities such as the BDCP.

The Delta Stewardship Council and others are very interested in the potential for gains in the recreation economy to offset potential losses in agriculture. It is important to be realistic about this potential and understand current trends. Over the past twenty years, the trend for recreation in the Delta has been flat despite rapid population growth in the surrounding region. Delta agriculture has grown in value, and shares many of the same strong growth prospects as agriculture in the rest of the state. This is in strong contrast to the 1980s when agriculture was a struggling industry and boating was growing fast. In the 1980s, it might have been reasonable to project these trends would continue and recreation would supplant agriculture as the economic driver in the Delta. As discussed in the ESP, this transition did not occur over the past 20 years when conditions were more favorable than they are today. Given the history of the past 20 years and current economic and demographic trends, a transition to a recreation economy should be viewed as far less likely today than it was 25 years ago. Thus, it would be irresponsible to develop Delta plans that count on a reversal of this pattern and dramatic growth in recreation and tourism.

Despite these cautions, it is important to note that the ESP does show that there is significant potential to grow and enhance the Delta's recreation and tourism sectors. Improving recreation assets can not only provide economic benefits, but also enhance the quality of life in the Delta and people outside the Delta who could take advantage of these opportunities. However, growing recreation and tourism requires strategic investment and reinvestment in facilities, improved flood control, and scaling back some of the water supply and habitat proposals that conflicts with recreation and tourism. A loss of agriculture on the low end of the range of potential BDCP impacts, about 10%, could potentially be offset by growth in other areas and consistent with economic sustainability in the Delta. Proposals that would reduce the capacity of conveyance and

reduce habitat acreage goals by 70-80 percent (i.e. 3,000 cfs conveyance, about 25,000 acres of habitat restoration, one small flooded island) were not evaluated formally, but could be consistent with economic sustainability if combined with substantive actions to improve recreation and tourism, enhance legacy communities, support value-added opportunities in agriculture, and provide adequate flood control to support public safety and encourage the needed investments.



White Egrets are a common sight throughout the Delta.

RECOMMENDATIONS FOR ECONOMIC SUSTAINABILITY IN THE DELTA

The recommendations are organized around eight topics. Considering the recommendations together, the overall strategy is consistent with economic sustainability in the Delta and the coequal goals of increased water supply reliability and ecological restoration. Chapter 12 includes more detailed descriptions and discussion of the proposed recommendations.

LEVEES AND PUBLIC SAFETY RECOMMENDATIONS

- Improve and maintain all non-project levees to at least the Delta-specific PL 84-99 standard.
- Improve most "lowland" levees and selected other levees to a higher Delta-specific standard that more fully addresses the risks due to earthquakes, extreme floods, and sea-level rise, allows for improved flood fighting and emergency response, provides improved protection for legacy communities, and allows for growth of vegetation on the water side of levees to improve habitat.
- The Delta Levee Subventions and Special Projects Program should continue to be supported.
- Transfer to a regional agency with fee assessment authority on levee beneficiaries responsibility for allocating funds for the longer-term improvement of Delta levees and the maintenance of regional emergency preparedness, response, and recovery systems developed jointly with the Delta counties and state and federal governments.
- In addition to providing funding for longer-term levee improvements, provide on-going funding for regular levee maintenance and expanded emergency preparedness, response, and recovery.
- Reduce or eliminate regulatory impediments to action by the creation of a one-stop permitting system for selected activities within the Delta including dredging, levee construction, and ecosystem restoration.
- Fully and expeditiously implement the recommendations contained in the SB27 Sacramento-San Joaquin Delta Multi-Hazard Coordination Task Force report.
- Formally identify the Delta region as the geographic basis for integrated response, mutual aid, decision making, and information sharing processes during major floods.

GENERAL RECOMMENDATIONS FOR ECONOMIC SUSTAINABILITY

- Designate a regional agency to implement and facilitate economic development efforts. The main tasks of this entity are: marketing and branding, permitting and regulatory assistance, planning and coordination, and strategically managing the Delta Investment Fund as described in Section 1 of Chapter 11.
- Economic impacts of habitat creation and development of facilities for export water supply should be fully mitigated.
- Land use planning and regulation must be clear and consistent across agencies.

RECOMMENDATIONS FOR THE ECONOMIC SUSTAINABILITY OF AGRICULTURE

- Maintain and enhance the value of Delta agriculture.
- Limit the loss of productive farmland to urbanization, habitat, and flooding to the greatest practical extent.
- Protect Delta water quality and water supplies for agriculture.
- Support growth in agritourism.
- Support local value-added processing of Delta crops.

RECOMMENDATIONS FOR ECONOMIC SUSTAINABILITY OF RECREATION AND TOURISM

- Protect and enhance private enterprise-based recreation with support from state and local public agencies.
- Focus recreation development in five location-based concepts:
  - Enhance Delta waterways
  - Develop dispersed points of interest and activity areas
  - Create focal point destination complexes with natural areas, parks, Legacy Communities, marinas, historic features, and trails
  - Expand public access to natural habitat areas
  - Create recreation-oriented buffers at Delta urban edges
- Implement Economic Sustainability Plan through specific strategies such as consistency planning and regulation refinement, coordination among state and local agencies, obtaining strategic levee protection for Legacy Communities and key recreation areas, designating a marketing and economic development facilitator, and providing key funding for catalyst projects and agencies.

RECOMMENDATIONS FOR INFRASTRUCTURE

- Planning of levee investments must fully consider the economic value of infrastructure services along with all other benefits.

- All owners and operators of infrastructure that depend on Delta levees must contribute to levee system investment and maintenance.
- Protect and improve Delta water quality and supply for agricultural, municipal and industrial uses.
- Ensure that future development of infrastructure in the Delta is aligned with economic sustainability strategies.
- Support expansion and development of the ports.

RECOMMENDATIONS FOR HABITAT AND ECOSYSTEM IMPROVEMENTS

- Emphasize strategies with little or no conflict with the Delta economy such as increased fresh water flows, growth of vegetation on enlarged levees, restoration of mid-channel berms, and reactivation of upstream floodplains.
- Expanded and enhanced flood bypasses can be consistent with economic sustainability if agencies work with local stakeholders to minimize and mitigate economic impacts.
- Tidal marsh habitat plans should be significantly reduced.
- Increased open-water habitat in the Delta is not recommended.
- Include recreation facility development in habitat enhancement plans when possible.
- Habitat restoration should start on State-owned land and only occur on private lands with willing sellers consistent with local land use plans.

RECOMMENDATIONS FOR WATER SUPPLY RELIABILITY

- Continuing the through-Delta conveyance is important to economic sustainability in the Delta and can be consistent with water supply reliability within and outside the Delta.
- A dual conveyance plan with a large, 15,000 cfs isolated conveyance facility has large conflicts with Delta economic sustainability and has high risk for Delta stakeholders.
- Options to large isolated conveyance must be fully and consistently evaluated.

RECOMMENDATIONS FOR RESEARCH AND MONITORING

- Conduct a comprehensive and credible cost-benefit analysis to analyze Delta alternatives.
- New recreation data is needed and should be updated regularly.
- Maintain an Economic Sustainability Scoreboard to track progress.
- The Delta Science Program should sponsor more engineering and economic studies in addition to ecological research.
- Increase alignment among the various research and planning initiatives.

Photo credit: Adrian Mendoza and Department of Water Resources

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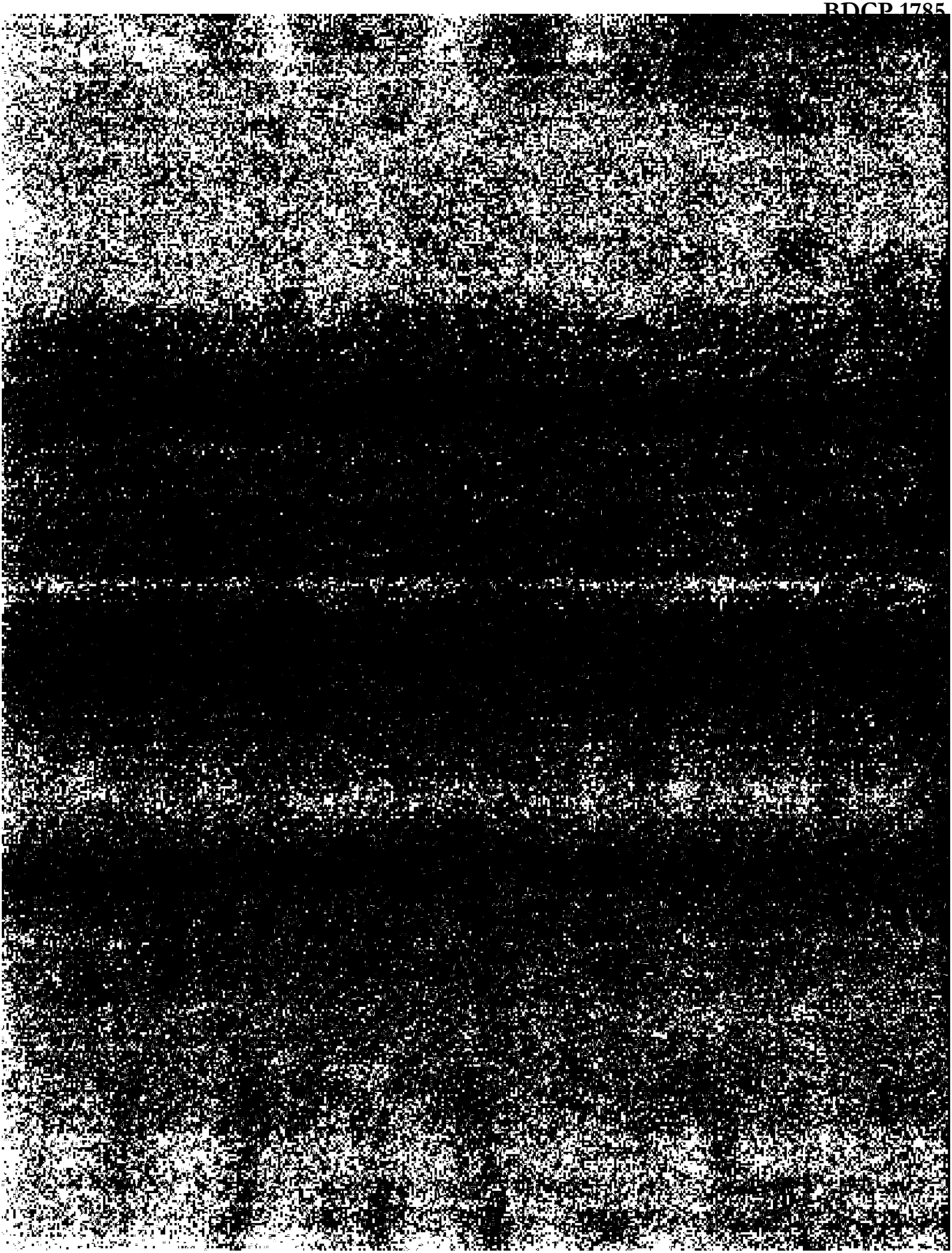

EXHIBIT H

Michael Report

May 16, 2014

Comments on the BDCP EIR/EIS Socioeconomic Analysis

Prepared for Sacramento County by

Dr. Jeffrey Michael

May 22, 2014

This review of Chapter 16: Socioeconomics consists of two parts. The first part focuses on the specification of the no-action and action alternatives in the EIR/EIS, and the second part addresses the specific information in the Socioeconomic chapter. The socioeconomic effects of any project can only be meaningfully assessed by comparing it to a baseline or alternative scenario. Defining a favorable baseline or no-action alternative is one of the most common ways that project proponents skew an analysis in favor of their desired actions. Worse yet is when a baseline is inconsistent between separate analysis of the same project, such as using one baseline for analyzing the environmental effects of the project, and a different baseline for analyzing the projects socio-economic effects. The BDCP EIR/EIS commits both errors. The EIR/EIS specifies an inaccurate no-action baseline that does not follow existing laws or plans, and the EIR/EIS baseline is inconsistent with the baseline used in the BDCP's economic analysis and development of its financing plan and cost allocation. As a result, much of the analysis of Socioeconomic effects in chapter 16 is skewed and inaccurate.

Section II focuses on the specifics of the Socioeconomic chapter. In general, this chapter does not use the best available science to evaluate BDCP impacts, ignoring other peer-reviewed assessments such as the Delta Protection Commission's Economic Sustainability Plan and even the BDCP's own Statewide Economic Impact report. It displays bias by quantifying and emphasizing favorable effects, while relegating large unfavorable effects to short, qualitative discussions. In some areas, the problem with the EIR/EIS is mostly a matter of emphasis, but in several important areas the analysis is incorrect or omits important negative socioeconomic effects of the proposed tunnels and other conservation measure projects.

Section I. Alternatives

The analysis of environmental and socio-economic impacts depends critically on the specification of baseline conditions (the no-action alternative) and an adequate array of alternatives. The EIR incorrectly uses a weak and unrealistic no-action alternative that results in serious understatements of the adverse effects of the proposed tunnels on the Delta economy and environment. The EIR/EIS fails to consider a reasonable range of alternatives, including those which would achieve the project goals and be beneficial rather than harmful to Sacramento County, other areas within the Delta, and the environment. The incorrect, inconsistent and inadequate description of no-action and action alternatives results in serious errors in the Socioeconomic Analysis (chapter 16) as well as other sections of the EIR/EIS.

No-Action Alternative is incorrect and inconsistent. BDCP uses an extremely weak and inaccurate no-action alternative. The no-action alternative used in the EIR/EIS assumes that the state and other state and local agencies take no action to comply with the Delta Reform Act of 2009 in the absence of BDCP. Furthermore, the EIR/EIS no-action alternative is inconsistent with other critical BDCP planning documents, including the critical issue of the no-action level of water exports used in chapter 9 of the BDCP and the BDCP statewide economic impact report that is being used as the basis for negotiations about BDCP cost allocations and its implementation agreement. The inaccurate EIR/EIS no-action alternative is less protective of the environment, and provides a lower level of in-Delta water quality and flood control than can be reasonably expected in the absence of the BDCP. Because of the inaccurate and inconsistent baseline, the EIR/EIS badly understates the adverse impacts of BDCP on the environment and areas of the Delta region such as Sacramento County.

No-Action Water Exports in the EIR/EIS appear to be too high and are inconsistent with other BDCP documents. BDCP chapter 9 uses a level of water exports, which it calls the Existing Conveyance Scenario, that is more than 1 million acre feet per year lower than the EIR/EIS no-action scenario. A footnote on page 1-2 of the EIR/EIS states that all BDCP chapters and appendices should be considered part of the full EIR/EIS. Thus, there is a critical lack of internal consistency within the EIR/EIS. This low-export "existing conveyance" scenario is also being used as the baseline in the cost allocation discussions for BDCP. If this "existing conveyance scenario" were used as the no-action baseline for the EIR/EIS, the baseline level of environmental protection and in-Delta water quality would be higher, and thus the adverse impacts of the BDCP on Sacramento County would be larger.

No-Action Habitat Enhancement is Too Low and Alternative Habitat Options Are Ignored. A number of the Conservation Measures included in the BDCP, most notably the Yolo Bypass Enhancements, can be reasonably assumed to take place without the BDCP and its tunnels. These projects rely on funding that is independent of the BDCP. Thus, many of these conservation projects should be included in the no-action baseline, and thus the environmental and other benefits (i.e. flood control) would be higher than in the baseline, and the beneficial impacts of BDCP would be lower.

BDCP ignores many alternative approaches to improving habitat that would be less harmful or even beneficial to Sacramento County. In particular, BDCP ignores opportunities to upgrade the existing levee system in ways that would both increase the physical reliability of water exports and improve riparian habitat in the Delta. The levee system acts simultaneously as a water conveyance system and critical habitat. While the shortcomings of the current levee system in serving these purposes is part of the project need, the EIR/EIS fails to consider the most obvious action alternative – investing in improvements to the existing system.

Seismic Levee Upgrades are ignored as an alternative. Protection from the impacts of an earthquake-induced flood is often presented as the most important justification for the tunnels.

Considering the importance of flood risk to the case for the BDCP, it is imperative that the BDCP consider alternative methods of reducing this risk that would be less damaging to Delta communities and avoid the negative environmental impacts of constructing and operating the tunnels. The common-sense alternative of seismic-levee upgrades has been proposed and evaluated positively in other assessments but has been ignored by BDCP. Most notably, the Department of Water Resources identified Seismic Levee Upgrades as one of 3 promising alternatives for Delta Risk Reduction in a January 2008 report to the legislature[1] one year before the 2009 Notice of Preparation for BDCP. This date may be significant since BDCP representatives have cited this date as justification for leaving out alternatives that have been suggested after 2009. Also, it is significant to note that preliminary analysis for DRMS phase 2 found that a seismic levee upgrade scenario had lower implementation costs and higher economic benefits than isolated conveyance strategies similar to the BDCP proposal.[2] Seismic levee upgrades were also the principal recommendation in the Delta Protection Commission's Economic Sustainability Plan. This strategy of seismically-improved habitat levees would further water supply reliability, ecosystem enhancement, and make critically-needed flood control improvements in the Delta to enhance its socio-economic and environmental sustainability. The exclusion of seismic levee upgrades in any of the alternatives highlights the flaws in the process BDCP used to develop alternatives in 2007, as described in Appendix 3A and 3G of the EIR/EIS. More detailed discussion of the inadequate alternatives and its importance to evaluating the socio-economic effects of BDCP on Sacramento County is in the appendix to these comments.

Through Delta Conveyance alternatives are inadequately analyzed and developed. BDCP included one alternative with a through-Delta conveyance approach. This alternative includes over a dozen modifications to the Delta, and was one of the best performing alternatives in the evaluation of BDCP chapter 9.[3] While there are many opportunities to add and subtract, resize, and adjust operations of individual elements of a through-Delta strategy, no such effort was made for through-Delta options. In contrast, over a dozen configurations of isolated conveyance were analyzed by BDCP, not to mention many different operating scenarios for isolated conveyance options. The through-Delta alternatives would be significantly less harmful to Sacramento County, and less costly for the water exporters than the BDCP. The failure to

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[1] Risks and Options to Reduce Risks to Fishery and Water Supply Uses of the Sacramento/San Joaquin Delta. A Report Pursuant to Requirements of Assembly Bill 1200, Laird. Department of Water Resources & Department of Fish and Game, January 2008. Available online at http://www.water.ca.gov/floodsafe/fessro/levees/drms/docs/AB1200_Report_to_Legislature.pdf

[2] See Appendix N of the Delta Protection Commission Economic Sustainability Plan, available at http://forecast.pacific.edu/DESP/report/Appendix%20N.pdf

[3] While the chapter 9 analysis finds that the BDCP preferred project is superior, it is based on some dubious claims that the through-Delta alternative is not technically-feasible. The technical infeasibility claim is remarkable considering how much simpler the through-Delta technology and approach is compared to the preferred twin tunnels.

adequately analyze and develop through Delta alternatives is an important flaw in the EIR/EIS, and its analysis of impacts on Sacramento County.

II. Specific Comments on Chapter 16: Socioeconomics

This chapter does not use the best available science to evaluate BDCP impacts, and displays bias by quantifying and emphasizing favorable effects, while relegating large unfavorable effects to short, qualitative discussions. In some areas, the problem with the EIR/EIS is mostly a matter of emphasis, but in several important areas the analysis is incorrect or omits important negative socioeconomic effects of the proposed tunnels. Specific shortcomings in Chapter 16 include the following:

The EIR/EIS invalidly ignores the Delta Protection Commission's peer-reviewed Economic Sustainability Plan (ESP). While the report is acknowledged on page 16-32, 33, its data and analysis of project impacts are ignored. The EIR/EIS justifies this by stating that "the ESP sometimes used assumptions and data different than those applied for the analysis in this chapter." The EIR/EIS should be more specific on the differences, and why the data and analysis used in the EIR/EIS is better. The ESP took its descriptions of conveyance and habitat directly from BDCP's 2010 project description. With respect to the water conveyance and habitat projects analyzed, the main difference in the documents is the ESP looked at the 5 intake options (alternative 1), whereas the preferred project now is alternative 4 with 3 intakes.

In other cases, the data in the ESP is actually more current and accurate than used in the EIR, including the data on agricultural production in the Delta. The DPC ESP uses 2009 field level data on crop production, whereas the EIR/EIS is based on a 2007 land-use survey compiled by the Department of Water Resources. A peer-review panel convened by the Delta Stewardship Council's Independent Science Board praised the ESP analysis of Delta agriculture as "state of the art", yet this analysis is ignored by the EIR/EIS in favor of older and less detailed data. In addition, the 2013 BDCP statewide economic impact study utilized the same data as DPC ESP instead of the 2007 DWR survey. Furthermore, there is no meaningful difference in the descriptions of the CMs 2-22 measures in the 2010 BDCP documents used as the basis for the ESP, and the CMs 2-22 descriptions in the current EIR/EIS. Thus, there is no valid reason why the EIR/EIS does not cite the estimates of agricultural revenue loss from implementing CMs 2-22 from the DPC ESP or utilize its detailed and more recent data to establish baseline levels of agricultural production in the Delta.

The EIR/EIS invalidly fails to quantify the economic impacts on agriculture of Conservation Measures 2-22, even though other assessments have found these measures to have extremely large negative impacts on agriculture production in the Delta. The EIR/EIS fails to quantify large and permanent losses in economic activity while focusing on temporary economic impacts of construction activity. The habitat conservation measures (CMs 2-22) would impact substantially more agricultural land than the proposed conveyance project (CM 1),

and multiple reports have found that CMs 2-22 would cause a larger direct decrease in agricultural production than the proposed conveyance project itself. The EIR/EIS states that these impacts were not quantified "because the information required as input to the IMPLAN model was not available." This statement is clearly false, as the available data was sufficient for the BDCP itself to produce estimates in its August 2013 Statewide Economic Impact Report.[4]

The BDCP Statewide Economic Impact Report estimates an $89 million annual loss in Delta agricultural production from CMs 2-22. Similarly, the Delta Protection Commission found the habitat measures in CMs 2-22 would reduce agricultural production by $32-$132 million annually depending on the locations used for conservation.[5] These estimates are only the direct effects, and do not include indirect and induced (i.e. multiplier) effects from the lost income from decreased agricultural production or effects on value-added processing such as winemaking. Using multipliers from the DPC ESP, the total economic impact of CMs 2-22 could be an annual loss of between $100-400 million in economic output for the 5-county Delta region.[6] Thus, even the lowest and most optimistic estimate of the economic impact of CMs 2-22 on Delta agricultural production is a very significant effect.

The EIR/EIS estimates of total Delta recreation spending and total agricultural revenue are significantly lower than other, more recent assessments. The EIR/EIS estimates revenue Delta agriculture at $697 million in 2007, whereas the DPC ESP estimated it to be $795 million in 2009. The EIR/EIS estimates recreational spending at only $236 million, 25% less than the $312 million estimate in the DPC ESP. No explanation is provided for the discrepancy in these estimates, and it appears the EIR/EIS simply elected to rely on the numbers that would reflect more favorably on the project by minimizing its actual impacts. Since the EIR/EIS's estimates of baseline economic activity in the Delta are too low, its estimates of the impacts of BDCP actions on the Delta economy are also likely to be too low.

The EIR/EIS underestimates temporary loss of agricultural production during construction of isolated conveyance facility at only $5.2 million (page 16-168). The loss is far too low considering the area of greatest construction impact in the north Delta is some of the highest value farmland in the region. The DPC ESP estimated a loss of roughly 8,000 acres from the tunnels configuration with 5 intakes in this region would displace $10 to $15 million of annual production. Alternative 4 is estimated to only impact 5,600 acres with the 3 intakes, and

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[4] See page 5.1-16 of the Statewide Economic Impact Report available at http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Draft_BDCP_Statewide_Economic_Impact_Report_8-5-13.sflb.ashx

[5] See page 145 of the Economic Sustainability Plan, or Figure C, page 14 of Executive Summary of the Economic Sustainability Plan.

[6] The DPC ESP estimated that the $795 million in lost direct Delta agricultural production results in $2.6 billion in total economic impact in the five Delta Counties considering direct impacts as well as value-added manufacturing such as wineries, an output multiplier of approximately 3.3. The range of $100 to $400 million in total annual economic impacts is based on applying this multiplier to the range of $32-132 million loss in direct revenue from CM 2-22.

thus the direct impact would be $7 to $10.5 million using the estimates in the ESP, up to two times higher than the figure relied on in the EIS/EIR. Furthermore, the estimated $7 to $10.5 million loss does not take into account the broader impacts of construction, such as disrupting transportation and other services that support production on agricultural land, which would not be directly displaced by construction, as well as impacts on structures and facilities that support agricultural production on surrounding land. While the EIR/EIS correctly notes that these impacts are not included, it should be stressed that the effect of omitting these important economic impacts means that all of the quantified economic impacts are lower than will actually occur. The actual economic impacts of the BDCP on the Delta communities will be significantly greater.

The EIR/EIS underestimates permanent loss of agricultural production during operation and maintenance of the isolated conveyance facility at only $3.8 million (page 16-174). Based on the analysis in the DPC ESP, the actual gross revenue loss for an estimated 4,500 acres permanently removed from production due to the isolated conveyance facility would be $5 to $8 million. These figures are only based on the land directly removed from production. Impacts resulting from disruption and damage to transportation, support and processing infrastructure during construction and operation of the facility would add to these totals. In addition, agriculture in the Delta, including Sacramento County, will be harmed from increased levels of salinity resulting from the operation of the Delta tunnels. The EIR/EIS water quality chapter claims that the impacts of the tunnels on salinity will be minimal based on the BDCP's modeling, but these results are strongly disputed. Furthermore, the State has repeatedly violated current water quality standards in the Delta or relaxed standards in dry years such as 2014. Given this history of weak enforcement in the current system, the tens of billions of dollars borrowed to build the isolated conveyance system, and the fact that this debt will be repaid from revenues of water sales from the Delta, the risk of BDCP actually operating differently than described in the EIR and serious degradation of Delta water quality through excessive north Delta diversions is great. The DPC ESP modeled plausible scenarios where increased salinity as a result of the tunnels could reduce agricultural gross revenue in the Delta by $80 million per year. It is impossible to know exactly what the effect of the tunnels will be on Delta water quality as it depends upon the future actions of agencies under heavy political and financial stress. However, the EIR/EIS should at least acknowledge a risk that losses to Delta agriculture from implementing the BDCP could be 20-25 times greater than estimated in the EIR/EIS.

The EIR/EIS underestimates long-term loss to the recreation economy from the construction and operation of the isolated conveyance facility, and these impacts disproportionately harm Sacramento County. The EIR/EIS accurately conveys the devastating impact of the tunnels on recreation activity during the construction period; many of the most harmful impacts would occur in Sacramento County locations in the North Delta. The EIR/EIS correctly notes in the construction impact section that (page 16-167, lines 23-25)

> recreation-dependent businesses including marinas and recreational supply retailers may not be able to economically weather the effects of multiyear construction activities and may be forced to close as a result.

Despite the predicted permanent closure of recreation providing businesses from construction, the EIR/EIS rather remarkably predicts that the effects on recreation during the operation and maintenance period will be minor. Recreation businesses that close during a decade of construction are unlikely to reappear once the tunnels are operating. The facilities will deteriorate during the closure period, and, as found in chapter 10 of the DPC ESP found that the flood zone and other regulatory constraints in the Delta make it difficult if not impossible to build new facilities, even in the EIR/EIS optimistic assumption that recreational visitors will choose return to a Delta that has been so significantly altered by the presence and operation of the giant diversion structures.

The EIR/EIS underestimates the negative impact of BDCP on community character in the Delta. The EIR/EIS suggests that the temporary economic impacts from construction activity would have positive impacts on community character, but this prediction is based solely on redundant numbers of temporary construction jobs. In many places, the devastating impacts on community character from construction, including abandoned buildings, are correctly identified. However, much like the recreation sector, the community character discussion seems to suggest these effects are temporary – when it is likely, and much more reasonable to assume, that the severe impacts from a decade-long construction project will persist for decades and could lead to permanent blight and decline.

The EIR/EIS overstates the positive impact of BDCP on South-of-Delta Hydrologic regions. The socioeconomic impacts of BDCP on agricultural areas South-of-Delta are likely to be negative. The EIR/EIS focuses on optimistic and qualitative estimates of the water supply reliability benefits, and ignores the cost of constructing the facilities. However, other BDCP studies show that the economic benefits of the BDCP to south-of-Delta agriculture will be far less than their cost to finance the tunnels. Most notably, the BDCP Statewide Economic Impact Report estimates (page 5.1-21) that implementing BDCP will increase gross agricultural revenue in areas south-of-Delta by only $134 million per year. If the gross revenue change is only $134 million, the net revenue change – not including increased water supply costs – will be far below $100 million.

BDCP estimates debt service and operations and maintenance of the tunnels will result in annual costs of approximately $1.2 billion to the water contractors, and alternative estimates have ranged as high as $2 billion per year. BDCP chapter 8 and most other BDCP documents state that the costs will be allocated proportional to water received. This suggests the share of costs allocated to south-of-Delta agriculture will be at least 60% of the annual debt service and operating costs, which range between $1.2 billion and $2 billion in reports prepared for

Westlands Water District and other contractors.[7] Thus, agricultural users' share of the annual costs would be at least $700 million per year and plausibly exceed $1 billion. When these annual costs of nearly $1 billion to south-of-Delta agriculture are compared to the BDCP's estimated $134 million increase in agricultural revenue in these regions, it is clear that BDCP is likely to result in economic harm to south-of-Delta agriculture. Even the BDCP's best-case scenario would have debt service costs to farmers that are more than five times higher than the estimated change in gross revenue, so implementing BDCP would result in a significant net economic loss to agricultural contractors south of the Delta. Thus, the EIR/EIS conclusion that BDCP will provide economic benefits to south-of-Delta agriculture is contradicted by BDCP's own documents.

Chapter 30 of the BDCP EIR/EIS briefly mentions the likely effect of the excessive agricultural costs. The EIR/EIS states (page 30-40) that financing agreements for the BDCP could result in transfers of water from agricultural to urban users so that urban users would pick up a larger portion of BDCP costs. While the EIR/EIS does not estimate the magnitude of the transfers it predicts, the size of the difference between benefits and costs for agricultural users suggest that the water transfers could be substantial. However, the EIR/EIS does not discuss the environmental and economic effects that would result from the water transfers that would be forced by BDCP financing. Much like the impacts of a drought, the water transfers contemplated by the BDCP would result in fallowed fields and increased pressure on already overdrafted groundwater resources. This is just one of the critical areas where the failure of BDCP to complete an implementing agreement or financial plan undermines the credibility of the analysis in the EIR/EIS.

The overstatement of south-of-Delta benefits is not limited to agriculture. In the absence of Delta conveyance, the Metropolitan Water District's plans indicate that it would develop at least 500,000 acre feet of additional local water supplies.[8] Building these alternative water supplies would create thousands of jobs in South-of-Delta area that will not exist if BDCP is implemented, a socio-economic loss that is not accounted for in the EIR/EIS. In addition, since these substantial new water supplies would not be developed, the EIR/EIS overstates the benefits from water supply reliability because it ignores these alternatives that would be implemented without it. As stated in section 1, these additional south-of-Delta alternative water supplies should be included in the No-Action alternative.

The EIR/EIS does not consider socio-economic impacts that could result from increased flood risk in the Delta from implementing BDCP. BDCP would result in dramatic alterations to flood control systems in Sacramento County that could increase flood risk in the region. The BDCP would make large alterations in levees for both the conveyance and habitat elements that

[7] See November 20, 2013 presentation to Westlands Water District posted at http://www.mercurynews.com/ci_24795356/delta-tunnels-plans-true-price-tag-much-67

[8] See Metropolitan Water Districts Integrated Regional Plan at http://www.mwdh2o.com/mwdh2o/pages/yourwater/irp/IRP2010Report.pdf

increase socio-economic risk in Delta communities such as Sacramento County. The conclusion of the DPC ESP states the following finding: "Levees are the fundamental infrastructure that supports the Delta and its economy." (page 278) In addition, as discussed in Section 1 of this review, the BDCP fails to consider alternative approaches such as seismic levee improvements to meet the project goals and objectives that would result in substantial flood protection improvements throughout the Delta, including Sacramento County. Chapter 10 of the DPC ESP identified inadequate flood protection and a complex regulatory environment as the biggest constraints and barriers to new investment in Delta legacy communities. Furthermore, the same catastrophic flood events that concern BDCP due to their effect on water exports would lead to devastating losses of lives and property within Delta communities. The socioeconomic chapter of the EIR/EIS completely ignores this flood risk to the Delta, and thus it ignores how the BDCP proposed project increases the risk to communities through the alteration of the levee system, and the BDCP ignores alternatives that could simultaneously protect Delta communities and water exports through levee upgrades. .

Summary

The socio-economic analysis in the BDCP EIR/EIS fails to properly analyze the dramatic socio-economic impacts of the BDCP on Sacramento County and the Delta region. The EIR/EIS incorrectly defines both existing conditions and no-action alternative in a way that minimizes the BDCP's actual effects and fails to develop reasonable alternatives that would be less harmful or beneficial to Sacramento County and other in-Delta stakeholders. The EIR/EIS badly underestimates negative impacts on Sacramento County and in-Delta communities by failing to use the most current and best available data to evaluate economic impacts, and by failing to quantify the largest direct negative impact – the loss of agricultural land to CMs 2-22. In addition to underestimating the negative impacts on Delta communities, the EIR/EIS overstates the socio-economic benefit to south-of-Delta regions by completely ignoring the enormous costs of constructing CM 1. Finally, the EIR/EIS does not properly identify the critical socio-economic importance of flood control and the Delta levee system, and the substantial socio-economic risks of implementing BDCP over alternatives with superior flood control benefits.

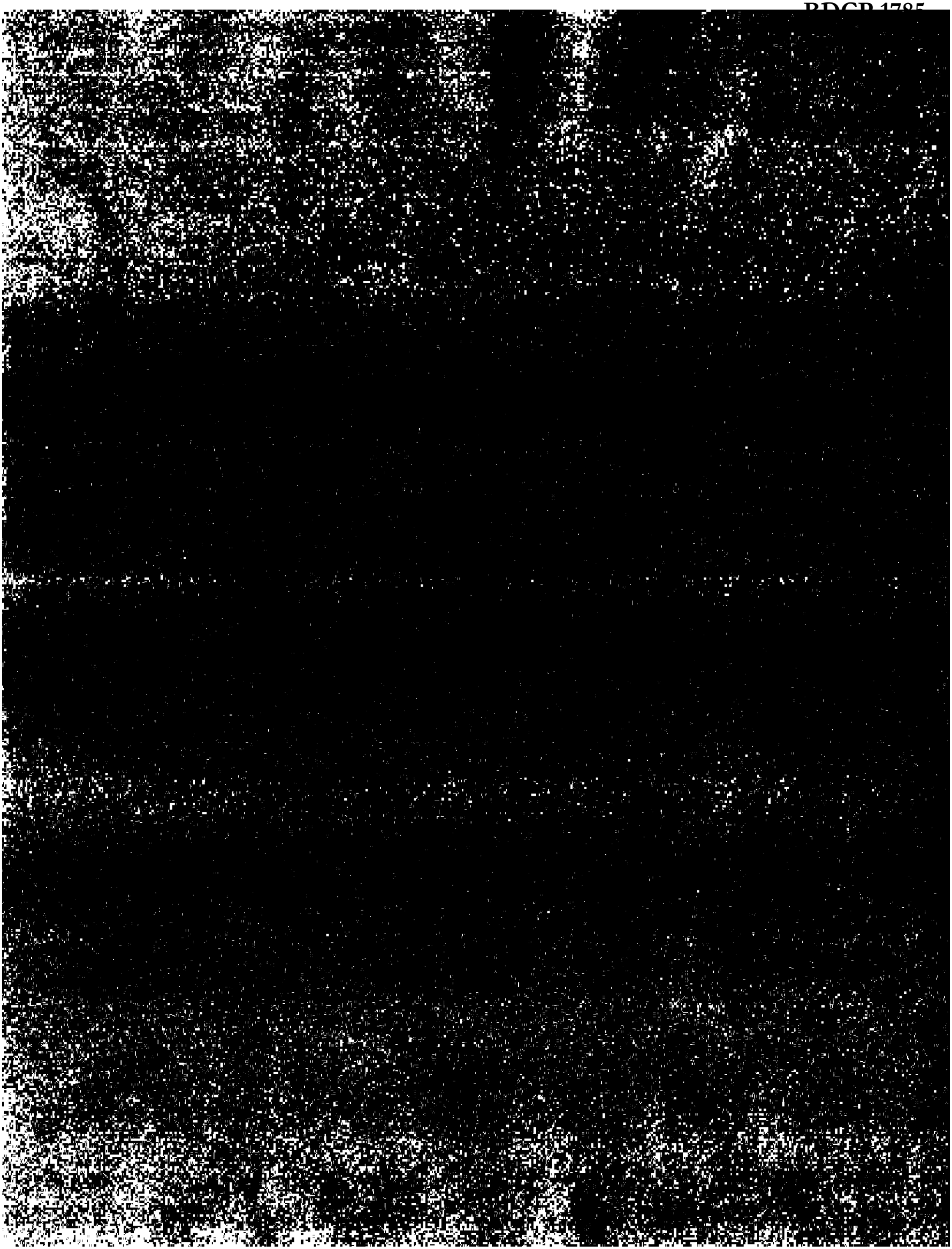

EXHIBIT I

Historical Society Newsletter

June 1994

BDCP 1785

Sacramento River Delta Historical Society
NEWSLETTER

"For what is the present, after all,
but a growth out of the past."
— Walt Whitman

NEWSLETTER Vol. 14, No. 1 JUNE 1994

SOCIETY NOTES

On January 17 our annual potluck dinner was held in the Jean Harvie Community Center Auditorium. JoAnn Wiseman and Cathy Hemly combined another time to produce a spectacular evening. JoAnn, as general Chairperson, calmly organized and presented a meal enjoyed by all who attended—all of them good cooks. Cathy produced the program and decorations which were most pleasant. These ladies had help with the arrangements from veteran helpers—Gene Wiseman, Jerry James, Leonard and Lillian Souza, Don and Jan Quesenberry, Jerry Watherworth, Ann Sorells, Becky Wheeler and the all-time Community helper Francis Mulvihill. Our heartfelt thanks for an evening of pleasure and education. The program, REBUILDING ROSEBUD, was presented by John and Cheryl Cox and their very creative architect, Bob McCabe. Even the highest expectations among the audience were met. The story from the devastating fire in 1990 to the present restoration is fascinating and was colorfully presented. The restoration took three years of time and toil and trouble. The tale drew empathy from fellow restorers and admiration from the rest of the audience. (See article on page 2.)

The Sacramento River Delta Historical Society officers for the 1994 year were announced. Leonard Souza, President; Cathy Hemly, Vice-President; Terry Alchorn, Recording Secretary; Carol Watson, Corresponding Secretary; and Clarice Jonson, Treasurer. The Directors are Becky Wheeler, Robert James, Tom Herzog, Jerry Waterworth, Gene Wiseman, Jim Tracey, Jim Dahlberg, Marshall Pylman, and newly elected Robert Arceo. Robert replaces Don Quesenberry whose shoes will be hard to fill. Don has done a lot of hard work for the Society over a long period of time and deserves a large vote of thanks and appreciation.

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The March meeting was held in the Jean Harvie History Resource Center on March 21. Mark Morias told the story of the Giusti family and their resort located on Snodgrass Slough. Mark presented the story in his own inimitable style, and members of the audience contributed stories of their own. It was a fun and fascinating evening. Refreshments were served to a capacity crowd by Jim and Barbara Dahlberg—another big job well done! Our thanks to Cathy Hemly for arranging the meeting, to Leonard Souza for setting it up and to the Dahlbergs for the refreshments, not to forget Mark Morias and his first-class presentation. (For more details see article on page 4.)

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People are borrowing some of our library research work, and it would be nice if they left a note so we would know where to find it. In the age of the copier, anyone is welcome to a copy of whatever we have, and we hope people will give us copies of historically significant papers that they want to keep. PLEASE RETURN ANY BORROWED PAPERS—ESPECIALLY THOSE NOT SIGNED OUT!

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We really appreciate all of your support at meetings and throughout the year. It is MEMBERSHIP time again—don't forget to renew.

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HELP WANTED. SOUND FAMILIAR? WE NEED HELP IN CUTTING, SORTING AND FILING NEWSPAPER ARTICLES, PICTURES AND OTHER SUNDRY ITEMS. NO EXPERIENCE NECESSARY. WE WORK FROM 10-12 NOON ON THE FIRST TUESDAY OF THE MONTH AND AT OTHER TIMES WHEN WE CAN. PLEASE HELP.

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Our President, Leonard Souza, led us on a tour of the Witter Ranch for our May Meeting. Over 25 attended and many brown-bag picnicked on the well-kept grounds. Participants reported that the weather cooperated and a most pleasant evening was enjoyed by all. The tour included the barn complete with a horse, turkeys and rabbits. Our group was given the opportunity to see the inside of the house, to which the general reaction was, "It's just like home." It is a ranch home of the 1920's. It is a truly beautiful@ spot and a marvelous tour for grandchildren.

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ROSEBUD REBUILT

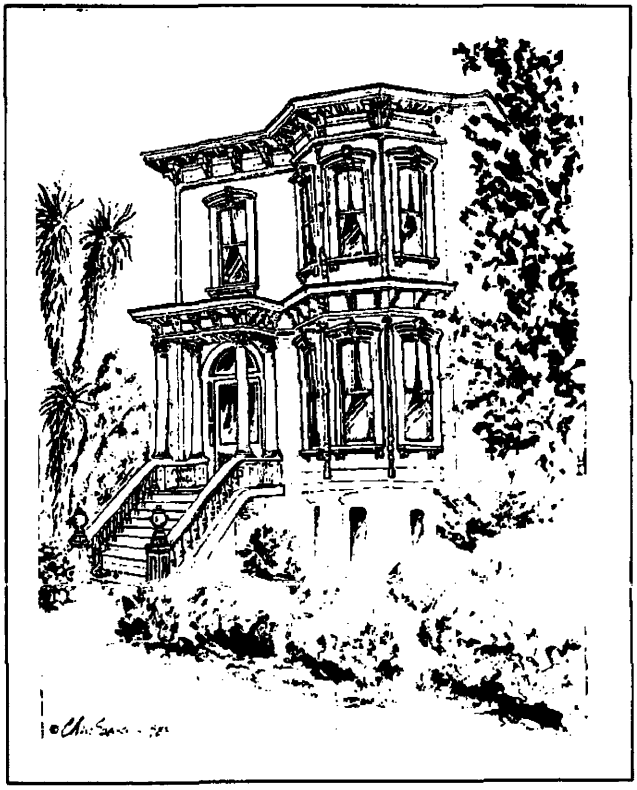
Cheryl and John Cox and their architect, Bob McCabe, presented the spellbinding story of the restoration of Rosebud.

John Cox pointed out that "Rosebud" has a mystique of its own apart from the people who have owned and occupied it. This feature must have prevailed on the November night in 1989 when the Courtland Volunteer Fire Department arrived to find the house engulfed in flame and decided to fight and save what they could. The Coxes were in New York and were told the house was demolished. They were very pleased to see something standing and many things protected — enough was left to investigate rebuilding!

Its original owner, William Johnston, a typical forty-niner, spent time in the gold fields, bought a hotel which burned down and then came to the Delta with a 160-acre homestead which over time became 1600 acres and a beautiful home called Rosebud Rancho. The home was family owned from 1857 to 1968. There have been five different owners since 1968—all of whom are interested in the welfare of Rosebud.

Rosebud was designed by Nathaniel Goodell, who also designed the historic Governor's Mansion. It was either started or finished in 1858 at a cost of $9800. The Coxes bought the house in 1987 complete with water tower and a blue exterior paint job on the south and white on the north. By 1989 there had been some interior cosmetic work and the outside painted all white — until the fateful November night when the whole thing was blackened. Much of the original furniture was lost.

It took a year to find architect Bob McCabe, sift through the ashes and retrieve everything useful, preserve what could be used again and locate craftsmen to begin the job.



Rosebud had been on the National Register of Historic Places and the hope was to return it to that status—not an easy task. There was a lot of cooperation—the State Fire Marshall's office agreed to leave some charred wood in place if it was completely supported and bondoed over. The plasterwork casting of center medallions and friezes were made in San Francisco by the same firm that worked on the Capitol Restoration. Painting of the 10 plaster rosettes was done locally. As much of the old work was saved as possible. This created a great deal of joinery work. Two were sculpted from photos, two were saved, five were pieced together.

After the building was put back together then the furnishing began. Many interior decorating skills were combined in this gigantic project: Interior designing, wallpaper selection, fauxgraining, mahogany decoration (real and faux) and shopping. As much of the old was saved as possible. Many of the "blended" items are impossible to identify without help.

The original plans included a "widow's walk" on the top of the house. This part of the house has a deck with a BEAUTIFUL view. Throughout the restoration there were constant infusions of time, money and patience. Cheryl Cox admitted it was a full year into the project before she could see that they would live in the house again. There are 10 rosettes. All the fireplaces had to be taken down and then put back together. Two original double doors were mounted and two pieced together. It may be twenty years before all the restoration and modernization is complete. It is amazing how much of the flavor of the grand old house is maintained in the "new" dwelling. The exterior paint is the original rose color with the maroon trim a shade lighter than the original.

The Coxes and their helpers deserve a great deal of credit and admiration for a tremendous project WELL DONE.

BDCP 1785

GRAND ISLAND

Upper Grand Island to Howard Landing Road

Grand Island, as its name implies, is the largest island in the North Delta. It is bounded by Steamboat Slough on the West and the Sacramento River on the East.

Shortly after settlement in 1850, an initial attempt was made to reclaim the upper island by Josiah Greene, Rueben Kercheval and James Collins. In 1861 the first Delta reclamation district was organized. Grand Island #3 and the first levees were built. Constructed in part by Chinese laborers, the levee at its highest was 8 feet and built with sod bricks like the levees in China's Pearl River Delta. The narrow levee was set back from the river berm. A small portion of this original levee can be found near Howard Landing. This levee was later built up using a Fresno Scraper, an early land leveler, used to drag soil. By 1875 the steam-powered floating dredge was introduced to build levees and a year later, in 1876, the Stockton Ironworks manufactured the first side-draft dredge with clamshell bucket. It was this dredge which through the years built the levees to their present level. Grand Island Reclamation District #3 owned its own such dredge. The levees on upper Grand Island are sand, which carries great weight and can be built high and which compacts well.

Before the modern system of upstream dams were constructed, the water in the river system rose high in winter and dropped low in summer. So low that sandbars were common. Large scale flooding was recorded in the Delta in 1878, 1881, 1890 and 1907. Grand Island was not spared but, in 1907, the flood engineer in Sacramento reported that all but Merritt, Grand, Randall, Sutter, and Upper Tyler islands had flooded. To attempt to head off flooding at Ryde, a wingdam was built to divert the flow, and although the island was reclaimed, there remained in its low saucer-like center shallow Beaver Lake surrounded by tules and fed by small and slow-moving Beaver Slough.

In the early years, ferries connected the island to its neighboring islands. There were once ferries at the foot of the island; the triangle ferry which connected Rio Vista, Grand Island and Brannan Island; the Isleton ferry; the Walnut Grove ferry; the Howard Landing ferry. Only Howard Landing survives. Fares at the Walnut Grove ferry in 1886/89 were:

Pedestrian	$.10
Rider and horse	$.25
Wagon or buggy with horse	$.25
Wagon and two horses	$.50
Wagon and four horses	$.75
Sheep, hogs and goats	$.15 (each 1-9)
	$.08 (over 10)
Other loose livestock	$.20 (each 1-9)
	$.15 (over 10)
Separator	$2.00
Steam engine	$2.00
Barley cooker	$1.50
Cook Wagon	$1.00

In 1906 the first bridge was built linking upper Grand Island, near the head of Steamboat Slough, to the Pierson District. A pivot bridge, the tender risked serious injury if the bridge slipped its moorings and didn't lock properly. In 1916 the first counterweight bascule drawbridge west of the Mississippi River opened at Walnut Grove. At the grand opening Governor Hiram Johnson cut the ribbon. In 1923 the Isleton Bridge opened and in 1924 the Steamboat Landing Bridge connecting Sutter and Grand islands opened. At this time the graded sand levee road was paved with concrete. State Highway 24, dubbed the "Victory Highway," traveled the east levee from Steamboat Landing to the Isleton Bridge. Highway 12 crossed the island from Ryde to Howard Landing.

Since the early 1880's the river has split Walnut Grove, the west bank being the younger settlement. In the early 1920's Bob Clampett bought marshy land from Robert Kercheval, drained it and sold lots. Known as "Clampettville" after World War II its appellation changed to Clampett Tract. Except for the three churches, St. Anthony's (1930), Walnut Grove Community Presbyterian (1956), and the former Christian Science Church, the area has remained mainly residential. On the levee use is mixed commercial-residential. Among the businesses that have populated the levee in past years were Veteran's Garage which had a blacksmith's shop in the basement, Butschy Brothers Body Works, the Studebaker Auto Agency (later Ford Agency), Molino's Chevrolet and Appliances, Morais's Central Market, and Addie Brown's Bakery. On the river side of the levee was a packing shed and/or cannery roughly opposite Veterans, the Texaco wharf roughly opposite Butschy Brothers, the Grove Inn which served short-order meals and was situated next to the bridge, downstream, which blocked the view of the bridge approach. Opposite the bridge was the ferry tender's house. Now occupying a site to the rear of the old Studebaker/Ford Agency, the Catholic Convent was between Veteran's Garage and Komoorians Cleaners.

Principal crops grown have been pears and field crops such as tomatoes, sugar beets, wheat, barley, field corn, safflower, and alfalfa. In the past stone fruit was farmed as well as pink beans, asparagus and celery. These were all shipped to market, by river boat and railroad in the early years and since the late twenties and early thirties by truck and rail.

(See GRAND ISLAND, Page 6.)

P3

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GIUSTI'S

Mark Morias, entertainingly and with pride and pleasure, told the story of his family and his restaurant at the March meeting. Three brothers born in Lucca, Italy, immigrated to America in the 1880's. They were Paul (Paolo), Mario and Pete (Pietro) Giusti and they settled in the Ryde-Walker Landing area. Paolo, the eldest, opened the first bar/saloon at Walker Landing. He next opened the first hotel at what later became Ryde.* For several years the brothers traded off managing the hotel, salon and trips to Italy. Around 1912-13 they moved the business to its present location on the back of Tyler Island where Snodgrass Slough flows into the North Fork of the Mokelumne River, just above the Walnut Grove Thornton Road. When Egisto, the youngest brother, came to the Delta, the older brothers moved on and Paul gave Egisto, who became the Grandfather of Mark Morias, the restaurant/saloon business.

The Brown family owned the buildings—the original bar, a separate house and kitchen. There were six rooms downstairs—sleeping quarters and storage area. There was also a dock and a wharf. In 1928, Egisto married Irene Imhof Simoni, a widow. They lived at Giusti's and imported a cousin from San Francisco, Julio Pieretti, to be the first chef. He was chef until 1953. Grandfather ran the bar, restaurant and the ferry. When the original bridge was built it was not motorized. It was opened by man power, six or eight men. Usually bar customers cranked it open. It took 48-72 hours notice. They charged $10 for a drink and dinner—family style.

In the 1940's Moe Morias from Ryde courted the Giusti's daughter, Dolores. After they were married, from the 1950's to the 70's, they were the proprietors along with Grandmother Giusti who had lived on the premises since 1928. At 240 pounds there was some concern about her falling through the floor but she never did. She spent most of the time in the kitchen. When she died in 1971 Moe and Dolores operated Giusti's. Dolores' birthday parties, where her sister Lorraine played the accordion, were held on the porch, which slanted even then. In 1954, Julio Pieretti died and Giusti's began charging for food. When the Ryde Hotel closed Lo Giannetti became the bartender at Giusti's and Louise Giannetti became the cook. By 1954 there was a menu and daily meal service. Employees included, among others, Dorothy Slauson, Emma Herchcorn, Donna Lane and the cook, Ruth Cazier.

Was Grandfather a Bootlegger? Stories that he was raided were not substantiated. The family belief was the he was never bothered because he "knew the people." There was a collection of 100 proof liquor, bonded and green label and lots of rumors, but when asked about grandfather doing time, Mark said he doubted it. Through the 40's and 50's, there were many BIG parties, including politicos and law enforcement people, sheriffs department and game wardens. The menus included blackbirds, robins and polenta.

In the "good" or "bad" old days however you looked at them the water had a lot of sulphur—and wine was added to hide the flavor. This made drunks of the children. There were chicken coops and herb gardens in the present parking area and fig trees. Figs and prosciotto were a number one Italian antipasto. Italian custom called for a "little Easter" the Monday after Easter. Originally the meals were individually prepared. When Louie Rider was cooking he was smashed early in the evening—finally found out there was sherry in his coffee. The soup was always burnt on Tuesday—seems the chef overslept after Monday off and to make 60 gallons of soup in a hurry ended with burnt minestrone.

Meanwhile young Mark went to college. He came back to work during the summer of 1972 and somehow is still there. He has been running Giusti's for 20 years. His comment about hanging it up in a couple of years did not set well with the audience. The lease for the building with the Brown family came due in 1975. At that time Art and Myron Brown sold the building to Mark. Mark's mother died and his father, Moe, opened The Liquor Store in Walnut Grove and had plans to rehabilitate the Walnut Grove Hotel and Mark ran Giusti's. The Walnut Grove Hotel burned down in 1970. Mark learned the most by being there—working in summers, washing dishes, pumping gas, watching the bartender and getting some recipes.

After he took over Mark was able to make some changes—slowly. He got tired of seeing people in the bar talking to Moe, having a couple of drinks and then off to Tony's or elsewhere to eat, neither did he like patrons tramping through the bar and out the door of the restaurant's only entrance. Fifteen years ago he put the two buildings together so it is now a bar and restaurant combined. Basically, the building is original as built in 1900 with porches added. It was remodeled in 1935, Knotty Pine in Bar which was originally smaller and off to the right. The large back bar was added later. The refrigerator built in 1935 lasted until the early 1950's when a refrigera-tion unit was installed. In 1970 a swamp cooler was replaced with an air cooler in the restaurant. The resort had been open seven days a week and began to close on Monday, with lunch Tuesday through Friday and now a small lunch menu on Saturday and Sunday. The House wine was a "dago red" Petri forever but Italian Swiss Colony bought Petri and Pestoso was discontinued three or four years ago. The Carafe wine is now a Tabari Vino Rosso.

(continued on page 5.)

GIUSTI'S (continued)

Mark remembers being in Mexico in February 1986. When he phoned home he was told to get here as fast as possible. After making his way by Antioch and Tyler Island he got by S&W Tires to get some of the downstairs things and watch the water get closer and closer to Kruses. The building was protected, it settled a bit but remained sound and survived.

The bridge finally opened on the first Friday in May and then the State decided to plant some fish. The tanker truck backed onto the open bridge and sank the bridge. It opened again in July!

Moe collected people and thus created the "Wall of Fame." The best known celebrity was Earl Stanley Gardner of Perry Mason fame. The bell, on the right by the piano, was taken from the old bridge when it was replaced. The builders lived at Giusti's and the bell was stowed in the basement. Eventually Moe got help to move the 1500-pound bell, cast in Baltimore in 1916, into the bar, where it is used to announce the "last call" or a round of drinks. There are old menus and pictures. Mark keeps the books, as his Grandmother and Mother did, on a daily basis.

Giusti's had a number of habitues over the years, Brownie and Jack Molino, Ernie Cossi, numerous relatives, domino players, i.e., Sid Ising, Phil de Back, Lo Giannetti, Bill Beck and other patrons like Al Reed, George Buckley and Jack Burchell Sr.

The evening ended on memories of charismatic Moe, popular Dolores and others. Someone remembered being urged to drink in order to get Mark through college. One man remembered(?) his bachelor party on a Wednesday night when he got involved with bourbon, wine and Brandy Alexanders. He awoke on Friday in time for his Saturday wedding. Giusti's has been a "fun" place for a long time and leaves us with the feeling that perhaps charisma is genetic.

*(NOTE: In the Ryde Gazette there is a picture of the original Ryde Hotel built in 1886 by Paul Giusti and brothers. It was located south of the present structure. The business functioned with sleeping rooms, bar and small kitchen until its demise in 1918 when it was destroyed by fire.)

OUR JEAN*

When Jean was just a little girl
She watched the birds,
And listened too.
Caught the song that each one sang;
And loved it when the churchbells rang.
She swam the river unafraid,
And wondered how this world was made
And why the sky is blue.

Jean ran the bases of life's game.
Not stopped by fear, she'd hit the ball
Away out there
To help a friend bring in a run!
Then shared the trick of what she'd done.
Taught as she learned—
The game, the rules, the songs, the fun!

She's still that learning, caring Jean.
We love her for her listening ear.
We love her for eyes that see
So much of all that's beautiful.
And finally
We love indeed that "off and running" Jean—
That Jean she was, and is,
And that she'll always be.

**Written by Mary Joy Entwistle*

Jean Harvie, who passed away on Wednesday, February 16, was a "legend in her own time." She had a knack of knowing what her community needed and also being able to fulfill those needs. Jean was born in Rio Vista, attended Canright Elementary School, Beaver Union Rio Vista High School and San Francisco State College. She lived in Isleton and worked in Walnut Grove so her community was the heart of the Delta. In 1977 Jean determined a need for a local historical society. She gathered community leaders from Freeport to Collinsville, organized a workshop and joined in creation of the Sacramento River Delta Historical Society. Both the Society and its offshoot, the Dai Loy Gambling Museum in Locke, flourish today. All of Jean's projects will survive, but we will miss her enthusiastic support.

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GRAND ISLAND (continued)

Upper Grand Island children attended school at Onisbo (1860-1914), Walnut Grove (1861-1967), Ryer Island, Walker (1910-1921), Grand Island (1882-1921), Good Hope (1894-1921) and Beaver Union (1921-1967). After that they attended the Bates Elementary School in Courtland or Walnut Grove Elementary.

Early settlers and principal land owners on Grand Island were Kercheval, Cook, Shelley, Stambaugh, Bogle, Collins, Smith, Meyer, Davis, Johnson, Reynolds, Williams, Hollenbeck, Leary, Goldman, Volman, and Giovannoni. Followed by Kesner, Graham, Seymour, Gwerder, Darsie, and Hutchinson. Some of the early settlers left houses which remain today. Others have long been gone. Among notable residences that have been lost are those of Rueben Kercheval, Robert Kercheval, Russell Graham, Will Metsen (the Kercheval attorney in San Francisco), Kesner, Rugaard, Smith, Stambaugh, Shelley, Coggeshall and Volmans. Among those which remain are Hartley Kercheval, Howard Kercheval, Darsie, John Brown, Crewe, Davis, Goldman, Durbin, Stewart Brown, Stanford Brown, Barry, Hutchinson, Henry Meyer, Collins, Edward Meyer, Frank Kerchival, Porter, Cunha, Hollenbeck and Seymour.

Stay tuned for the December Newsletter when we will complete Lower Grand Island below Howard Landing Road.

TO DO

PEAR FAIR Historical exhibit Courtland Sunday July 31. 10:00-5:00 am.

WITTER RANCH Now available by appointment. Write or call Witter Ranch 3480 Witter Way, Sacramento Ca. 95834 (916) 927-4116 or call Leonard Souza.

LOCAL MUSEUMS in Locke, Galt, Elk Grove, Antioch and Rio Vista.

GALT HERITAGE DAYS June 17-19

TO DO

THE CHINESE IN SACRAMENTO exhibit at the Discovery Museum (formerly Sacramento History Museum), 101 I Street, Sacramento. Wednesday-Sunday, 10-4:30, until September.

FOLSOM. "A Century of Women in Folsom (1849-1949)." Vintage clothing and Photographs. Folsom History Museum, 823 Sutter Street. Wednesday-Sunday, 11-4.

OLD CITY CEMETERY. Free tours weekends at 10 a.m. except June 19, July 2 & 3 and September 3 & 4. 10th and Broadway, Sacramento.

CONSUMNES RIVER PRESERVE, Twin Cities Road to Franklin Boulevard, south on Franklin for one mile past Desmond Road. Will Slough trailhead is located on your left 1/2 mile past Desmond Road. The office, with historical exhibits, is in a barn located off Desmond Road.

YOLO SHORTLINE portion of the original Sacramento Northern. Train rides from Woodland to West Sacramento and return. Adults $10, Seniors $8, Children $5. July 16 and August 27, special trips to Clarksburg. (916) 372-9777 for schedule and tickets.

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