COMMENT LETTER OF C-WIN, CSPA, AND AQUALLIANCE

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RE: Comment Letter No. 1: - BDCP and Associated EIR/EIS Related to Habitat Restoration and Conservation Measures

Dear Mr. Wulff,

C-WIN, CSPA, and AquAlliance submit the following comments on the Bay Delta Conservation Plan. We incorporate by reference the comments submitted by Bill Jennings for CSPA and the comments of the Central Delta Water Agency, the County of San Joaquin, the Environmental Water Caucus, Friends of the River, and the South Delta Water Agency.

INTRODUCTION

The Bay Delta Conservation Plan (BDCP) is currently being developed to create a fifty (50) year conversation plan with the co-equal goals of restoring the Sacramento-San Joaquin Delta ecosystem and securing California water supplies. The plan, made of up "conservation measures" aims to improve the Delta ecosystem. Of the twenty-two conservation measures (CMs), the first conversation measure, or CM1, is the construction of a massive water delivery system known as the "twin tunnels." The theory behind CM1 is that through the construction and operation of the twin tunnels, the ecological health of the Delta would improve. Our organizations believe just the opposite – that the construction of the twin tunnels would be the final blow to an already exhausted and impaired Delta ecosystem. Our comments are aimed at demonstrating the very real harm and imminent risk of this project's approval and implementation.

The Delta water system is made up of inflow and outflow of water from several waterways through various tributaries and out through the San Francisco Bay. Flow of water – at specific times, at specific temperatures, and at specific rates – is critical habitat to a plethora of fish and wildlife living within the estuary. The BDCP proposes to increase water supply reliability by diverting the Sacramento River through twin 40-foot tunnels under the Delta for export to the San Joaquin Valley and Southern California. It also proposes creation of approximately 150,000 acres of new habitat in the Delta to restore the estuary and offset adverse impacts from diverting vast quantities of water around the Delta. The BDCP Conservancy Strategy also identifies some 222,902 acres of existing conservation lands in the plan area. These include properties managed by conservancies and land trusts, agency restoration sites, designated biological mitigation sites, wetlands owned or managed by agencies or private parties, conservation easements, parks, and lands associated with implementation of HCPs and NCCPs.[1] The costs of tunnel infrastructure will be paid by the state and federal water contractors while the vast majority of habitat restoration costs will be borne by the general public.

Delta Habitat

Delta aquatic habitat has been greatly altered by 150 years of reclamation. Between 1930 and 1943, an average of 82% of estimated unimpaired flow reached San Francisco Bay. In recent years, unimpaired flow has declined to less than 50%.[2] The majority of the tidal marsh, slough, and open water habitats were reclaimed or altered by a vast system of levees and connecting sloughs by the second decade of the last century. More recently, two major ship channels were carved through the Delta. However, these changes have only exacerbated the vast alteration of natural habitat thanks to water diversions through the Central Valley Project (CVP) and State Water Project (SWP). Massive diversions of water through the CVP and SWP to the San Joaquin Valley and Southern California preceded a precipitous decline in pelagic and anadromous species, including numerous species listed as endangered under State and Federal laws. A number of fishery scientists now refer to the Delta as being in a state of perpetual drought. The number of years of critically low inflow to the Bay has more than tripled to 62% of the time since the 1930s.[3]

In 2010 the State Water Board convened a comprehensive proceeding, mandated by the State Legislature, to study the development of flow criteria for the Delta. The proceeding included testimony and evidence by agency and independent scientists, academia, water agencies and public interest groups.[4] The conclusion found by the State Board was that 75% unimpaired flow is needed to protect public trust resources and estuarine health. The California Department of Fish and Wildlife, under a similar legislative mandate, reached similar conclusions.[5]

The BDCP proposes approximately 150,000 acres of habitat restoration, focusing primarily on tidal marsh restoration. Tidal marsh is proposed to provide direct and indirect benefits to Delta fish through the food web and as habitat for various fish species or specific life stages. However, Native Delta species depend heavily on the Delta habitats, especially in drier years when flows are insufficient to move their young downstream to the Bay. Delta smelt are pelagic species found predominantly in shoal and open water, and benches near the open water. Young smelt and salmon rear in brackish water in what is called the Low Salinity Zone or LSZ. This zone is

[1] Public Draft, Bay Delta Conservation Plan: Chapter 3, Conservation Strategy, Table 3.2-2, page 3.2-20.
[2] Swanson, C., WATER-Freshwater Inflow Indicators and Index, Technical Appendix, State of San Francisco Bay 2011, Appendix B, page 73.
[3] Swanson, C., The Power of Measurement, Part II: Projected Freshwater Inflow to the San Francisco Bay Estuary with the Bay Delta Conservation Plan, Swanson's Blog, NRDC Switchboard, 17 December 2013, page 2.
[4] State Water Resources Control Board, Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem, 2010, page 5.
[5] CDFG, Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta, 2010.

typically defined as 0.5 to 6.0 ppt salinity (or roughly 500-10,000 EC conductivity). The LSZ is important because it provides slightly brackish water, frequently suitable water temperatures, and abundant prey for the young fish. X2, the center of the LSZ, is measured at 2 ppt salinity. LSZ and X2 move throughout the year. The main rearing period for the young of both smelt species is late winter into early summer. After spawning upstream in freshwater, by summer the smelt tend to concentrate at X2. In drier years the LSZ and X2 are found mainly in the Delta. Therefore, it is critically important that habitat be restored and developed within or near the LSZ if the expected benefits to smelt and other pelagic fishes are to be achieved.

Young salmon begin entering the Delta as fry soon after emerging from river spawning gravels from late winter to early spring. Fry and fingerlings (25-75 mm) concentrate in shoreline areas and adjacent margin habitats including tidal marshes, sloughs, and channels. Smolt salmon (80 mm +) are often collected in open channels migrating westward toward the ocean generally in winter and early spring, but are also found feeding in margin habitats. Therefore, it is important that habitats be restored and developed along their Delta migration pathways to ensure successful passage from the river to the Bay. BDCP proposes to restore only about twenty miles of channel margin habitat over a span of thirty years.

Uncertainties of Habitat Restoration

New habitat creation is often used to mitigate adverse impacts to wildlife. When habitat is land, other land can occasionally be purchased and managed to mimic that of the land from which the animal or animals are displaced. However, this becomes increasingly difficult when the habitat in question is a precise *flow of water*. Water - flowing at a specific rate, at a specific temperature, and through specific ecosystem conditions - has no substitute.

As a preliminary matter, developing comprehensive and detailed comments on this version of the BDCP is a difficult task because of the significant and numerous flaws contained in the BDCP itself. There are few details on specific habitat restoration projects. The BDCP EIR/EIS analyzes the tunnels to a project specific level, while habitat restoration has only been analyzed at a programmatic level. 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. 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 purpose of a Habitat Conservation Plan should never be to implement an environmentally destructive private construction project like CM-1 (the twin tunnels).

Fishery agencies and scientists have bluntly questioned the likelihood that habitat creation will be as successful as claimed by BDCP proponents or whether habitat restoration can realistically offset the projected adverse consequences from increased exports and reduced outflow to San Francisco Bay. For example, the Delta Independent Science Board, in its review of the Draft

BDCP EIR/EIS and Draft BDCP Plan observed, "Many of the impact assessments hinge on overly optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration."[6] "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."[7] Likewise, the Panel Review of the Draft Bay Delta Conservation Plan, prepared for the Nature Conservancy and American Rivers said, "BDCP is too optimistic about benefits of tidal marsh and floodplain restoration for smelt, particularly the extent of food production."[8]

The National Marine Fisheries Service, in comments on the Draft EIR/EIS said, "There is too much benefit to steelhead smolts assumed from habitat restoration in the Delta."[9] The U.S. Fish and Wildlife Services wrote, "Scientific literature cited in the plan, new analyses provided by DWR, and conclusions of the independent scientific review panel have reinforced our concern that the BDCP restoration plan has not been carefully thought out and has uncertain prospects for benefiting native aquatic estuarine species, particularly delta smelt and longfin smelt."[10] Habitat restoration cannot adequately offset the loss of flow due to diversion of massive quantities of fresh water around the estuary and succeed in restoring severely degraded fisheries. In comments on the Administrative Draft EIR/EIS, the U.S. Environmental Protection Agency wrote that:

> [t]here is broad scientific agreement that existing Delta outflow conditions are insufficient for protecting the aquatic ecosystem and multiple fish species, and that both increased freshwater flows and aquatic habitat restoration are needed to restore ecosystem processes in the Bay Delta and protect T & E fish populations. This includes statements from lead federal agencies.

Habitat restoration projects have historically been fraught with problems. Much of the historical and BDCP habitat restoration has been focused on restoring tidal marsh, with recent scientific debate focused on the relative merits of tidal marsh restoration on the shallow water and pelagic food web of the Delta. The key questions are: whether smelt and young salmon use the tidal marsh habitats, whether tidal marshes contribute to food production in the preferred smelt and salmon open water (pelagic) and channel margins (shoreline) habitats of the Delta, and whether restoration projects themselves create deleterious effects and the uncertainties of funding and actual implementation.

One key BDCP hypothesis is that tidal marshes export nutrients and food web production to adjoining pelagic habitats. However, recent scientific reports question that hypothesis. The 2013 Panal Review of the Draft Bay Delta Conservation Plan, prepared for the Nature Conservancy and American Rivers, found that "[t]idal marshes can be sources or sinks for phytoplankton and

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[6] Delta Independent Science Board, Review of the Draft BDCP EIR/EIS and Draft BDCP, May 2014. Page 3.
[7] *Id.* Page A-25.
[8] Mount J., et al., Panel Review of the Draft Bay Delta Conservation Plan, prepared for the Nature Conservancy and American Rivers, September 2013, page 109.
[9] National Marine Fisheries Service, Federal Agency Comments on Consultant Administrative Draft EIR-EIS, July 2013, Page 8.

[10] U.S. Fish and Wildlife Service Staff BDCP Progress Assessment, 2013, Page 7.

zooplankton. Most appear to be sinks, particularly for zooplankton."[11] Further "even under the most highly favorable assumptions, restored marshes would have at best a minor contribution of plankton production in smelt rearing areas."[12] In the work, "The Role of Tidal Marsh Restoration in Fish Management of the San Francisco Estuary (2014), the author found that

> "[m]ovement of plankton from a tidal marsh (beyond the immediate area of tidal exchange) is likely to be limited and to decrease strongly with distance. Even under ideal circumstances, plankton in water discharged from tidal marsh cannot greatly affect the standing crop of plankton in large, deep channels. Feeding by clams and other introduced species can further reduce contributions of marsh plankton to open-water food webs."[13]

As the Delta Independent Science Board recently wrote, "[w]hether 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."[14] There is also the looming question of whether the proposed habitat can be created without exacerbating methylmercury problems. As the National Marine Fisheries Service (NMFS) found:

> There is no indication that the kinds of habitat restoration that can meaningfully contribute to estuarine fish viability can be created or restored without also methylating the ubiquitous mercury in the system because the management tools available conflict with these fishes' habitat needs. Minimization of water depth and reduction of turbidity to control mercury methylation conflict with the direct habitat needs of delta and longfin smelt and will in some locations favor invasive species such as sunfishes and water hyacinth. However, minimization of water depth and turbidity will maximize the potential for algal production and algal production will generate dissolved organic carbon (DOC). If, as the ADEIS implies, restoration sites will also be designed to minimize the export of DOC from restoration sites to minimize anoxic conditions (reducing methylation opportunities) these designs will also reduce their potential food web benefits.[15]

Despite these concerns, BDCP's preferred alternative would increase mercury concentrations and exceed tissue toxicity thresholds in largemouth bass in the Delta.[16] Increases in mercury loading resulting from habitat restoration projects would only exacerbate the problem.

This issue is not limited to mercury. Marshes are often sinks for organic contaminates like PCBs, PAHs, organochlorine compounds and organophosphate and pyrethroid insecticides.

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[11] Mount J., et al., Panel Review of the Draft Bay Delta Conservation Plan, prepared for the Nature Conservancy and American Rivers, September 2013, page 109.
[12] Id.
[13] Herbold, B. et al., The Role of Tidal Marsh Restoration in Fish Management in the San Francisco Estuary, 2014, page A-11. http://www.escholarship.org/uc/item/1147j4nz

[14] Delta Independent Science Board, Review of the Draft BDCP EIR/EIS and Draft BDCP, May 2014. Page B-39.
[15] National Marine Fisheries Service, Federal Agency Comments on Consultant Administrative Draft EIR-EIS, July 2013, Page 10.
[16] Bay Delta Conservation Plan, Appendix 8I, Mercury, Tables I-7a, I-15Aa, I-11Ba, I-11Ca, I-11Da.

Selenium is a serious problem. NMFS commented on the BDCP EIR/EIS, and noted that "[a]n expected increase in contribution of San Joaquin River water to the Delta will increase selenium loading in the Delta, especially in the southern Delta and Suisun Bay where bioaccumulation by bivalves is assured (Stewart et al. 2004). This in turn represents an increased risk of deleterious reproductive effects caused by selenium accumulation in fish and wildlife."[17] Despite this, BDCP's preferred alternative would increase annual average selenium concentration in sturgeon over the existing conditions and no action alternatives.[18]

There is also serious concern that diverting flow around the Delta and reducing outflow will expand the range of overbite clams. The Delta Science Program, in analyzing the Conservation Measures (CM) of the Bay-Delta Conservation Plan, stated that:

> Only adverse effects are indicated resulting from conservation measures in the context of invasive mollusks. CM1 [the twin tunnels project] may increase Corbula habitat by moving X2 upriver, assuming greater freshwater diversion. Given that Corbula is the more effective trophic competitor with covered planktivorous fish, this suggests degradation of habitat characteristics due to CM1. Restoration involved in CM4 (tidal wetland), CM5 (seasonally inundated floodplain), and CM6 (channel margin habitat) may increase potential benthic habitat for Corbula and Corbicula, overall exacerbating the impacts of these competitors. Tidal and shallow water habitat restoration, if invaded by Corbula or Corbicula may result in phytoplankton sinks actually worsening circumstances for fish.[19]

Tidal energy is another area of uncertainty for habitat restoration. The Independent Science Board observed that "[t]idal 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."[20] A number of agencies have expressed concerns that changes in tidal amplitude caused by creation of more open tidal habitat will increase salt intrusion in the Delta.

Given the programmatic level analysis of proposed habitat restoration, there is significant uncertainty that large-scale restoration projects will actually be implemented or implemented in a timely manner. The Independent Science Board acknowledged these concerns, noting that

> Construction and flow operations may have impacts immediately, whereas the restoration impacts and benefits may lag a decade or more after construction…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

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[17] *Id.*
[18] Bay Delta Conservation Plan EIR/EIS, Appendix 8M, Selenium in Sturgeon, Tables 8M-2, 8M-3, Page 8M-9.
[19] Delta Science Program, Review Panel Summary Report, Bay Delta Conservation Plan (BDCP) Effects Analysis, May 2012, page 60.
[20] Delta Independent Science Board, Review of the Draft BDCP EIR/EIS and Draft BDCP, May 2014. Page B-17.

> actions would no longer be present, and the final assessment of a net positive or no net negative effect would not be valid…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…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. [21]

The lack of funding commitments for BDCP's proposed restoration projects creates major uncertainties. Habitat restoration is extremely expensive. Many previously proposed restoration projects have been unable to be implemented due to lack of funding. Even when property is purchased for restoration, the inability to secure funding can stop implementation. Previous projects that have been constructed have failed because they lacked sufficient funding to maintain or adaptively manage the habitat.

Native species like salmon, steelhead, Delta and longfin smelt, splittail, threadfin shad, native phytoplankton and zooplankton, and several species introduced in the 1800s like striped bass and American shad are collapsing. While these native species are collapsing, invasive predatory species like inland silversides, bluegill, largemouth bass, overbite clams and troublesome invasive plants like water hyacinth, arundo, Brazilian waterweed, parrots feather and potamogeton are flourishing.

It is unclear whether habitat restoration can meet the physical goals and objectives of restoration. Further, it is unclear whether the contemplated restoration habitats would be appropriate for smelt and salmon. After four decades of sampling fish in Delta habitats, it is unclear whether altered habitats after levee breaching, channel digging, and vegetation planting are functioning. Further, it is unclear whether water quality been sufficient to support fish, or whether non-native invasive plants and fish have taken over these new restored habitats.

BDCP Habitat Evaluations, Conservation Goals and Conservation Measures

As discussed more fully below, the Bay Delta Conservation Plan (BDCP) conservation measures to improve important aquatic communities and habitats in the Delta Plan Area are wholly inadequate to mitigate for the expected effects of the BDCP. Furthermore, proposed conservation measures do not include protection and enhancement of the most important and affected habitat in the Delta: the low salinity zone and freshwater pelagic habitats of the Delta on which many Delta native fishes including Delta Smelt depend. These habitats are unproductive because they are quickly exported in drier years and summers of most years at the existing south Delta export facilities and thus lack the necessary residence time, nutrients, and water quality to sustain pelagic fish production.

The West Delta Restoration Opportunity Area (ROA) especially lacks emphasis for many important aquatic habitat types despite its overall importance and sensitivity to Delta exports.

[21] *Id,* page B-38, B-39.

There is no Central Delta ROA as this Delta region's habitat appears to have been largely ignored by BDCP planners for restoration despite its central location in the area affected most by the North and South Delta exports. Conservation Zone 1 and 2, the center and northern Yolo Bypass also lack emphasis and are not included in any ROA.

CM1 is essentially a water conveyance project masquerading as a conservation measure. It will reduce outflow and exacerbate already poor Delta hydrological habitat that is essential for key fish species and their critical habitats. Conservation measures CM 2-21 are only analyzed at a programmatic level, lack assured funding and are highly unlikely to achieve the predicted results. There are no assurances that proposed habitat protections and enhancements will be able to overcome the long-term detrimental effects of excessive Delta water diversions or the proposed new North Delta conveyance facilities. Indeed, the programmatic nature of the conservation measures precludes anyone from identifying the number and extent of impacts to biological resources, water quality, and other beneficial uses; let alone determining whether the conservation measures will effectively mitigate impacts.

Our review of the BDCP Conservation Measures and supporting documents provides the following specific conclusions:

Continuation of South Delta exports with higher use in drier years and seasons will continue recent population declines and will not contribute to recovery of the species, because of further degradation of existing habitats.

Wetlands proposed predominantly in Suisun Marsh, East Delta (Cosumnes/Mokelumne ROA), and Cache Slough areas will have marginal benefit to key Delta foodwebs because of isolation from the Low Salinity Zone and key pelagic habitats. Invasive clams limit foodweb production in Suisun Bay and Marsh. Reductions in North and East Delta inflows from proposed North Delta exports would reduce net transport of water and foodweb contributors from Cache Slough and East Delta. No changes to water quality standards will mean that the Cosumnes/Mokelumne ROA will become more isolated from Delta inflows from the Sacramento River than under present conditions.

CM1 lacks focus on Delta hydrodynamic factors that would provide benefits to the pelagic foodweb that would otherwise continue being devastated by North and South Delta exports. Specifically, Delta outflow remains the most critical factor in Suisun Bay and Delta portions of the Low Salinity Zone nursery areas of smelt and other pelagic organisms; under the BDCP, Delta outflows would further decline in drier year types and seasons to the detriment of the Low Salinity Zone pelagic habitat.

CM2 focuses on the Yolo Bypass, Cache Slough, and Ship Canal habitats but offers little potential improvements to existing poor water quality conditions (mainly high water temperature and low dissolved oxygen) in these areas especially during spring and summer when these areas are important salmon and smelt nursery areas. In drier years, spring-summer habitats will suffer from reduced freshwater inflow to Cache Slough because of the proposed North Delta exports.
There is no mention of the reducing amount of "stormwater" pollutants that degrade the smelt and salmon habitats in existing or proposed new habitat areas.

CM3 lacks focus and actions on West and Central Delta tidal wetland improvements.
There is lack of treatment of the linear shoreline habitats throughout the Delta. Smelt and salmon rearing are far more concentrated in shoreline and nearby open-water habitats than in tidal marshes.

The is a lack of specifics as to habitats, locations, and timing of habitat improvements relative to the needs of each of the target native fishes in the Delta

There are no actions offered to replace the millions of acre-feet of pelagic habitat that will be exported from the North and South Delta each year under the BDCP.

There is no mention of the detailed habitat improvement actions presented in the smelt, salmon, and steelhead state and federal recovery plans.

There are repeated references to adaptive management actions that will adjust habitat improvement actions of the BDCP but virtually no details on how adaptive management will actually be implemented or funded. Adaptive management programs have frequently failed throughout the nation, as have decades of adaptive management actions on dozens of failed habitat mitigation projects that were constructed in the Delta.

Many of the specific habitat actions proposed in the BDCP already exist and will likely be implemented in the future without the BDCP. These actions should not be included in the BDCP's portfolio of habitat mitigation actions, but instead should be considered part of the baseline (or no-action alternative).

The conservation measures are insufficient in amount and quality of aquatic habitat to meet the goals and objectives of the BDCP.

Habitat Conservation Planning and the ESA

The purpose of the habitat conservation planning process and subsequent issuance of incidental take permits is to authorize the incidental take of threatened or endangered species, not to authorize the underlying activities that result in take. Section 9 of the Endangered Species Act of 1973, as amended (ESA), prohibits the "take" of any fish or wildlife species listed under the ESA as endangered; under Federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation. Take, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

In the 1982 amendments to the ESA, Congress established a provision in section 10 that allows for the "incidental take" of endangered and threatened species of wildlife by non-Federal entities. Incidental take is defined by the ESA as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." Section 10(a)(2)(A) of the ESA requires an applicant for an incidental take permit to submit a "conservation plan" that specifies, among other things, the impacts that are likely to result from the taking and the measures the permit applicant will undertake to minimize and mitigate such impacts. Conservation plans under the ESA have come to be known as "habitat conservation plans" or "HCPs" for short. The Bay/Delta

Conservation Plan (BDCP) is proposed as such a conservation Plan. However, the BDCP fails the statutory and regulatory requirements for a habitat conservation Plan for all of the reasons hereinafter described in this comment letter.

The FWS published its final regulations for implementing the section 10 permit program in the Federal Register on September 30, 1985 (50 FR 39681-39691); NMFS published final regulations for its program on May 18, 1990 (55 FR 20603. FWS and NMFS share joint authorities under the ESA for administering the incidental take permit program. Generally, the FWS is responsible for terrestrial and freshwater aquatic species while NMFS is responsible for listed marine mammals, anadromous fish, and other living marine resources. Both of these agencies, and the California Department of Fish & Wildlife will be responsible for approving the BDCP.

A section 10(a)(1)(B) permit only authorizes take that is incidental to otherwise lawful activities. In this context, "otherwise lawful activities" means economic development or land or water use activities that, while they may result in take of federally listed species, are consistent with other Federal, state, and local laws. The BDCP is therefore required to be consistent with laws including, but not limited to, the federal Clean Water Act, California Water law, the California Constitution, the California Public Trust Doctrine, the California Natural Communities Conservation Planning law, and the 2009 Delta Reform Act. BDCP fails consistency on all counts as will be more completely explained herein.

Issuance of an incidental take permit is also a Federal action subject to section 7 of the ESA. Section 7(a)(2) requires all Federal agencies, in consultation with the Services, to ensure that any action "authorized, funded, or carried out" by any such agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of critical habitat. Because issuance of a section 10 permit involves an authorization, it is subject to this provision. Although the provisions of section 7 and section 10 are similar, section 7 and its regulations introduce several considerations into the HCP process that are not explicitly required by section 10-- specifically, indirect effects of the proposed project, effects on federally listed plants, and effects on critical habitat for listed species. Issuance of an incidental take permit is also a Federal action subject to section 7 of the ESA.

The section 10 process is an opportunity to provide species protection and habitat conservation within the context of non-Federal development and land and water use activities. Ideally, it may also allow for the conservation and recovery of federally listed, proposed, and candidate species as well as overall biological diversity. It thus provides a mechanism for allowing economic development that will not "appreciably reduce the likelihood of the survival and recovery of the species in the wild." The BDCP is not a permittable project because it will appreciably reduce the likelihood of the survival and recovery of aquatic species in the Bay/Delta and its watershed.

HCPs require: (1) an HCP; (2) an application form and fee; (3) an Implementing Agreement (optional, depending on Regional Director discretion); (4) a NEPA analysis, either an EA or EIS; (5) publication in the Federal Register of a Notice of Receipt of a Permit Application and Notice(s) of Availability of the NEPA analysis; (6) Solicitor's Office review of the application package; (7) formal section 7 consultation; and (8) a Set of Findings, which evaluates a section

10(a)(1)(B) permit application in the context of 1-10 of permit issuance criteria found at section 10(a)(2)(B) of the ESA and 50 CFR Part 17.

Under the Endangered Species Act [Section 10(a)(2)(A)] and Federal regulation [50 CFR 17.22(b)(1), 17.32(b)(1), and 222.22], a conservation plan submitted in support of an incidental take permit application must detail the following information:

- Impacts likely to result from the proposed taking of the species for which permit coverage is requested;
- Measures the applicant will undertake to monitor, minimize, and mitigate such impacts; the funding that will be made available to undertake such measures; and the procedures to deal with unforeseen circumstances;
- Alternative actions the applicant considered that would not result in take, and the reasons why such alternatives are not being utilized; and,
- Additional measures FWS or NMFS may require as necessary or appropriate for the purposes of the plan.

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 provide assurance 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.

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.) The federal lead agencies for the BDCP EIR/EIS, the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, recently provided the California Department of Water Resources (DWR) with comments on the Second Administrative Draft EIR/EIS. The U.S. Environmental Protection Agency, U.S. Army Corps of Engineers and the State Water Resources Control Board have also provided comments.

Federal agency comments continue to highlight serious problems with the BDCP and its potential to harm key fish species. The U.S. EPA noted that freshwater flow is possibly the best tool to improve fish population responses and to protect aquatic life prior to the completion of any planned restoration projects. Therefore, in recognition of the broad scientific agreement that existing Delta outflow conditions are insufficient for protecting the aquatic ecosystem and multiple fish species, the U.S. EPA found that increased freshwater flows and aquatic habitat restoration are needed to restore ecosystem processes in the Bay Delta and protect Threatened & Endangered fish populations. Further, the conclusion that the preferred alternative results in increased sea water intrusion in all years in addition to conclusions about EC levels in the southern Delta (see page 8-425 and -426), indicates a high likelihood for degradation in both the quality and quantity of open water aquatic habitats (low salinity zones and migratory corridors for salmonids). The U.S. EPA expressed uncertainty that the necessary quantitative estimates or details were available to support the conclusion that ongoing operation of new Delta conveyance would have no adverse effect on tidal freshwater emergent wetland natural community. It questioned how the changes in flow would *not* have an adverse affect on the habitat of species that depend on it.

The National Marine Fisheries Service (NMFS) also noted several deficiencies in the proposed project. Specifically, the section related to the Delta was found by NMFS to provide an inadequate level of analysis for a project that proposes to put major new diversion intakes in the main migratory route of several listed species. Analysis of impacts for fish passing the intakes and using the migratory corridors downstream of the proposed intakes should be a major focus of this document. NMFS noted that the Effects Analysis lacked a transparent method of assessing how the diversions and resulting flow alterations would impact juvenile survival, existing wetland benches, and predation related mortality.

The U.S. Fish and Wildlife Service (USFWS) was also critical of the project. Specifically, USFWS found that the description and analysis of alternative 4 (Proposed Action) should reflect agreement that the "high outflow scenario" version of CM1 will be permitted as the initial BDCP operations. The USFWS questioned whether there was sound scientific information that supports the theory that increased Delta outflows are not needed. The BDCP modeled Delta outflow results. Despite their "similar" modeling structure, the biological models for longfin smelt predicted declines in longfin smelt abundance (Stevens and Miller 1983; Jassby et al. 1995;

Rosenfield and Baxter 2007; Thomson et al. 2010). Rather than reporting these results, the effects were summarized. The predicted declines were labeled only as "minor". In contrast, the USFWS determined that longfin smelt is warranted for listing under the ESA, with any additional threats or further declines in the status of the species warranting immediate and careful evaluation. The Service posited that if evidence existed to show that increased Delta outflows were not needed, and that habitat restoration *alone* would be able to restore ecosystem processes and protect fish species, that that information was conspicuously lacking. Although the Service acknowledged that CMs 2 and 4 could plausibly contribute to longfin smelt (given the timing of their reproduction and their primary distribution in the estuary), it found that notion that habitat restoration could benefit the estuary, as outlined in the other CMs, was unsupportable. Specifically, it noted that if CMs 2 and 4 were to improve conditions for longfin smelt, it would not be in Suisun Bay, it would be in the ROAs themselves. The implication that restored habitats "would" provide a food subsidy to the open water bays in which most longfin smelt rear, was neither supportable or substantially uncertain. San Joaquin Basin salmonid populations "continue to decline and [USFWS] believes that flow increases are needed to improve salmonid survival and habitat."[22]

Several other agencies noted problems with the draft BDCP. The National Academy of Sciences Natural Resource Council Committee on Sustainable Water Management in California's Bay Delta Report noted that "…sufficient reductions in outflow due to diversions would tend to reduce the abundance of these organisms ["these organisms" = 8 Bay Delta aquatic species at various trophic levels]."[23] "Thus, it appears that if the goal is to sustain an ecosystem that resembles the one that appeared to be functional up to the 1986-93 drought, exports of all types will necessarily need to be limited in dry years, to some fraction of unimpaired flows that remains to be determined."[24] Inadequate flow to support fish and their habitats was noted to be "directly and indirectly linked to many stressors in the San Joaquin river basin and is a primary threat to steelhead and salmon."[25]

<u>Present Condition of the Bay Delta</u>

In order to determine whether or not the BDCP meets the standards required for an incidental take permit under Sections 7 and 10 for listed aquatic species in the Bay/Delta, it is necessary to examine the existing environmental conditions in the Bay/Delta. The most complete examination of present conditions for these public trust resources in the estuary took place as a requirement of the 2009 Delta Reform Act after hearings conducted by the California State Water Resource Control Board. The State Board, after completing extensive hearings, found that

> The Sacramento-San Joaquin Delta (Delta) is a critically important natural resource for California and the nation. It is both the hub of California's water

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[22] USFWS Staff BDCP Progress Assessment, April 2013, and USFWS May 23, 2011 Phase I Scoping Comments to SWRCB

[23] National Academy of Sciences Natural Resource Council Committee on Sustainable Water Management in California's Bay-Delta (2012) Report, pg. 60

[24] Id. at 105.

[25] NMFS Progress Assessment and Remaining Issues Regarding the Administrative Draft BDCP Document, and NMFS February 4, 2011 Phase I Scoping Comments to SWRCB

> supply system and the most valuable estuary and wetlands on the western coast of the Americas. The Delta is in ecological crisis, resulting in high levels of conflict that affect the sustainability of existing water policy in California. Several species of fish have been listed as protected species under the California Endangered Species Act (CESA) and under the federal Endangered Species Act (ESA). These two laws and other regulatory constraints have restricted water diversions from the Delta in an effort to prevent further harm to the protected species.

In November 2009, California enacted a comprehensive package of four policy bills and a bond measure intended to meet California's growing water challenges by adopting a policy of sustainable water supply management to ensure a reliable water supply for the State and to restore the Delta and other ecologically sensitive areas. One of these bills, Senate Bill No. 1(SB1) (Stats. 2009 (7th Ex. Sess.) ch 5, § 39) contains the Sacramento-San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Water Code section 85000 et seq. The Delta Reform Act establishes a Delta Stewardship Council (Council), tasked with developing a comprehensive, long-term management plan for the Delta, known as the Delta Plan, and providing direction to multiple state and local agencies that take actions related to the Delta. The comprehensive bill package also sets water conservation policy, requires increased groundwater monitoring, and provides for increased enforcement against illegal water diversions.

The Delta Reform Act required the State Water Board to use a public process to develop new flow criteria for the Delta ecosystem. So, in 2010 the State Water Board considered the testimony presented during the Board's informational proceeding to develop flow criteria and to support the following summary conclusions

<u>Flow Criteria Established By the SWRCB Are Undermined by BDCP</u>

Flow in the Delta "is one of the most important components of ecosystem function."[26] Thus, acceptable habitat restoration requires adequate physical parameters (flow, residence time, variability, etc.), chemical parameters (salinity, temperature, turbidity, chemical constituents, etc.), and nutrients to support renewable fisheries. The effects of non-flow changes in the Delta ecosystem, such as nutrient composition, channelization, habitat, invasive species, and water quality, also need to be addressed and integrated with flow measures. The California Department of Fish and Wildlife noted in 2010 that "…current Delta water flows for environmental resources are not adequate to maintain, recover, or restore the functions and processes that support native Delta fish."[27] Despite these complexities, and the current deficiency of flow, the BDCP's answer to fixing the Delta is simply that habitat restoration can substitute for flow.

Flow and physical habitat interact in many ways, but they are not interchangeable. Since the CVP and SWP have been in effect, historic flows have been below the necessary amount to preserve aquatic health. Historic unimpaired flows over the last 18 to 22 years have been about

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[26] Testimony of the U.S. Fish & Wildlife Service, State Water Resources Control Board 2010 flow hearing

[27] Executive Summary, Cal. Department of Fish and Wildlife (2010) Quantifiable Biological Objectives and Flow Criteria, pg. 1

50% on average from April through June for Sacramento River inflows; approximately 30% in drier years to almost 100% of unimpaired flows in wetter years for Delta outflows; and approximately 20% in drier years to almost 50% in wetter years for San Joaquin River inflows. Flow modification is one of the immediate actions available although the links between flows and fish response are often indirect and are not fully resolved. In developing its flow criteria, the State Water Board reviewed the life history requirements of the following pelagic and anadromous species:

- Chinook Salmon (various runs)
- American Shad.
- Longfin Smelt
- Delta Smelt
- Sacramento Splittail
- Starry Flounder
- Bay Shrimp
- Zooplankton

The flow criteria needed to protect public trust resources are more than just the sum of each species-specific flow need. The State Water Board also considered the following issues to make its flow criteria determinations:

- Variability, flow paths, and the natural hydrograph
- Floodplain activation and other habitat improvements
- Water quality and contaminants
- Cold water pool management
- Adaptive management

The flow criteria were also intended to also inform the BDCP and the California NCCP, with the BDCP being a multispecies conservation plan developed pursuant to the ESA and the State Natural Community Conservation Planning Act (NCCPA), administered by the USFWS and the NMFS and the DFG, respectively.

The Flow Criteria that came out of the 2010 State Board hearings addressed flow necessary to preserve the attributes of a natural variable system to which native fish species are adapted. Many of the criteria developed by the State Water Board were crafted as percentages of natural or unimpaired flows. The criteria included the following recommendations for necessary Delta flow:

- 75% of unimpaired Delta outflow from January through June;
- 75% of unimpaired Sacramento River inflow from November through June; and
- 60% of unimpaired San Joaquin River inflow from February through June.

Although the State Water Board noted that these criteria should not be interpreted as precise flow requirements for fish under current conditions, they do reflect the general timing and magnitude of flows under the circumstances of the flow criteria report. Other criteria include: increased fall

Delta outflow in wet and above normal years; fall pulse flows on the Sacramento and San Joaquin Rivers; and flow criteria in the Delta to help protect fish from mortality in the central and southern Delta resulting from operations of the State and federal water export facilities. The report also includes determinations regarding variability and the natural hydrograph, floodplain activation and other habitat improvements, water quality and contaminants, cold water pool management, and adaptive management. The determination criteria should reflect the frequency, duration, timing, and rate of change of flows, and not just volumes or magnitudes. Accordingly, whenever possible, the criteria specified above are expressed as a percentage of the unimpaired hydrograph. Inflows should generally be provided from tributaries to the Delta watershed in proportion to their contribution to unimpaired flow unless otherwise indicated, and studies and demonstration projects for, and implementation of, floodplain restoration, improved connectivity and passage, and other habitat improvements should proceed to provide additional protection of public trust uses and potentially allow for the reduction of flows otherwise needed to protect public trust resources in the Delta.

During the SWRCB Flow Criteria Hearing in 2010, the Department of the Interior recommended flow criteria for both Sacramento and San Joaquin River inflows, noting that "flows that mimic the natural hydrograph will benefit native fishes in the Delta and should be used in determining magnitude and timing of needed flows for Delta ecosystem." [28] The Department of Interior opined that "[m]imicking the natural hydrograph may provide flow regimes that change habitat conditions to benefit native fish and flush some nonnatives out of the system (as occurred on Putah Creek).[29] Despite this recommendation, the BDCP plan alters the hydrographs of Sacramento more than current alterations exhibit. Sacramento River at Rio Vista flows reduced relative to unimpaired flow (UF) hydrograph in February through June from North Delta Intakes' diversions in W and AN years. Average annual flows will decrease from 66% of UF to 56% of UF under BDCP. (BDCP EIS/EIR: Attachment 1). Further, the BDCP plan alters the hydrographs of San Joaquin River more in some spring and summer months than current alterations. (BDCP EIS/EIR: Attachment 1). San Joaquin River flows at Vernalis are a similar percentage of unimpaired flow except in June and July.[30] Average annual flows under BDCP will be 47 to 49% of unimpaired flows, which is similar to current flows at 46%.[31]

The Department of the Interior also gave net Delta outflow criteria comments at the 2010 Flow Criteria proceedings. The Department of Interior found that "Delta outflow, Delta inflows, and X2 position are highly correlated," and that Delta outflow was reduced 34 percent from unimpaired flow conditions with a hydrograph peak shifted from winter/spring to summer/early fall.[32] Despite these recommendations, the BDCP alters the hydrographs of Delta outflow even more than current alterations indicate, and would reduce Delta outflows relative to unimpaired flow in February through August by 5-12%.[33] Average annual flows would decrease even further, from 58% unimpaired flow to 56% unimpaired flow.[34]

[28] 2010 SWRCB Flow Criteria Report, p. 55. See also Attachment A – Draft Combined Criteria Tables
[29] Id. at 26. See also Attachment A – Draft Combined Criteria Tables
[30] Attachment A – Draft Combined Criteria Tables
[31] Id.
[32] Id.
[33] BDCP Attachment 1, see also Attachment A – Draft Combined Criteria Tables
[34] Id.

Recommendations regarding X2 were also made by the Department of the Interior in the 2010 Flow Criteria hearings. The Department of the Interior found that X2 objectives are designed to restore a more natural hydrograph and salinity pattern by requiring maintenance of the low salinity zone at a specified point and duration based on unimpaired flow conditions. Delta outflows and inflows and the X2 position are highly correlated, and since Delta export operations began, X2 and Delta outflow have been "highly altered." [35]Again, despite these findings and recommendations, the BDCP moves X2 into an area under the twin tunnels operations. [36] Annual average X2 would decrease from 86 to 83 km , but would remain upstream of Collinsville.[37] Old and Middle River flow recommendations made by the Department of the Interior were also not followed in the BDCP. The Department of the Interior noted that Old Middle River (OMR) flow is a hydrodynamic metric that best characterized effects of exports on entrainment of pelagic fish in the Delta.[38] Entrainment increases as OMR flows grow more negative (a larger upstream flow). The Department of the Interior opined that effects could be minimized by managing OMR flows during critical spawning and rearing periods.[39] However, the BDCP draft would only lower reverse OMR flows in wet and above normal years, and would increase reverse flows in drier years as South Delta export pumps are more heavily used.[40] These increased reverse flows would directly lead to greater Delta smelt and longfin smelt entrainment risks.[41]

The flow criteria report went on to note that the Central Valley and San Francisco Regional Water Quality Control Boards should continue developing Total Maximum Daily Loads (TMDLs) for all listed pollutants and adopting programs to implement control actions. The Central Valley Regional Water Quality Control Board should require additional studies and incorporate discharge limits and other controls into permits, as appropriate, for the control of nutrients and ammonia. Temperature and water supply modeling and analyses should be conducted to identify conflicting requirements to achieve both flow and cold water temperature goals, with a strong science program and a flexible management regime noted as critical to improving flow criteria. The report suggested that the State Water Board should work with the Council, the Delta Science Program, BDCP, the Interagency Ecological Program (IEP), and others to develop the framework for adaptive management that could be relied upon for the management and regulation of Delta flows. As physical changes occur to the environment and scientists' understanding of the needs of species improves, the long-term flow needs are expected to change. Actual flows should be informed by adaptive management.

Restoring environmental variability in the Delta is fundamentally inconsistent with continuing to move large volumes of water through the Delta for export. Unfortunately, past changes in the Delta may have influenced migratory cues for some fishes. These cues are further scrambled by a reverse salinity gradient in the south Delta. Therefore, the report found it important to establish seaward gradients and create more slough networks with natural channel geometry, thereby achieving a variable more complex estuary requires establishing seasonal gradients in salinity and other water quality variables and diverse habitats throughout the estuary. These goals would,

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[35] 2010 SWRCB Flow Criteria Report, pg. 19. See also Attachment A – Draft Combined Criteria Tables
[36] BDCP Attachment 3. See also Attachment A – Draft Combined Criteria Tables
[37] Id.
[38] Attachment A – Draft Combined Criteria Tables
[39] Id.
[40] Id.
[41] Id.

in turn, encourage policies which establish internal Delta flows that create a tidally-mixed upstream- downstream gradient (without cross-Delta flows) in water quality. Thus, the continued through-Delta conveyance is likely to continue the need for in-Delta flow requirements and restrictions to protect fish within the Delta. The drinking and agricultural water quality requirements of through-Delta exports, and perhaps even some current in-Delta uses, are at odds with the water quality and variability needs of desirable Delta species. The positive changes resulting from improved flow or flow patterns will benefit humans as well as fish and wildlife. The Delta ecosystem is likely to dramatically shift within 50 years due to large scale levee collapse, with these changes likely to promote a more variable, heterogeneous estuary, which would be better (or, at least, not worse) for desirable estuarine species.

CESA and the federal ESA generally prohibit the "take" of species protected pursuant to the acts. Both acts contain provisions that allow entities to seek approvals from the resources agencies, which approvals allow limited take of protected species under some circumstances. The BDCP is intended to meet all regulatory requirements necessary for USFWS and NMFS to issue Incidental Take Permits to allow incidental take of all proposed covered species as a result of covered activities undertaken by DWR, certain SWP contractors, and Mirant Corporation, and to issue biological opinions under the ESA to authorize incidental take for covered actions undertaken by USBR and CVP contractors. The BDCP is also intended to address all of the requirements of the NCCPA for aquatic, wetland, and terrestrial covered species of fish, wildlife, and plants and Delta natural communities affected by BDCP actions and is intended to provide sufficient information for DFG to issue permits under the CESA for the taking of the species proposed for coverage under the BDCP." This information fails to inform the evaluation of BDCP's CM1, the Delta tunnels program. Voluminous information, given by state and federal agency experts, was presented and evaluated at the hearing. It is clear that BDCP rejected or ignored the conclusions from scientists, experts, and the responsible agencies' findings. We have therefore prepared a bibliography that identifies most of the scientific studies on the ecological health of the Bay/Delta by scientists in their respective fields over the past 30 years.[42] We suggest that this bibliography is used when BDCP reviews these comments, and that it be considered when the responsible agencies determine whether they can legally permit CM-1 as a habitat conservation plan under state and federal law.

The California Department of Fish and Wildlife has conducted surveys of the Delta's pelagic fish species since 1959. The Fall Midwater Trawl (FMWT) survey was initiated in 1967, the year the State Water Project began exporting water from the Delta. It samples 122 stations each month from September to December and the data is used to calculate an annual abundance index of pelagic species. These stations range from San Pablo Bay upstream to Stockton on the San Joaquin River, Hood on the Sacramento and the Sacramento Deep Water Ship Channel.[43]
The Summer Townet Survey was begun in 1959 and samples striped bass and Delta smelt at 32 stations, ranging from eastern San Pablo Bay to Rio Vista on the Sacramento River and to Stockton on the San Joaquin River. Surveys begin in early June and continue on alternate weeks through August and the data is used to calculate an abundance index.[44] The annual abundance indices document the continued one to two magnitude decline of the entire spectrum of native

[42] Attachment B - Bibliography
[43] http://www.dfg.ca.gov/delta/projects.asp?ProjectID=FMWT
[44] http://www.dfg.ca.gov/delta/projects.asp?ProjectID=TOWNET

pelagic species in the estuary. The same magnitude declines hold true for the native lower trophic orders that comprise the base of the food web.

Department of Fish and Wildlife
Percent Decline in Delta Fish Population Abundance Indices

Fall Midwater Trawl Survey

Species	1967 v. 2013	Five Year Average 67-71 v. 09-13
Striped Bass	99.6%	98.8%
Delta Smelt	95.6%	89.8%
Longfin Smelt	99.8%	99.4%
American Shad	90.9%	99.4%
Splittail	98.5%	87.7%
Threadfin Shad	97.8%	98.1%

Summer Townet Survey

Species	1967 v. 2013	Five Year Average 67-71 v. 09-13
Striped Bass	98.2%	95.4%
Delta Smelt	94.2%	94.3%

Data compiled by CSPA from CDF&W FMWT and STN annual abundance indices.

Central Valley anadromous fisheries have also not fared well and are far below the doubling levels mandated some 22 years ago by the Central Valley Project Improvement Act, California Water Code and California Fish and Game Code.[45] For example, winter-run, spring-run, Sacramento fall-run and San Joaquin fall-run Chinook salmon have declined to 5.7, 20, 31 and 25.5 percent, respectively, of legally mandated population levels. The BDCP proposes no accurate, detailed, viable proposal to respond to this large scale decline.

<u>The BDCP Fails to Adequately Discuss the Operation of the Facility</u>

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 reduce or eliminate those conditions, the United States Bureau of Reclamation (USBR) must 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.

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

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.

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 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.)

The BDCP Lacks an Adequate and Reliable Source of Funding

Section 10 of the ESA requires the United States Fish and Wildlife Service (USFWS) 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 unwillingness 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 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 Implementation 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."[46] The BDCP fails to comply with this mandate.

Another defect in Chapter 8 is the assumption that funding responsibilities can simply be deferred to some future date.[47] Without an understanding of who will pay and what funding is needed – there is simply 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.[48]

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

[46] Fish and Game Code,§ 2820(b)(3).
[47] BDCP, p. 8-2.
[48] Id.

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, the BDCP cannot 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 and has not confirmed it will sign the Implementation 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 and will not sign the Implementation 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, recent testimony of a DWR representative 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 (PREs) will revisit plan and renegotiate ESA take permit scope of coverage with agencies and possibly scale back the project.[49] 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.[50]

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 on 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 all of the 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. First, 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."[51] 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

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[49] Laura King Moon Testimony, 2/12/14 Hearing, timestamp 00:19:00-00:19:40.

[50] Id. at time stamp 00:18:23 – 00:18:30

[51] BDCP, p. 6-10.

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."[52] 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 additional costs of purchasing replacement lands, or discusses the additional impacts of taking more 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 alternate 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 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 contractors based upon the delivery of federal CVP water is flawed, as the USBR will not be a permittee and will not sign the Implementation Agreement. The remaining sources of funding identified in the BDCP are too speculative to support the issuance of an incidental take permit.

Legal Requirements Under CEQA and NEPA

Under CEQA, the project must include "the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment…"[53] To comply with CEQA's standards for completeness, the project description must address "not only the immediate environmental

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[52] Id. at 6-35.

[53] 14 Cal. Code Regs., § 15368; see also Nelson v. County of Kern (2010) 190 Cal.App.4th 252, 271.

consequences of going forward with the project, but also all 'reasonably foreseeable consequence[s] of the initial project'."[54] As courts have recognized for decades, "an accurate, stable and finite project description" is "the sine qua non of an informative and legally sufficient EIR."[55] Reliance on a "curtailed, enigmatic or unstable definition of the project" stands as the paradigm of legal error under CEQA, because it "draws a red herring across the path of public input."[56] An "EIR may not define a purpose for a project and then remove from consideration those matters necessary to the assessment whether the purpose can be achieved."[57] CEQA requires "interactive process of assessment of environmental impacts and responsive project modification which must be genuine."[58]

A lawful project description under CEQA helps the lead agency "develop a reasonable range of alternatives to evaluate in the EIR [that] will aid the decision-makers…"[59] However, "a lead agency may not give a project's purpose an artificially narrow definition…." [60] A "curtailed or distorted project description may stultify the objectives of the reporting process." [61] In Inyo III, the court rejected the Los Angeles Department of Water and Power's attempt in its EIR to "narrow the city's obligation—and the scope of this lawsuit—down to the relatively small flow of underground water destined for in-valley use."[62] That narrow definition evaded the county's warning that EIR simply assumed the "filling of the second aqueduct," and the State Board's warning that the narrow definition diverted attention "from the impacts of the of the major project which is the importation of additional water to Los Angeles."[63] The "selection of a narrow project as the launching pad for a vastly wider proposal frustrated CEQA's public information aims The department's calculated selection of its truncated project concept was not an abstract violation of CEQA," but rather, a failure to proceed "in a manner required by law."[64] The "impermissibly truncated" and inconsistent project definition in the EIR also unlawfully skewed the lead agency's assessment of the "no project" alternative and project alternatives.[65]

In Communities for a Better Environment, the court held that the City of Richmond's EIR for a refinery project "fails as an informational document," in part because the EIR's project description "is inconsistent and obscure as to whether the Project enables the Refinery to process heavier crude." [66] The court noted that conflicting information in the EIR, and in 10-K

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[54] Communities for a Better Environment v. City of Richmond (2010) 184 Cal.App.4th 70, 82 (quoting Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova (2007) 40 Cal.4th 412, 428; Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 391, fn. 2 (Laurel Heights I).
[55] County of Inyo v. City of Los Angeles (Inyo III) (1977) 71 Cal.App.3d 185, 199.
[56] Id. at 199.
[57] County of Inyo v. City of Los Angeles (Inyo V) (1981) 124 Cal.App.3d 1, 9.
[58] County of Inyo v. City of Los Angeles (Inyo VI) (1984) 160 Cal.App.3d 1178, 1183; see Id. at 1186 (project cannot be defined to set up "a CEQA turkey shoot").
[59] 14 Cal. Code Regs, §15124(b); see also In Re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings (In Re Bay-Delta) (2008) 43 Cal.4th 1143, 1166 (lead agency "may structure its EIR alternatives analysis around a reasonable definition of underlying purpose and need").
[60] Id.
[61] Inyo III, 71 Cal.App.3d 185, 192; see also Inyo VI, 160 Cal.App.3d at 1186 .
[62] Inyo III, 71 Cal.App.3d at 196.
[63] Id. at 198.
[64] Id. at 200 (quoting Pub. Res. Code, § 21168.5.
[65] Id. at 200-206.
[66] 184 Cal.App.4th at 89.

statements filed with the Securities and Exchange Commission, contradicted the benign account provided in the EIR. The substantial evidence test was "not relevant" to assessment of violations of CEQA's information disclosure provisions. If the EIR does not "adequately apprise all interested parties of the true scope of the project for intelligent weighing of the environmental consequences, informed decision-making cannot occur under CEQA and the final EIR is inadequate as a matter of law.[67]

NEPA requires federal agencies to articulate the "purpose and need" for a proposed action for which environmental review is required.[68] That articulation is crucial for the "heart" of NEPA, the alternatives analysis, which enables the EIS to provide "a clear basis for choice among options by the decision-maker and the public."[69] Federal courts have also noted that NEPA prohibits the use of the use of a truncated "purpose and need" statement, in which the articulation of objectives is defined in a manner that curtails full assessment of the project and alternatives. [70]

Project Definition in BDCP EIR-EIS

Fundamental Purpose

The EIR-EIS asserts that the "fundamental purpose" in BDCP is to "make physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, water supplies of the SWP and CVP south-of-Delta, and water quality within a stable regulatory framework, consistent with statutory and contractual obligations." (EIR-EIS 2-1.) The EIR-EIS purports to be "informed by past efforts taken within the Delta and the watersheds of the Sacramento and San Joaquin Rivers, including those undertaken through the CALFED Bay-Delta." (Id..)

Relationship to Project Approval

The intent of the BDCP proponents is to formulate a plan that could ultimately be approved by the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service as a Habitat Conservation Plan under the provisions of ESA Section 10(a)(1)(B) and by CDFW as an NCCP 8 under California Fish and Game Code Sections 2800 et seq. (EIR-EIS, ES-8.) The BDCP proponents—DWR and six State Water Project (SWP) and Central Valley Project (CVP) water contractors—are applying for incidental take permits (ITPs) from USFWS and NMFS, pursuant to Section 10(a)(1)(B) of the federal Endangered Species Act (ESA) and incidental take authorization by the California Department of Fish and Wildlife (DFW), pursuant to California Fish and Game Code Section 2835. The BDCP "has been prepared as a required component of the application for the ITPs/NCCP permit, and to support the issuance of these permits for a term of 50 years." (Id.)

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[67] Id. at 83 (citations omitted).

[68] (40 C.F.R. §1502.13.)

[69] (40 C.F.R. §1502.14.)

[70] (City of Carmel-by-the-Sea v. United States Department of Transportation (9th Cir. 1997) 123 F.3d 1147, 1155; Friends of Southeast's Future v. Morrison (9th Cir. 1998) 153 F.3d 1059, 1066.)

Project Objectives

BDCP's fundamental purpose gives rise to more specific project objectives, which the EIR-EIS retains with small changes from those listed earlier in the Notice of Preparation. While several focus on improving "the ecosystem of the Delta," others focus more directly on project operations and deliveries to water contractors. These include objectives to:

- Authorize the take of protected species related to "[t]he operation of existing SWP Delta facilities and construction and operation of facilities for the movement of water entering the Delta from the existing watershed" to the existing SWP and CVP pumping plants in the southern Delta. (EIR-EIS, 2-3.)

- "Restore and protect the ability of the SWP and CVP to deliver up to full contract amounts, when hydrologic conditions result in the availability of sufficient water, consistent with the requirements of State and federal law and the terms and conditions of water delivery contracts and other existing applicable agreements." (EIR-EIS, 2-3.)

- Project objectives also include consideration of "conveyance options in the north Delta that can reliably deliver water at costs that are not so high as to preclude, and in amounts that are sufficient to support, the financing of the investments necessary to fund construction and operation of facilities and/or improvements." (EIR-EIS, 2-4.) Others include:

    - "To ensure that the BDCP meets the standards for an NCCP by, among other things, protecting, restoring, and enhancing aquatic and terrestrial natural communities and ecosystems that support covered species within the Plan Area."
    - "To make physical improvements to the conveyance system in anticipation of rising sea levels and other reasonably foreseeable consequences of climate change."
    - "To make physical improvements to the conveyance system that will minimize the potential for public health and safety impacts resulting from a major earthquake that causes breaching of Delta levees and the inundation of brackish water into the areas in which the SWP and CVP pumping plants operate in the southern Delta." (EIR-EIS, 2-3.)
    - "To develop projects that restore and protect water supply and ecosystem health and reduce other stressors on the ecological functions of the Delta in a manner that creates a stable regulatory framework under the ESA and NCCPA." (Id.)
    - "To identify new operations and a new configuration for conveyance of water entering the Delta from the Sacramento River watershed to the existing SWP and CVP pumping plants in the southern Delta by considering conveyance options in the north Delta that can reliably deliver water at costs that are not so high as to preclude, and in amounts that are sufficient to support, the financing of the investments necessary to fund construction and operation of facilities and/or improvements." (Id.)

Project Purpose and Need

The implementation of any conservation actions that have the potential to result in take of species that are or may become listed under the ESA, pursuant to the ESA at section 10(a)(1)(B) and its implementing regulations and policies, must improve the ecosystem of the Delta by providing for the conservation and management of covered species through actions within the BDCP Planning Area that will contribute to the recovery of the species. These improvements must be done through: protecting, restoring, and enhancing certain aquatic, riparian, and associated terrestrial natural communities and ecosystems; reducing the adverse effects on certain listed species due to diverting water; and through restoring and protect the ability of the SWP and CVP to deliver up to full contract amounts, when hydrologic conditions result in the availability of sufficient water, consistent with the requirements of state and federal law and the terms and conditions of water delivery contracts held by SWP contractors and certain members of San Luis Delta Mendota Water Authority, and other existing applicable agreements. (EIR-EIS 2-4.)

The EIR-EIS asserts the intention to "advance the coequal goals set forth in the Sacramento–San Joaquin Delta Reform Act of 2009 of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem." It also clarifies that the phrase "restore and protect the ability of the SWP and CVP to deliver up to full contract amounts" is sets an "upper limit of legal CVP and SWP contractual water amounts," and is "not intended to imply that increased quantities of water will be delivered under the BDCP." (EIR-EIS, 2-5.)

The EIR-EIS's statement of project need mentions "[t]the multiple, and sometimes conflicting, challenges currently faced within the Delta. The Delta has long been an important resource for California, providing municipal, industrial, agricultural and recreational uses, fish and wildlife habitat, and water supply for large portions of the state. However, by several key criteria, the Delta is now widely perceived to be in crisis. There is an urgent need to improve the conditions for threatened and endangered fish species within the Delta. Improvements to the conveyance system are needed to respond to increased demands upon and risks to water supply reliability, water quality, and the aquatic ecosystem." (EIR-EIS, 2-5.)

Key Problems With the BDCP Project Definition

The EIR-EIS signals that BDCP proponents expect to rely on In Re Bay-Delta to support the decision-makers' discretion to define this unusual "conservation" project and limit on the range of alternatives. (EIR-EIS, 2-2 and fn. 1.) In that decision, the California Supreme Court reversed an appellate ruling and narrowly upheld the CALFED Program EIR, including its rejection of a "reduced exports" alternative on the ground that it would not feasibly accomplish CALFED's water supply objective, and well as its underlying goal of reducing conflicts. (In Re Bay-Delta, 43 Cal.3d at 1165.)

BDCP's EIR-EIS fails to note the narrow context in which the California Supreme Court decided In Re Bay-Delta, as well as its cautionary language relating to future conditions in the Delta. Reviewing a "relatively early" stage of program design, opportunities to pursue a different course in later stages, and analysis of other alternatives believed to cover a reasonable range of alternatives, the Supreme Court was willing to give CALFED the benefit of the doubt in a close call. At the same time, the Court issued this warning: "As the CALFED PEIS/R itself recognizes, Bay-Delta ecosystem restoration to protect endangered species is mandated by both state and federal endangered species laws, and for this reason water exports from the Bay-Delta ultimately must be subordinated to environmental considerations. The CALFED Program is premised on the theory, as yet unproven, that it is possible to restore the Bay-Delta's ecological health while maintaining and perhaps increasing Bay-Delta water exports through the CVP and SWP. If practical experience demonstrates that the theory is unsound, Bay-Delta water exports may need to be capped or reduced." (In Re Bay-Delta, 43 Cal.3d at 1165.)

The years since the 2008 In Re Bay-Delta decision have shown this warning to be prophetic. As the California Supreme Court anticipated, the CALFED program failed to restore the Bay-Delta's ecological health, and failed to stop the precipitous decline in its pelagic organisms. Numerous sources, including the Delta Independent Science Board to the State Water Resources Control Board, have eviscerated any credible expectation that it is possible to achieve that restoration--much less provide a lawful "conservation plan" meeting legal requirements for protected species--while maintaining and perhaps increasing Bay-Delta water exports. The 2009 Delta Reform Act, which articulates a state policy to "reduce reliance on the Delta," also requires BDCP to study "[a] reasonable range of flow criteria, rates of diversion, and other operational criteria required to meet the requirements for a lawful NCCP. (Delta Reform Act, §85320(b)(2)(A).)

In short, science and law should now converge prevent the agencies from framing BDCP in a manner that forecloses meaningful alternatives and consigns the Delta's future to wishful thinking. As framed and analyzed in the EIR-EIS, BDCP's approach to project definition includes several dispositive errors.

First, the EIR-EIS is fundamentally misleading in portraying BDCP as a "comprehensive conservation strategy for the Sacramento-San Joaquin Delta (Delta) to advance the planning goal" of "restoring" the Delta's ecological functions. (EIR-EIS, ES-1.) Reviewing BDCP's proposed conservation measures listed below (Table ES-3 of Proposed BDCP), it is clear which of the 22 listed is not like the others. Conservation measure CM-1 provides "for the construction and operation of a new north Delta water conveyance facility to bring water from the Sacramento River in the north Delta to the existing water export pumping plants in the south Delta, as well as for the operation of existing south Delta export facilities."

The EIR-EIS offers no credible analysis of why CM-1 qualifies as a conservation measure. The EIR-EIS untenably assumes that a plan proposing large new conveyance facilities, which would prevent millions of acre-feet per year from reaching the Delta, can be managed to improve Delta water quality and protect endangered species. Far from contributing to the protection or restoration of ecosystem health in the Delta, this measure would take large quantities of additional water out of the Delta and compound ecological risks. Indeed, scientific critiques from the ISB cast doubt help confirm it is an "unproven theory" at best whether CM-2 to CM-22 will be capable of mitigating the harm from CM-1. Bundling a toxic conservation asset with other nice-sounding proposals does not turn it into a conservation plan. The project description distorts the project's impacts on existing and senior water users, and species (including humans) depending on flows through the Delta. It sidesteps the protection of areas of origin rights and beneficial uses in the Delta region.

Second, the EIR-EIS's division of project and program components creates a major obstacle to ensuring timely consideration of the "whole" of the project in accordance with CEQA and

NEPA. Remarkably, only the non-conserving "conservation" measure CM-1 is slated for project-level analysis, while the remaining measures (CM 2-22) are consigned to program-level review, with the caveat that further environmental review may be needed prior to implementation. This creates a major disconnect, in which project-level decision-making may be completed on the conveyance part of BDCP while details and implementation of the other proposed conservation measures remain mired in doubt.

Third, the statement of project objectives and project purpose rely upon the legally erroneous direction to "restore and protect" the SWP and CVP's nonexistent ability to deliver "up to full contract amounts." BDCP cannot credibly base a conservation plan on institutionalizing the same "aura of unreality" on contract deliveries discussed and discredited in PCL v. DWR.
(Planning and Conservation League v. Department of Water Resources (2000) 83 Cal.App.4th 892, 915.) Similarly, NRDC v. Jewell, the new Ninth Circuit decision on ESA obligations for settlement contract renewals, serves as an important reminder that expectations of deliveries in project contracts cannot be counted on to justify an end-run around ESA requirements,
Lastly, the description of project operation improperly assumes the protection of beneficial uses and meeting of other regulatory requirements, without consistently analyzing hydrologic constraints over the project term. (See, e.g., ES-7.) The project assessment improperly seeks to insulate permit holders from further responsibility to meet federal and state environmental laws, as well as other legal standards and permit requirements. (See Chapter 6.4.2 and following).

State and Federal Water Quality Standards

The Delta is an incredibly complex estuarine ecosystem and only in our hubris do we believe we understand the intricacies of its hydrological, chemical and biological tapestry. Virtually every previous environmental document prepared for hydro-modification projects in this estuary have promised benign or beneficial results. All exacerbated existing conditions. Almost every significant physical change of the environment by humankind has been accompanied by unintended consequences. Adaptive management must be an integral component of any Delta Plan. But, adaptive management is difficult to implement. As the National Research Council opined:

> Numerous attempts have been made to develop and implement adaptive management strategies in environmental management, but many of them have not been successful, for a variety of reasons, including lack of resources; unwillingness of decision makers to admit to and embrace uncertainty; institutional, legal, and political preferences for known and predictable outcomes; the inherent uncertainty and variability of natural systems; the high cost of implementation; and the lack of clear mechanisms for incorporating scientific findings into decision making. [71]

There is seemingly nothing in the thousands of pages of BDCP's plan or EIR/EIS that provides any evidence that adaptive management is likely to succeed. Adaptive management remains subject to political pressure and the approval of the state and federal contractors. Over mere decades, construction of the CVP and SWP have deprived the Delta estuary of half its flow,

[71] National Research Council, *A Review of the Use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan*, 2011, p. 6.

turned the natural hydrograph on its head, reduced temporal and spatial variability, and deprived or eliminated crucial habitat. It is not surprising that an ecosystem that developed and prospered under a state of nature has been brought to the brink of destruction. No estuarine ecosystem in the world has survived this level of abuse. Water quality and water quantity are flip sides of the same coin. Increases or decreases in flow alter assimilative capacity and residence time and change the fate and transport of contaminates. Hydrologic changes modify constituent concentration and bioavailability, which in turn can adversely impact the aquatic ecosystem and other beneficial uses. Water from the Sacramento River is significantly less polluted than water flowing into the estuary from other tributaries. Sacramento River water drawn across the Delta to the export pumps is a major reason water quality in the South Delta is better than it would otherwise be. Diversion of this relatively good quality water around the Delta will increase the concentration of existing constituents. It will also increase the residence time of water in the Delta thereby enhancing the opportunity for bioaccumulation and oxygen depletion to occur. The EIR/EIS and Delta Plan must fully analyze and discuss the likelihood of degradation of Delta water quality caused by alternative conveyance or increased exports.

Previous efforts to evaluate potential water quality impacts from proposed projects to modify the hydrology of the Delta have either ignored water quality, with the exception of salt, or relied upon models that track “particles” to evaluate water quality. However, the majority of pollutants identified as impairing the estuary are non-conservative dissolved forms of pesticides, mercury, nutrients or oxygen demand constituents. Conservative constituents like salt are unacceptable surrogates for the universe of chemical constituents and pathogens impairing in the Delta. Furthermore, existing water criteria fails to address many issues that must be considered in considering impacts on aquatic life. For example:

- Existing criteria fails to consider additive and synergistic properties of regulated chemicals that occur in concentration below criteria. For example, Delta water frequently contains a cocktail of as many as 15 pesticides, many of which interact additively or synergistically.
- Adverse impacts to sensitive species, such as zooplankton, were not included in the development of many criteria.
- There is limited information on chronic exposure to sublethal impacts of chemicals and mixtures of chemicals. Numerous studies in the scientific literature demonstrate adverse effects of chemical exposure well below water quality criterion.
- Water quality criterion fails to address the chronic effects of multiple stressors acting on an already weakened aquatic ecosystem.
- Chemical degradants, a product of chemical breakdown in the environment, are little understood but are frequently highly toxic.
- Water quality criteria have been developed for only a small subset of the chemicals found in these waters. Of the approximately 100,000 chemicals registered for use in the United States, only about 200 are regulated with respect to water quality. The Priority Pollutant List is an artifact of a legal settlement several decades ago, has never been peer-reviewed and is an inadequate surrogate for the maelstrom of chemicals found in waterways today. These include pharmaceuticals and personal care products, industrial chemicals and other potentially hazardous constituents that have been identified as carcinogens, reproductive toxins, endocrine disruptors and immune suppressors, etc.

- Criteria are frequently insufficiently protective for pollutants that bioconcentrate and/or bioaccumulate in tissue.
- Many drinking water criteria are economically based and not health risk based.

As noted above, relocation of export facilities to the Sacramento River will increase residence time in the Delta. This increased residence time may encourage the growth of toxic blue-green algae, which has become a serious problem in recent years. Bioaccumulating constituents like selenium and methyl-mercury or pollutants like DDT and dioxin will have more opportunity to work their way up the food chain. Increases in the concentration of mercury in fish tissue would further threaten the health of the Delta's large subsidence fishing community. Longer residence times will increase the timeframe for oxygen demanding constituents to reduce oxygen levels in channels already identified as impaired because of low dissolved oxygen.

An alternative conveyance facility and reduction in Sacramento inflow will impact dissolved oxygen in the Mokelumne River and Stockton Deep-Water Ship Channel. Presently, flow from the Sacramento is drawn into the ship channel via reverse flows in the San Joaquin River. Further exacerbating the problem will be an increase in nutrient loading into the ship channel. Since the recent Biological Opinion required the removal of the head of Old River barrier, a significant percentage of the high nutrient load in the San Joaquin River that previously reached the ship channel has been drawn down Old and Middle Rivers and exported south.

Elimination or reduction of this "siphon" effect would also affect numerous other pollutants in the South Delta. Presently, some part of the pollutant load in the San Joaquin River is drawn to the pumps and exported south. Elimination of this siphon mechanism would likely increase the spatial distribution of water quality impacts into the Central Delta. For example, selenium concentrations might increase to levels comparable to those found in wildlife in Suisun Bay.
An alternative conveyance facility and the elimination of dilution flows will increase the concentration of salt in the South Delta channels further impacting the yield of Delta agriculture. It will also reduce salinity variability and encourage the spread of certain undesirable invasive species.

To summarize, the Delta and its tributary streams are formally identified as impaired by a broad suite of pollutants. Water quality criteria have been developed for only a very small subset of the chemicals found in these waters. These criteria fail to adequately consider additive/synergistic, bioaccumulative and chronic/sublethal effects or multiple stressors acting on an already weakened aquatic ecosystem. Increased diversion or routing of good quality dilution flows around the estuary will result in increased concentration and residence time of pollutants. Increased residence time exacerbates the effects of toxic and bioaccumulative pollutants. Reduced diversion and increased Delta flow enhances flushing of pollutants and decreases pollutant concentration. The BDCP fails to comprehensively analyze and address potential impacts to fish, wildlife and human health from reduced water quality caused by loss of dilution, increased residence time and modified channel hydrology. It also fails to include a comprehensive antidegradation analysis required by the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act. This EIR/EIS is seriously misleading, grossly inadequate, technically deficient and fails to meet the minimal CEQA and NEPA requirements for an environmental review document.

Specific Comments

The BDCP Introduction, Chapter 1, pages 1-2 and1-3, identifies the broad conservation goals of BDCP's conservancy strategy. The goals are repeated in Chapter 3, Conservation Strategy (3A-2 and 3A-3), which also describes the strategy as being built upon scientific tenets that reflects the current state of available science (3A-2, lines 38,39). The goals are identified as:

- Increase the quality, availability, spatial diversity, and complexity of aquatic habitat in the Delta.
- Create new opportunities to restore the ecological health of the Delta by modifying the water conveyance infrastructure.
- Directly address key ecosystem drivers in addition to freshwater flow patterns rather than manipulation of Delta flow patterns alone.
- Improve connectivity among aquatic habitats, facilitate migration and movement of covered fish among habitats, and provide transport flows for the dispersal of planktonic material (organic carbon), phytoplankton, zooplankton, macroinvertebrates, and fish eggs and larvae.
- Improve synchrony between environmental cues and conditions and the life history of covered fish and their food resources in the upstream rivers, Delta, and Suisun Bay, including seasonal water temperature gradients, salinity gradients, turbidity, and other environmental cues.
- Reduce sources of mortality, and other stressors, on the covered fish and the aquatic ecosystem in the Delta.
- Improve habitat conditions for covered fish in the Delta and downstream in the low salinity zone of the estuary in Suisun Bay through the integration of water operations with physical habitat enhancement and restoration.
- Avoid, minimize, and mitigate adverse effects on terrestrial wildlife and plants resulting from implementation of measures to benefit aquatic species.
- Expand the extent and enhance the functions of existing natural communities, and the habitat of covered wildlife and plants that is permanently protected.
- Restore habitat to expand the populations and distributions of covered wildlife and plant species.
- Emphasize natural physical habitat and biological processes to support and maintain species covered by the Plan (i.e., covered species) and their habitat.

BDCP Appendix 3A, (page 3A-13, lines 19-32), describes the types of habitat restoration and enhancement actions that were evaluated for inclusion in the conservation strategy included the following:

- Restoring intertidal habitat to establish vegetated marshes and associated sloughs to increase habitat diversity and complexity, food production, and in-Delta productivity, and rearing habitat for covered species.
- Increasing hydraulic residence time and tidal exchange in the Delta sloughs and channels by changing circulation patterns to increase primary productivity and foodweb support and improve turbidity conditions for delta smelt and longfin smelt.

- Increasing the amount of functional floodplain habitat to increase the quantity and quality of rearing habitat for salmonids and sturgeon and spawning habitat for Sacramento splittail, and generate food resources for pelagic species.
- Providing adequate water quality and quantity within the Delta at appropriate times to help conserve resident native fishes and improve rearing and migration habitats for salmon moving through the Delta.

Based upon the evaluation of the types of habitat restoration and enhancement actions that were evaluated for inclusion in the conservation strategy and development of the broad conservation goals, BDCP offers 22 conservation measures to advance the goal of restoring the Delta's ecological function. Conservation measures include:

- CM-1 (Water Facilities and Operation)
- CM-2 (Yolo Bypass Enhancement)
- CM-3 (Natural Communities enhancement)
- CM-4 (Tidal marsh creation/restoration)
- CM-5 (Seasonal Floodplain creation/restoration)
- CM-6 (Channel Margin Enhancement)
- CM-7 (Riparian Restoration)
- CM-8 (Grassland Natural Community Restoration)
- CM-9 (Vernal Pool and Alkali Seasonal Westland Restoration)
- CM-10 (Non-tidal Marsh Restoration)
- CM-11 (Natural Community Enhancement)
- CM-12 (Mercury management)
- CM-13 (Invasive vegetation)
- CM-14 (Stockton Ship Channel O2)
- CM-15 (Predatory fish)
- CM-16 (Non-physical fish barriers)
- CM-17 (Illegal Harvest Reduction)
- CM-18 (Hatchery Management)
- CM-19 (Urban Storm-water)
- CM-20 (Invasive species)
- CM-21 (Non-project diversions)

Of these, CM-1 is misleadingly described as a conservation measure. CM-1 provides for the construction and operation of new north Delta water conveyance facilities to bring water from the Sacramento River to the existing water export pumping plants in the south Delta, as well as for the operation of the existing south Delta export facilities. Diversion of Sacramento River inflow under the Delta to facilitate the increased export of water cannot be justified as a conservation measure. Nor can it qualify as a HCP or NCCP conservation measure addressing compliance with state and federal endangered species acts.

Further, there is no discussion in either the BDCP or EIR/S as to how conservation measures CM 2-21, which are predicated on uncertain public funding, which may or may not be implemented, which are unlikely to be fully successful and which are only analyzed to a programmatic level of analysis can be employed to mitigate for the impacts of a massive water diversion project that has been analyzed (if inadequately) to a project level of detail. Conservation measures CM 2-21 will need to be analyzed to a project level of detail and funding and implementation will need to be assured in order to qualify for consideration in an HCP or NCCP.

Conservation measures CM 2-21 together comprise a stand-alone publically funded project to restore the Delta's ecosystem and is not dependent on CM-1. In fact, conservation measure CM-2 and conservation measures CM 12-21 are not dependent on BDCP and are already underway and, in varying degrees, being approved, financed and managed by others. BDCP should not be seeking credit for these on going activities that are not dependent on BDCP or CM-1. Nor should BDCP be seeking credit for conservation measures CM 3-11, which will be funded by the public purse and are also not dependent on BDCP or CM-1.

Most importantly, none of the conservation measures CM 2-21 are likely to be as successful as predicted in the BDCP and EIR/S. For example, historical habitat restoration efforts have had questionable benefits and frequently provided habitat for undesirable non-native species, predators and noxious vegetation. Numerous commentators have remarked that excessive diversions of water have changed the hydrology of the estuary into something resembling an Arkansas lake. Creating more "Arkansas lake" habitat will not restore the natural ecological processes that supported myriad native species over millennia.

None of the conservation measures address the effects of increased Delta exports on the habitat and aquatic species of San Francisco or San Pablo Bays. This is a glaring omission, as numerous studies have documented the effects of Delta outflow on the circulation, water quality and productivity of San Francisco and San Pablo Bays and further reductions in outflow will exacerbate present adverse impacts caused by excessive upstream diversions.

The uncertainty of success of proposed habitat restoration efforts are lavishly documented in comments by the Delta Science Program's Independent Review Panel report on the BDCP Effects Analysis, the Delta Independent Science Board's review of the draft EIR/EIS for BDCP, the Independent Panel Review of BDCP sponsored by American Rivers and the Nature Conservancy, the March 2014 comments submitted by the Pacific Fishery Management Council, the February 2014 comments by the California Advisory Committee on Salmon and Steelhead Trout, as well as numerous earlier comments by the National Research Council on adaptive management and the effects analysis, the red flag and progress comments by the National Marine Fisheries Service, U.S. Fish and Wildlife Service, U.S. EPA, U.S. Corps of Engineers and comments on the EIR/EIS by the State Water Resources Control Board.

The underlying assumptions of habitat restoration are further brought into question by the evaluation of BDCP modeling by MBK Engineers in their presentation before the Delta Stewardship Council, which identified a number of flaws including the use of outdated models, the failure to accurately model climate change, the faulty assumptions of actual reservoir operations, the overrepresentation of outflow and underrepresentation of exports. The failure of BDCP models to accurately reflect anticipated changes in CVP and SWP operations with BDCP bring into serious question the assumptions of habitat restoration.

BDCP modeling demonstrates that, under the proposed alternative, Delta outflow will decrease, exports will increase, X2 will migrate eastward, residence time and pollutant concentration will increase throughout the Delta, salinity levels and violations of present fish and agricultural salinity standards will increase, survival rates of winter-run, spring-run and Sacramento and San Joaquin fall-run salmon smolts will decrease, and concentrations of mercury and selenium in bass and sturgeon will increase.

Below are our specific comments on: 1) the types of habitat restoration and enhancement actions that were evaluated for inclusion in the conservation strategy; 2) the broad conservation goals of BDCP's conservancy strategy and 3) the specific conservation measures CM 1-21.

Types of Habitat Restoration and Enhancement Actions That Were Evaluated for Inclusion in the Conservation Strategy (Page 3A-13, Lines 19-32)

The BDCP EIS/EIR evaluated several habitat restoration and enhancement actions to balance the effects of the implementation of CM-1, including:

1. Restoring intertidal habitat to establish vegetated marshes and associated sloughs to increase habitat diversity and complexity, food production, and in-Delta productivity, and rearing habitat for covered species;
2. Increasing hydraulic residence time and tidal exchange in the Delta sloughs and channels by changing circulation patterns to increase primary productivity and foodweb support and improve turbidity conditions for delta smelt and longfin smelt;
3. Continued reliance on south Delta exports in drier years and late spring and summer of wetter years will continue stressors on pelagic species and their tidal aquatic habitats. Any shift in the Low Salinity Zone upstream toward the North Delta intakes could put added pressures on the smelt populations because the screens will not protect larvae and early juvenile smelt whose habitat includes freshwater tidal pelagic habitats;
4. Increasing the amount of functional floodplain habitat to increase the quantity and quality of rearing habitat for salmonids and sturgeon and spawning habitat for Sacramento splittail, and generate food resources for pelagic species;
5. Providing adequate water quality and quantity within the Delta at appropriate times to help conserve resident native fishes and improve rearing and migration habitats for salmon moving through the Delta.

The BDCP holds little promise in providing more floodplain habitats that would be inundated by tidal or flood flows especially in the Yolo Bypass (CM2). More floodplain inundation in the East Delta and Yolo Bypass without improved access in CM2 would not significantly benefit salmon growth, survival, and production from the Delta. Target water quality objectives in the Delta include cooler waters, maintaining the Low Salinity Zone to the west of export facilities in both the North and South Delta, increasing the size of the LSZ, keeping low-productivity reservoir water out of the Delta, and retaining higher turbidity, higher productivity, low salinity water within the Delta's pelagic habitat. Retaining a salinity gradient and positive downstream flow through the Delta in winter and spring are necessary to improve salmon survival through the Delta. Such conditions are not provided under CM1 or other conservation measures.

Broad Conservation Goals and Strategy (Chapter 1, Page 1-2 and 1-3; and Appendix 3A, Pages 3A-2, lines 38-42 and 3A-3, lines 1-21)

The conservation goals and the strategy that they chose won't work to accomplish what needs to be done to improve habitat. For example, the BDCP EIS/EIR fails to increase the quality, availability, spatial diversity, and complexity of aquatic habitat in the Delta. CM1-11 if implemented as proposed would not lead to increased habitat quality and complexity in a timely manner. The main limitation is the lack of potential improvement to pelagic open water habitat under CM1 and lack of the indirect benefits of the other conservation measures to key LSZ pelagic habitats of the West and Central Delta.

The BDCP EIS/EIR also fails to create new opportunities to restore the ecological health of the Delta by modifying the water conveyance infrastructure. The potential to restore the ecological health of the Delta is severely restricted by retention of the south Delta export facilities. The potential for Delta pelagic and shoreline habitats to improve is also greatly restricted by the proposed large fine mesh passive screen intake infrastructure in the North Delta.

The BDCP EIS/EIR fails to directly address key ecosystem drivers in addition to freshwater flow patterns rather than manipulation of Delta flow patterns alone. Freshwater flow patterns in the Delta under CM1 remain the critical ecosystem driver in the Delta. Enhanced ecosystem inputs from new margin wetland and floodplain habitats will not be of benefit if they cannot contribute to the pelagic habitats of the West and Central Delta. Under the BDCP proposal both Suisun Marsh and Cache Slough Complex would be more isolated from contributing to the LSZ than under present conditions.

The plan outlined by the BDCP EIS/EIR will not improve connectivity among aquatic habitats, facilitate migration and movement of covered fish among habitats, and provide transport flows for the dispersal of planktonic material (organic carbon), phytoplankton, zooplankton, macroinvertebrates, and fish eggs and larvae. The proposed North Delta exports will reduce connectivity and create a serious impediment to migration and movement of salmon, smelt, steelhead, sturgeon, and many other important fish of the Central Valley. The North Delta diversions and continuation of South Delta diversions will entrain vast amounts of biological organisms, nutrients, and other essential elements of Bay-Delta productivity.

The timing of synchrony (water temperature gradients, salinity gradients, turbidity, and other environmental cues) is a key goal to improving Delta health. Despite this goal, the BDCP EIS/EIR fails to improve conditions for fish and their food resources in the upstream rivers, Delta, and Suisun Bay. The proposed North Delta exports and continued significant reliance on South Delta exports will further add to reduced synchrony of natural environmental cues to which native fishes are adapted. Food sources will be reduced, water temperatures will increase, salinities will increase, turbidity will be further reduced, and environmental cues will be further disrupted.

Despite voluminous information regarding the stressors affecting fish and aquatic life in the Delta, the BDCP EIS/EIR fails to adequately address these issues. Delta smelt have suffered relentlessly from the direct and indirect effects of past and present levels of exports from the

Delta. A switch of exports to the North Delta upstream of the main pelagic habitats of the smelt will simply increase the risk of smelt to South Delta exports and further degrade smelt critical habitat in the West, Central, and North Delta, as well as Suisun Bay. The North Delta intakes will add a significant source of mortality to Sacramento Valley listed salmon and steelhead that does not exist today. Continuation of South Delta exports does little to alleviate existing stressors that are related to fish growth, survival, and reproduction. Freshwater Delta inflow from the Sacramento River will decrease and inflow from the San Joaquin River will increase, thus contributing to even warmer water in the Delta from spring through summer and early fall. LSZ pelagic habitat of Delta Smelt would be drawn upstream into the influence of north Delta diversions and screening systems (which do not protect smelt). Pelagic low-salinity cool water Delta habitat would also suffer under new North Delta exports and continuing South Delta exports to the point where at a minimum no benefits would accrue. (Appendix 5B forecasts little if any benefits from reduced entrainment to Delta Smelt from the BDCP.) As for salmon, there will be more opportunity for the populations from the Sacramento River system to interact with the project screen systems than under the present configuration. Plus continuation of the south Delta exports maintains most of the present risks to these populations.

The BDCP EIS/EIR fails to develop alternatives to improve habitat conditions for fish in and downstream of the Delta (in the low salinity zone of the estuary in Suisun Bay) through the integration of water operations with physical habitat enhancement and restoration. Major habitat enhancements of the proposed conservation measures are isolated from the LSZ of the estuary. Proposed water operations and infrastructure (including the proposed North Delta export facilities) would further isolate, not integrate, proposed habitat improvements.

Finally, the BDCP EIS/EIR fails to emphasize natural physical habitat and biological processes that would support and maintain species covered by the Plan (i.e., covered species) and their habitat. The biological processes and habitats of the LSZ in the West and Central Delta are virtually ignored in the conservation measures. The natural pelagic habitats so important to Delta fishes are virtually ignored in the BDCP.

Specific BDCP Conservation Measures CM 1-21

BDCP conservation measures applicable to securing a take permit for CM-1 (Water facilities and Operation) include CM-2 (Yolo Bypass Enhancement), CM-3 (Natural Communities Enhancement), CM-4 (Tidal Marsh Creation/restoration), CM-5 (Seasonal Floodplain Creation/restoration), CM-6 (Channel Margin Enhancement), CM-7 (Riparian Restoration), CM-10 Non-tidal Marsh Restoration) and CM-11 (Natural Community Enhancement). Unfortunately, only CM-1 has received a project level evaluation and even that evaluation is sadly lacking in specific and necessary details. The lack of project level analysis and disclosure in the other conservation measures effectively piecemeals the project and defers mitigation and assurances in violation of HCP/NCCP permitting requirements. All components should receive the same level of detail.

Additionally, it appears that a number of habitat restoration projects in the above conservation measures are in various stages of planning and implementation and will likely proceed with or without BDCP. Again, BDCP should not seek credit for habitat projects that will be likely implemented, even should CM-1 not go forward.

BDCP conservation measures CM 12-21 are, in varying degrees, ongoing and should not be included in BDCP. They already have varying levels of CEQA or NEPA certification and are being directed or managed by others, do not depend upon CM-1 and BDCP should not be seeking credit for them. That said; none of them have achieved their envisioned or desired results.

<u>CM-1 (Water Facilities and Operation)</u>

CM1 is essentially a water conveyance project masquerading as a conservation measure. It will reduce outflow and exacerbate already poor Delta hydrological habitat that is essential for key fish species and their critical habitats. By drawing X2 further eastward, CM-1 will increase the habitat expanse of Potamocorbula amurensis, the saltwater clam that invaded the estuary in the 1980s to the detriment of primary and secondary productivity and fish production. Higher salinities and reduced outflow will also expand the habitat of an array of invasive aquatic vegetation that has expanded throughout the Delta and established itself in recent habitat restoration areas. Invasive aquatic vegetation has reduced productivity and provided habitat for an assortment of non-native predatory fish species. CM-1 will increase residence time and will exacerbate already poor water quality conditions and significantly increase the frequency of violations of water quality standards established to protect fish and other beneficial uses of water.

Existing water exports from the south Delta have altered Delta hydrology, degraded water quality, expanded the range of invasive species, reduced plankton productivity, exported primary production, decreased suspended sediment and entrained vast numbers of fish. According to the California Department of Fish and Wildlife's Fall Midwater Trawls, between 1967 (the beginning of SWP exports) and 2013, population abundance indices of striped bass, Delta smelt, longfin smelt, American shad, splittail and threadfin shad have declined 99.6, 95.6, 99.8, 90.9, 98.5 and 97.8%, respectively. During the same period, the Summer Townet Survey reveals that abundance indices for striped bass and Delta smelt declined 98.2 and 94.2%, respectively. Native lower trophic orders and populations of wild winter-run and spring-run Chinook salmon show similar orders of magnitude declines.

The majority of Delta exports will continue to come from the south Delta export facilities. During dry years, south Delta exports will significantly exceed north Delta exports. Yet, there is no conservation measure to upgrade the existing 1950s-technology fish screens at south Delta facilities to state-of-the-art screens, as required by the CalFed Record of Decision. It is highly uncertain whether or not the proposed new fish screens in the north Delta will work as envisioned. The new screens will require a variance from present National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (DFW) fish screen requirements. BDPC has rejected the recommendations of the NMFS and the Fish Facilities Technical Team to phase in installation of the new screens to see if they work or can be legally permitted.

The assessment models in the CM-1 proposed operations include the existing restrictions including operational criteria prescribed in the two OCAP biological opinions and the state's D-1641 water quality standards. However, these are the same restrictions and operating criteria that contributed to many of the present problems, including the Pelagic Organism Decline (POD).

A fundamental problem with CM-1 is that it does not enhance Delta outflow, but rather decreases outflow to enhance exports. Outflow is the common denominator of many intertwined processes and influences distribution, condition and abundance of numerous species.[72] The failure to increase outflow will likely undermine any improvements that may occur with other conservation measures.

BDCP is pregnant with uncertainty, as evidenced by comments by the Delta Science Program's Independent Review Panel report on the BDCP Effects Analysis, the Delta Independent Science Board's review of the draft EIR/EIS for BDCP, the Independent Panel Review of BDCP sponsored by American Rivers and the Nature Conservancy, as well as numerous earlier comments by the National Research Council on adaptive management and the effects analysis, the red flag and progress comments by the National Marine Fisheries Service, U.S. Fish and Wildlife Service, U.S. EPA, U.S. Corps of Engineers and comments on the EIR/EIS by the State Water Resources Control Board.

Failing to acknowledge the enormous uncertainties inherent in CM-1 construction and operation and waiting to address uncertainty until sometime later through a vague undefined decision tree and adaptive management process is unacceptable. Especially, when all four decision tree operational alternatives will lead to reduced outflow in the long-term. Especially, when BDCP has refused to release the Implementing Agreement in time for public review prior to the public review draft of the BDCP, as required by the 2006 Planning Agreement regarding the BDCP.[73] Especially, when adaptive management programs have historically frequently failed to achieve desired results.[74]

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[72] "Outflow is thus the common denominator among the multitude of intertwined processes. In recognizing this, the Panel is unified in agreeing that the distribution, condition, or abundance of some estuarine organisms are statistically related to outflow and X2 because these two indicators reflect underlying physical and ecological processes that more directly affect the estuarine organisms. In statistical terminology, a number of important ecological factors "co-vary" with outflow and X2 and are more proximal influences on organism distribution, condition, and abundance. For example, some biotic indices may correlate with X2 because their distributions are driven by properties (for example salinity) that co-vary with X2, or because seasonal trends in X2 happen to coincide with inherent reproductive seasonality." (Workshop on Delta Outflows and Related Stressors Panel Summary Report, May 2014)

[73] The Implementing Agreement includes specific provisions for: conditions of species coverage; the long-term protection of any habitat reserves or other measures that provide equivalent conservation; implementation of mitigation and conservation measures; adequate funding to implement the plan; terms for suspension or revocation of the take permit; procedures for amendment of the BDCP, Implementing Agreement, and take authorizations; implementation of monitoring and adaptive management; oversight of BDCP effectiveness and funding; and periodic reporting.

[74] See Delta Independent Science Board: *Review of the Draft EIR/EIS for the Bay Delta Conservation Plan*, May 2014 and National Research Council: *A Review of the Use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan*, 2011 and Delta Science Program *Independent Review Panel Report, BDCP Effects Analysis Review, Phase 3*, March 2014.

Existing water export operations by BDCP project proponents have frequently violated promulgated water quality and flow standards established to protect fisheries and other beneficial uses. These include, San Joaquin River and south and west Delta salinity objectives protective of agriculture, Delta and Suisun Marsh salinity objectives protective of fish and wildlife, Delta outflow objectives, Sacramento and San Joaquin River flow objectives and objectives limiting exports and establishing inflow/export ratios. The State Water Resources Control Board has never taken enforcement action for thousands of documented violations of these water quality standards. There is no discussion or assurances in BDCP regarding compliance with water quality violations or how or whether CM-1 will comply with water quality standards in the future.

Nothing in BDCP and CM-1 and associated conservation measures demonstrates or provides assurances that CM-1, in conjunction with continued south Delta exports, will alleviate present downward trends, let alone reverse these trends and begin restoration of the Delta ecosystem to meet the requirements of an HCP or NCCP.

CM-2 (Yolo Bypass Enhancement)

CM2 is designed to mitigate a long list of identified problems on the Yolo Bypass and Cache Slough that were, in significant measure, created by flood control system projects. The flood control system should mitigate these problems. In any case, a number of these valuable and important activities are already underway, are being financed and managed by others and can move forward with or without CM-1. BDCP should not be latching on to ongoing projects or taking credit for them.

CM-2 is only analyzed at a programmatic level. Many of the proposed projects are highly speculative, may or may not be implemented and have uncertain likelihood of being funded. They cannot comply with HCP or NCCP requirements unless they can demonstrate adequate assurances of funding and implementation.

There is no ROA for 30 miles of the central tidal Bypass and non-tidal northern Bypass where tidal and non-tidal wetlands and seasonal inundated habitat could be added with benefits to young salmon that would be passing into the Bypass via the Fremont Weir. Nor are there proposals to address the many water diversions in the Bypass that entrain salmon and smelt. Many of the diversions in the south end have unscreened tide gates.

The Ship Channel that runs for over 20 miles along the east side of the lower Bypass and the Tule Canal that runs within the east side of the Bypass are important smelt spawning and early rearing habitats, yet they suffer from poor habitat and water quality conditions. The BDCP ignores addressing these issues. The entire Bypass, Cache Slough, and Ship Canal suffer poor water quality from stormwater and agricultural return-flow discharges in winter, spring, and summer that degrade the smelt and salmon habitats. The Bypass also receives significant methylmercury loading that bioconcentrates in fish tissue. These issues have been long known and amply documented but existing regulatory programs have failed to achieve anticipated results. Failure to ensure that these problems are adequately addressed increases the likelihood that many of the CM2 improvements may be wasted or may even be detrimental to overall fish survival and production.

CM-3 (Natural Communities Enhancement)

CM-3 proposes to provide a mechanism and guidance to establish a reserve system by acquiring lands for protection and restoration to meet biological goals and objectives addressed under the BDCP. However, no specific properties have been identified for acquisition in the BDCP, although Restoration Opportunity Areas (ROAs) have been identified. Goals for establishing habitat include: 27,000 acres of tidal perennial aquatic; 932 acres of tidal mudflat; 6,000 acres of tidal brackish emergent wetland; 24,000 acres of tidal freshwater emergent wetland; 4,300 acres of valley/foothill riparian; 100 acres of non-tidal perennial aquatic; 670 acres of non-tidal freshwater perennial emergent wetland; and unknown acres of other seasonal wetland.

CM-3 is essentially a conceptual wish list. It has only been analyzed to a programmatic level. Specific properties have not been identified nor specific plans developed. Potential adverse impacts and possible mitigation measures have not been identified or analyzed. If implementation proceeds, it will lag far behind the construction of CM-1. Funding is not assured and is dependent on future state and federal authorizations. Given the lack of success of numerous previous habitat restoration projects in the Delta, implementation is unlikely to achieve the 100% success rate envisioned by BDCP.

Habitat restoration is not simply acres of new terrain or physical structure. Habitat is the quantity and quality of water flowing through terrain. Open water habitat is critically important, especially for pelagic species, but largely ignored in BDCP's conservation measures. It is highly unlikely that conservation measures CM 2-11 can mitigate for the significant reduction in the inflow of relatively good quality water to the estuary caused by the diversion of Sacramento water through tunnels under the Delta. As previously noted, BDCP modeling demonstrates that those inflow reductions will: decrease outflow; move X2 and the low salinity zone's crucial habitat for pelagic species eastward; increase the concentration of pollutants and the residence time for pollutants to interact with the ecosystem; reduce smolt survival rates for winter-run, spring-run and Sacramento and San Joaquin fall-run salmon and increase the bioconcentration of mercury and selenium in fish tissue. These significant and unavoidable impacts may be dismissed in environmental review by adopting statements of overriding consideration. They cannot be dismissed in securing an HCP or NCCP, when they would not occur in the absence of the project.

The West Delta ROA contains virtually all the dry year spring-summer-fall critical habitats of the Delta Smelt and much of the winter-spring habitat of rearing salmon in the Delta. These large pelagic habitat units and many miles of shorelines and shoals of the West Delta are critical to the success of these species as well as the BDCP. BDCP documents describe the West Delta as an integral part of the "North Delta Arc of Native Fishes" (Figure 1). Yet, inexplicably, the West Delta ROA is virtually ignored in CM-3 and other conservation measures. Over 50 miles of shoreline, half of which is un-leveed and "natural," are completely ignored, as is thousands of acres of important pelagic open-water habitat of the West Delta. These are critical areas heavily used by salmon and smelt in the Delta, especially in dry years when populations are highly stressed by low Delta outflow. In these drier years, the West Delta is especially critical habitat, given the high salinities of Suisun Marsh and the Bay and the fact that the Cache Slough complex in the north Delta is subject to lethal temperatures. At such times the Low Salinity Zone (LSZ) lies almost entirely within the West Delta. The remaining LSZ habitat is completely ignored, as it is in the Central Delta and does not have an ROA.

The LSZ is supposed to be the most productive and prolific area of an estuary. However, as BDCP acknowledges in Chapter 5, primary production in the West Delta ROA is currently the second lowest of the ROAs. BDCP models predict that production will increase but will remain lower than the average of the other ROAs. The BDCP states: "Tidal habitat restoration in the West Delta ROA could increase local food production for rearing salmonids and splittail," but virtually no tidal habitat restoration is proposed. Of course, tidal habitat is already extensive in the Western Delta, as virtually the entire area is tidal habitat. Primary productivity does not suffer from lack of tidal habitat. Poor productivity or primary production is a result of the radically altered hydrodynamics and low quality inputs created by excessive Delta exports.

Habitat is more than mere acres; it also includes the quality of water and the nutrients necessary for primary production. Excessive Delta exports literally vacuum the critical LSZ pelagic habitat to the central and south Delta for export to southern California. This important habitat area needs more nutrients, longer residence times, more productive inputs from adjacent ROAs, and less export of its primary production to southern California. High inflows of unproductive reservoir water during the summer from the Sacramento River, coupled with negative flows in the lower San Joaquin River, draw critical habitat toward the South Delta export facilities. This reduces residence time and primary production and exports critical pelagic habitat. Summer temperatures frequently exceed levels lethal to Delta smelt. Pelagic habitat remaining in the western Delta is largely comprised of unproductive reservoir water feeding the exports.

The new North Delta export facility in CM-1 will exacerbate these hydrodynamic problems, as continuation of South Delta exports sustains them. By failing to enhance the pelagic habitat and plankton community of the West Delta ROA by failing to manage and restore natural Delta hydrodynamics, CM-3 cannot mitigate the adverse impacts of CM-1.

4. **CM-4 (Tidal Marsh Creation/Restoration)**

Open water or pelagic habitat is largely missing from the tidal habitat discussion in CM-4, as it is in CM-3. Open water habitat in the Delta is the key habitat of smelt and other pelagic fishes and clearly part of the Tidal Perennial Aquatic Habitat Community, but CM4 only focuses on 30,000 acres of emergent wetland restoration. Implementation of CM-1 will likely adversely impact the time and space array of quality pelagic habitat in the Delta. In other words, it will likely decrease the amount of quality Delta smelt habitat.

5. **CM-21 (Non-project Diversions)**

Moyle et al (2012)[75] promote a "Reconciled Delta - a coherent, robust, and dynamic portfolio of habitats and flows that support desired ecosystem functions and conditions". Despite a relatively negative prognosis for the future of the Delta, these authors state that "physical habitats and flows can be managed, where possible, to provide conditions that native estuarine species need at different stages in their lives…. In our vision for a reconciled Delta ecosystem, habitats in different parts of the Delta would be specialized to foster improved conditions for native fishes. All forms of habitat cannot be at all locations, so we propose a strategy in which different habitat types are available and connected to support each desirable species at the appropriate season, taking advantage of existing ecological differences among different regions of the Delta. Area specialization can provide the ecosystem diversity and variability that native fishes (and other organisms) need, while supporting continued human uses of Delta land and waters."

These statements portray the basic problem with the BDCP, which is that it lacks specifics as to habitats, locations, and timing to meet the needs of the target native fishes in the Delta. Specifically the BDCP needs to show where the critical areas are in the Delta for salmon and smelt, the problems with these habitat areas, and what specifically can be done to improve habitats and fish populations. The complete lack of discussion of pelagic habitat and the low salinity zone of the Delta estuary is a perfect example of what is missing from the BDCP. It is almost like the BDCP sponsors forgot why they are doing a BDCP. If society plans to continue massive water supply exports from the Delta, how are we going to replace all the 6 million acre feet or so of pelagic habitat lost each year and keep native species that depend on that habitat from going extinct. CM1 fails to provide more outflow critical to the estuary, instead offering less in order to enhance water supply benefits. There is no doubt that with the new facilities and retention of the old ones, it would be relatively easy to completely decimate Delta pelagic habitats and the salmon and smelt populations, and that the weak adaptive management provisions to address uncertainties in operational effects are weak at best. Determining how the system should work after the infrastructure is built is recipe for further disaster. Parallel efforts to the BDCP to revise water quality standards and operations of the CVP also need be incorporated into the process to ensure success. Suggesting undertaking the BDCP under the present antiquated and inadequate regulatory systems will not lead to success.

If there has been one thing learned over the past several decades in the Bay-Delta is that the regime shifts and population crashes occur in drier years. Yet we continue to advocate relaxing standards in dry years and focusing protections in wetter years. The smelt population has yet to recover from 1981. The striped bass have yet to recover from 1987-1992. We killed modest smelt recoveries in 01-02, 07-09, and 12-14. The focus is wrong. The BDCP will increase the problems in dry years because the plan retains large South Delta exports in dry years. We simply cannot condone removal of all high quality, low salinity zone, pelagic habitat as in 2013. A start toward recovery would be to plan to save what little habitat occurs in dry years when the low salinity zone pelagic habitat lies within the West and Central Delta. CM1 is the measure that should deal with this issue. It is too important to wait until after the BCDP is implemented to address this issue.

"Outflow is thus the common denominator among the multitude of intertwined processes. In recognizing this, the Panel is unified in agreeing that the distribution, condition, or abundance of

[75] http://www.ppic.org/main/publication.asp?i=1053

some estuarine organisms are statistically related to outflow and X2 because these two indicators reflect underlying physical and ecological processes that more directly affect the estuarine organisms. In statistical terminology, a number of important ecological factors "co-vary" with outflow and X2 and are more proximal influences on organism distribution, condition, and abundance. For example, some biotic indices may correlate with X2 because their distributions are driven by properties (for example salinity) that co-vary with X2, or because seasonal trends in X2 happen to coincide with inherent reproductive seasonality." (Workshop on Delta Outflows and Related Stressors Panel Summary Report, May 2014)

PROPOSED BDCP CONSERVATION MEASURES
[Table ES-3. Proposed BDCP]

Conservation Measures Cm	Title	General Description
1	Water Facilities and Operation	This CM provides for the construction and operation of a new north Delta water conveyance facility to bring water from the Sacramento River in the north Delta to the existing water export pumping plants in the south Delta, as well as for the operation of existing south Delta export facilities. The 15 action alternatives for the proposed BDCP differ in the location, design, and operation of conveyance facilities/improvements implemented under CM1. The total capacity of the proposed north Delta water conveyance facility would be 3,000–15,000 cubic feet/second, depending on the alternative.
2	Yolo Bypass Fisheries Enhancement	The Fremont Weir and Yolo Bypass would be modified to increase the frequency, duration, and magnitude of floodplain inundation and to improve fish passage in the Yolo Bypass.
3	Natural Communities Protection and Restoration	A system of conservation lands in the Plan Area would be established by acquiring lands for protection and restoration.
4	Tidal Natural Communities Restoration	65,000 acres of tidal natural communities restoration would occur, including a minimum of 24,000 acres of intertidal freshwater wetland and 6,000 acres of brackish wetland. Under Alternative 5, tidal habitat restoration would be limited to 25,000 acres.
5	Seasonally Inundated Floodplain Restoration	10,000 acres of seasonally inundated floodplains that historically existed in the Plan Area, but have been lost as a result of flood control and channelization, would be restored. Under Alternative 7, 20,000 acres of seasonally

		inundated floodplain would be restored.
6	Channel Margin Enhancement	20 linear miles of channel margin would be enhanced by improving channel geometry and restoring riparian, marsh, and mudflat habitats on the waterside side of levees along channels that provide rearing and outmigration habitat for juvenile salmonids. Under Alternative 7, 40 linear miles of channel margin habitat would be enhanced.
7	Riparian Natural Community Restoration	5,000 acres of native riparian forest and scrub would be restored, and 750 acres would be protected. This restoration would be in association with restoration of tidal and floodplain areas (CM4 and CM5, respectively) and channel margin enhancements (CM6).
8	Grassland Natural Community Restoration	2,000 acres of grassland habitat would be restored, and 8,000 acres would be protected.
9	Vernal Pool and Alkali Seasonal Wetland Complex Restoration	Up to 67 acres of vernal pool complex and 72 acres of alkali seasonal wetland complex would be restored to achieve no net loss in acreage from BDCP covered activities. In addition, at least 600 acres of vernal pool complex would be protected in conjunction with 150 acres of alkali seasonal wetland complex.
10	Nontidal Marsh Restoration	1,200 acres of nontidal marsh would be restored.
11	Natural Communities Enhancement and Management	Natural communities and covered species' habitats would be enhanced and managed.
12	Methylmercury Management	The conditions that promote production of methylmercury in restored areas and its subsequent introduction to the foodweb, and to covered species in particular, would be minimized.
13	Invasive Aquatic Vegetation Control	The introduction and spread of invasive aquatic vegetation in aquatic restoration areas would be prevented and controlled
14	Stockton Deep Water Ship Channel Dissolved Oxygen Levels	The Stockton Deep Water Ship Channel DWR Aeration Facility would be operated to maintain dissolved oxygen concentrations above target levels during the BDCP permit term.
15	Localized Reduction of Predatory Fishes (Predator Control)	Populations of nonnative predatory fishes would be reduced at specific locations, and holding habitat for these predatory fishes would be eliminated or modified at selected locations of high predation risk.
16	Nonphysical Fish Barriers	Nonphysical barriers (structures combining sound, light, and bubbles) would be installed at the head of Old River, Delta Cross Channel, Georgiana Slough, and possibly Turner Cut and

		Columbia Cut to deter juvenile salmonids from using specific channels/migration routes that may contribute to decreased survival.
17	Illegal Harvest Reduction	Funding would be provided to CDFW to increase the enforcement of fishing regulations to reduce illegal harvest of Chinook salmon, Central Valley steelhead, green sturgeon, and white sturgeon in the Delta, bays, and upstream waterways.
18	Conservation Hatcheries	New delta smelt and longfin smelt conservation propagation programs would be established and existing programs would be expanded to ensure the existence of refugial captive populations of these species to help reduce their risks of extinction.
19	Urban Stormwater Treatment	Funding would be provided for implementing stormwater treatment measures in urban areas that would result in decreased discharge of contaminants to the Delta
20	Recreational Users Invasive Species Program	A Delta Recreational Users Invasive Species Program would be funded. This program would implement actions to prevent the introduction of new aquatic species and reduce the spread of existing aquatic invasive species by means of recreational watercraft, trailers, and other mobile recreational equipment used in aquatic environments in the Plan Area.
21	Nonproject Diversions	Funding would be provided for actions that would minimize the potential for entrainment of covered fish species associated with operation of nonproject diversions (diversions other those related to the SWP and CVP).
22	Avoidance and Minimization Measures	Avoidance and minimization measures would be implemented to avoid and minimize effects on covered species and natural communities that could result from BDCP covered activities. These measures would be implemented for all BDCP covered activities through the BDCP permit term.

Bay Delta Conservation Plan, Draft EIR Comments, Water Quality (Chapter 8 and Appendix 8N, Trace Metals)

There is a fundamental flaw in the analysis regarding Water Quality (Chapter 8). Individual constituents were analyzed and discussed based on the potential for exceedance of Federal water quality criteria or State water quality objectives or if the constituent was on the State's Clean Water Act Section 303(d) list. A cornerstone of the State and Regional Water Board's regulatory authority is the Antidegradation Policy (Resolution 68-16) which is included in the Basin Plans as an appendix. However, the EIR fails to discuss or analyze constituents which will "degrade" water quality unless they pose a threat to exceed a water quality standard.

Section 101(a) of the Clean Water Act (CWA), the basis for the antidegradation policy, states that the objective of the Act is to "restore and maintain the chemical, biological and physical integrity of the nation's waters." Section 303(d)(4) of the CWA carries this further, referring explicitly to the need for states to satisfy the antidegradation regulations at 40 CFR § 131.12 before taking action to lower water quality. These regulations (40 CFR § 131.12(a)) describe the federal antidegradation policy and dictate that states must adopt both a policy at least as stringent as the federal policy as well as implementing procedures.

California's antidegradation policy is composed of both the federal antidegradation policy and the State Board's Resolution 68-16 (State Water Resources Control Board, Water Quality Order 86-17, p. 20 (1986) ("Order 86-17); Memorandum from Chief Counsel William Attwater, SWRCB to Regional Board Executive Officers, "federal Antidegradation Policy," pp. 2, 18 (Oct. 7, 1987) ("State Antidegradation Guidance")). As a state policy, with inclusion in the Water Quality Control Plan (Basin Plan), the antidegradation policy is binding on all of the Regional Boards (Water Quality Order 86-17, pp. 17-18).

The Antidegradation Policy (Resolution 68-16) requires that:

- Existing high quality water will be maintained until it has been demonstrated that any change will be with the maximum benefit to the people of the State.
- The change will not unreasonably affect present and anticipated beneficial uses.
- The change will not result in water quality less than prescribed in the policies.

Any activity which produces a waste or increased volume or concentration will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that a pollution or nuisance will not occur and the highest water quality with maximum benefit to the people of the state will be maintained.

Implementation of the state's antidegradation policy is guided by the State Antidegradation Guidance, SWRCB Administrative Procedures Update 90-004, 2 July 1990 ("APU 90-004") and USEPA Region IX, "Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12" (3 June 1987) (" Region IX Guidance"), as well as Water Quality Order 86-17. The Regional Board must apply the antidegradation policy whenever it takes an action that will lower water quality (State Antidegradation Guidance, pp. 3, 5, 18, and Region IX Guidance, p. 1). Application of the policy does not depend on whether the action will actually impair beneficial uses (State Antidegradation Guidance, p. 6). The proposed project, as defined by the alternatives described in the EIR, will result in reduced flows and lower water quality in the Delta for some constituents.

The State Board's APU 90-004 specifies guidance to the Regional Boards for implementing the state and federal antidegradation policies and guidance. The guidance establishes a two-tiered process for addressing these policies and sets forth two levels of analysis: a simple analysis and a complete analysis. A simple analysis may be employed where a Regional Board determines that:

1) a reduction in water quality will be spatially localized or limited with respect to the waterbody, e.g. confined to the mixing zone; 2) a reduction in water quality is temporally limited; 3) a proposed action will produce minor effects which will not result in a significant reduction of water quality; and 4) a proposed activity has been approved in a General Plan and has been adequately subjected to the environmental and economic analysis required in an EIR. A complete antidegradation analysis is required if discharges would result in: 1) a substantial increase in mass emissions of a constituent; or 2) significant mortality, growth impairment, or reproductive impairment of resident species. Regional Boards are advised to apply stricter scrutiny to non-threshold constituents, i.e., carcinogens and other constituents that are deemed to present a risk of source magnitude at all non-zero concentrations. If a Regional Board cannot find that the above determinations can be reached, a complete analysis is required.

Even a minimal antidegradation analysis would require an examination of: 1) existing applicable water quality standards; 2) ambient conditions in receiving waters compared to standards; 3) incremental changes in constituent loading, both concentration and mass; 4) treatability; 5) best practicable treatment and control (BPTC); 6) comparison of the proposed increased loadings relative to other sources; 7) an assessment of the significance of changes in ambient water quality and 8) whether the waterbody was a ONRW. A minimal antidegradation analysis must also analyze whether: 1) such degradation is consistent with the maximum benefit to the people of the state; 2) the activity is necessary to accommodate important economic or social development in the area; 3) the highest statutory and regulatory requirements and best management practices for pollution control are achieved; and 4) resulting water quality is adequate to protect and maintain existing beneficial uses.

The EIR, page 8-408 states in part that:

> effects of the Alternative on Delta Hydrodynamics Under the No Action Alternative and Alternatives 1–9, the following two primary factors can substantially affect water quality within the Delta: Within the south, west, and interior Delta, a decrease in the percentage of Sacramento River sourced water and a concurrent increase in San Joaquin River-sourced water can increase the concentrations of numerous constituents (e.g., boron, bromide, chloride, electrical conductivity, nitrate, organic carbon, some pesticides, selenium). This source water replacement is caused by decreased exports of San Joaquin River water (due to increased Sacramento River water exports), or effects of climate change on timing of flows in the rivers. Changes in channel flows also can affect water residence time and many related physical, chemical, and biological variables. Particularly in the west Delta, sea water intrusion as a result of sea level rise or decreased Delta outflow can increase the concentration of salts (bromide, chloride) and levels of electrical conductivity. Conversely, increased Delta outflow (e.g., as a result of Fall X2 operations in wet and above normal water years) will decrease levels of these constituents, particularly in the west Delta.

The selected alternative #4 will reduce flows and result in lower water quality for several constituents (boron, bromide, chloride, electrical conductivity, nitrate, organic carbon, some pesticides and selenium). The Delta is currently impaired for many of the constituents that will increase under the proposed alternative. The Antidegradation Policy requires however that: "The change will not unreasonably affect present and anticipated beneficial uses and the change will not result in water quality less than prescribed in the policies." The proposed project will result in a substantial increase in mass emissions of constituents that already exceed water quality standards. This does not comply with the Policies set forth in the Basin Plan, exceeding a water quality standard does unreasonably affect present and anticipated beneficial uses. Impacts to the existing impaired water for unknown toxicity and specifically mortality, growth and reproduction of resident species has not been thoroughly discussed or analyzed for toxic constituents. A complete Antidegradation analysis must be conducted to determine incremental changes in constituent loading, both concentration and mass; an assessment of the significance of changes in ambient water quality; whether such degradation is consistent with the maximum benefit to the people of the state; whether the activity is necessary to accommodate important economic or social development in the area; and whether the resulting water quality is adequate to protect and maintain existing beneficial uses.

Aluminum is not considered in the EIR, Water Quality Section, as a constituent of concern. The Sacramento River maximum aluminum concentrations are over 8000 µg/L (Sacramento Regional Wastewater Treatment Plant NPDES Permit, page F-43, Order No. R5-2010-0114-021). The US EPA water quality criteria for the protection of freshwater aquatic life are four-day average (chronic) and one-hour average (acute) for aluminum are 87 ug/l and 750 ug/l, respectively. The drinking water standard (maximum contaminant level (MCL)), both state and federal, for aluminum is 200 ug/l. The draft EIR (8-764, Trace Metals) is quite simply wrong in stating that the primary source of aluminum in the Delta is due to wastewater discharges. As is stated above the background concentration of aluminum in the Delta, above the Sacramento Regional WWTP, was almost 92 times higher than EPA's chronic criteria for aluminum and more than ten times above the acute criteria which is necessary to protect aquatic life. This measured concentration of aluminum in the Delta also exceeds the drinking water standard by 40 times. The failure to address aluminum in the Water Quality section of the EIR is inexcusable, the EIR incomplete and does not comply with CEQA and/or NEPA.

The toxicity of hardness dependent metals was based on average (58 mg/l) and the 5th percentile hardness (39 mg/l, Sacramento River, appendix 8N6, table 11) rather than the lowest observed hardness (16 mg/l). Hardness dependent metals exhibit greater toxicity at lower harnesses. Ambient criteria for acute values are applicable to short periods of time, 1-hour average concentrations, and chronic values are defined as 4-day average concentrations.

The data set for hardness, as reported in Appendix 8N6, table 11, was collected from 1986 through 2010 and consisted of 630 data points. The data set does not state the type of samples collected, grab or composite. It is assumed that the samples were grab samples as most constituents, such as volatiles, require grab samples. A grab sample would be fairly representative of a one hour time period as water quality is generally not shifting quality that quickly. There is also nothing to indicate that hardness changes in surface water rapidly and a grab sample may also be representative of a four day average. The rationale for using the average and 5th percentile data points rather than the simple worst case hardness is not presented. There is certainly no indication that a four day average would be properly represented by an average of data points collected over a 24 year period. The worst case conditions and the worst case potential for toxicity has not been evaluated for hardness dependent metals.

Water Quality Criteria are stated as: The procedures described in US EPA's "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" indicate that, except possibly where a locally important species is very sensitive, (freshwater or saltwater) aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of (name of material) does not exceed (the Criterion Continuous Concentration) µg/L more than once every three years on the average and if the one-hour average concentration does not exceed (the Criterion Maximum Concentration) µg/L more than once every three years on the average. The use of an average or 95^{th} percentile hardness would potentially allow the criteria for hardness dependent metals to exceed the water quality criteria each time a hardness higher than the lowest recorded hardness is used to calculate the hardness. This in turn allows for exceedance of the criteria more than once in three years, the level EPA suggests would unacceptably affect aquatic life.

Pathogens, Section 8.2.3.12

The EIR identifies the beneficial uses impacted by pathogens as municipal and domestic supply, water contact recreation, shellfish harvesting, and commercial and sport fishing. Missing from this list is irrigated agriculture. Pathogens have not been evaluated for Agricultural Supply water. California Code of Regulations, Title 22, is mentioned in the EIR specifically with regard to pathogens and protecting Contact Recreational beneficial uses. However, Title 22 equally addresses agricultural irrigation and the acceptable levels of pathogens. From a regulatory point of view, Title 22 requirements are only directly applicable to reclaimed water, however the science used to determine a protective level for pathogens is directly applicable for protecting irrigated agriculture and recreational activities. The potential impacts to irrigated agriculture and the ingestion of food crops irrigated with water exceeding the recommended levels for pathogens presents at least the same level of concern as does recreational activities in that same water. The impacts to Irrigated Agriculture from pathogens, nitrates, constituents of emerging concern (CECs) and phthalates have not been assessed and the EIR is incomplete.

This Section of the EIR, page 8-80 states that: "Viruses also can be removed effectively through chlorine or ozone oxidation." This statement is incorrect; while chlorination may be effective at inactivating some limited viruses, it removes none. For the most part, viruses and protozoa have a moderate to high tolerance to chlorine. (CDC, Effect of Chlorination on Inactivating Selected Pathogens, 21 March 2012) It is also fairly well documented in Civil Engineering texts that virus and parasites are best removed by filtration and chlorination is generally accepted as ineffective. Going back to the requirements contained in CCR Title 22, filtration is required to remove pathogens, and one will note that disinfection with chlorine is not a requirement. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5% of viruses. Filtration is an effective means of reducing viruses and parasites from the waste stream not disinfection with chlorine.

The EIR is also incorrect that pathogens experience rapid die off in the environment. The EIR states that most pathogens die off quickly in the natural environment. However, the latest science shows that pathogens can survive for lengthy time periods and the indicator tests used to identify pathogens may not be reliable. Previous research had raised questions about whether E. coli O157:H7 outlasts indicator bacteria in the environment. So Michael Jenkins and his colleagues at the U.S. Department of Agriculture's Agricultural Research Service decided to test the reliability of the EPA's method by measuring the survival rates of E. coli O157:H7 and four species of indicator bacteria. In one experiment, they injected the E. coli strain and the indicator bacteria into small, porous chambers and then suspended the chambers in test ponds in northeast Georgia. By varying the chambers' depth in the water, the scientists could monitor the microbe's survival rate under different levels of solar radiation. In another experiment, they placed inoculated pond water in bottles in an outdoor laboratory. The researchers then measured bacteria levels at regular intervals. Both experiments exposed the bacteria to predation by other microorganisms—a common fate of microbes in the environment.

They found that in both experiments, the indicator bacteria died off significantly more quickly than E. coli O157:H7 did. For example, in the outdoor lab experiments, most cells of fecal Enterococcus—an indicator species—died in less than five days. But it took between seven and 18 days for most of the E. coli O157:H7 to die. The virulent strain appeared to be more resistant than indicator bacteria to solar radiation and to predation by other microorganisms. The findings suggest that the dangerous E. coli could be present in water even when tests for fecal indicator bacteria are negative, Jenkins says. "We need to develop methods that are going to be able to quantify the pathogens themselves," he says. (Chemical & Engineering News, ISSN 0009-2347)

> In general, many different kinds of viruses can persist in and on environmental media, including liquid and solid media and in the airborne state, with half-lives of hours, days, weeks or even months. The extent of persistence depends on the type of virus, it physical state (dispersed, aggregated, cell-associated, membrane-bound, adsorb to other solids, etc.), the medium in which it is present (faeces, respiratory secretions, tissues, other liquids or solids, air, etc. and prevailing environmental conditions that influence virus survival. The environmental conditions influencing virus survival generally include: temperature; pH and other physical and chemical properties of the medium in which the viruses are present, such as moisture content, organic matter, particulates, salt concentration, protective ions, and antiviral chemicals such as proteolytic enzymes; antiviral microbial activity, and light. On environmental surfaces and in aerosols additional environmental factors also influence virus survival, such as relative humidity and physico-chemical forces at air-water and air-water-solid interfaces." (WHO Virus Survival Report, Virus Survival in the Environment with Special Attention to Survival in Sewage Droplets and Other Environmental Media of Fecal or Respiratory Origin, August 21, 2003)
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> Three enteroviruses — polioviruses, echoviruses and coxsackieviruses — were used to contaminate soil and vegetables; their survival times, under various storage conditions, were then recorded (2). The concentration of the viruses employed varied from 1 x 104-5 to 1 x 105-5 CCID50/ml. Depending on soil type, moisture content, pH and temperature, the viruses survived for 150 to 170 days in soil. When added to uncooked vegetables and stored under household

conditions, the viruses survived for as long as 15 days." (Rev. sci. tech. Off. int. Epiz., 1991, 10 (3), 733-748, Virus survival in the environment)

Recreational Waters Criteria and Beach Closures

In most areas of California, the current water quality criterion for bacteria in recreational waters is based on fecal coliform organisms:

- In waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml.

US EPA's evaluation of the bacteriological data indicated that using the fecal coliform indicator group at the maximum geometric mean of 200/100 ml would cause an estimated 8 illnesses per 1,000 swimmers at marine beaches (Ambient Water Quality Criteria for Bacteria – 1986). US EPA now recommends the addition of criteria for E. coli (126/100 ml) and enterococci (33/100 ml) based on the same "acceptable" illness rate of 8 illnesses per 1,000 swimmers at marine beaches.

Even at the "acceptable" illness rate of 8 out of every 1,000 swimmers; the National Resources Defense Council (NRDC) in 2008 issued a press release interpreting EPA's data that beach closures were at their highest level in 18 years. In 2002, the Centers for Disease Control and Prevention (CDC) concluded that the incidence of waterborne infections from recreational water use has steadily increased over the last several decades. Despite the beach closures and the increase in reported sewage-related illnesses, in a healthy population, most of the illnesses resulting from exposure to inadequately treated sewage are relatively minor (respiratory illness; ear, nose, or throat irritation; and especially gastroenteritis) and go unreported. Even if such illnesses are reported to doctors, there is seldom an attempt to find or track an environmental source. Another complicating issue is inadequate data on the occurrence of sewer spills or overflows. The State Water Board has only begun requiring reporting of sewer spills into its new sanitary sewer overflow (SSO) database and reporting compliance rates are mixed. The lack of data regarding sewer spills and the under-reporting of illnesses makes it difficult to definitively estimate the incidence of diseases caused by exposure to sewage-contaminated waters. It can likely be conceded that the number of reported cases is a small subset of the actual number of illnesses caused by sewage exposure or waterborne pathogens. The discussion of beach closures has been largely limited to ocean waters; inland waters are rarely closed for recreational uses despite large numbers of documented sewer spills. The EIR fails to identify how many exceedances of the bacteria standard were recorded during the period analyzed. The EIR also fails to estimate the number of illnesses are typically occurring and are projected to occur during the study period. The EIR should also discuss beach closures within the Delta during periods when the standard is exceeded.

Beneficial Uses of the Receiving Water

By memorandum, dated September 28th 2000, Jeff Stone, California Department of Health Services (DHS), Office of Drinking Water, Recycled Water Unit, to Regional and District

Engineers wrote that: "Federal Standards for water quality where recreational bathing may occur were developed for freshwaters which are not directly influenced by sewage discharges (treated or untreated)." The memorandum goes on to state that the Department does not believe that the federal criteria are protective if the source of water is domestic wastewater and cites the "Uniform Guidelines" prepared by the Department.

Irrigated Agriculture

Although the discussion of pathogens has largely been limited to recreational uses, Irrigated Agriculture is a designated beneficial use of most inland waters. Outbreaks of bacteria-contaminated food have made headlines over the past few years. California Department of Public Health, Regulations, CCR Title 22, Section 60303, require that for the irrigation of Food Crops, including edible root crops, reclaimed water be tertiary treated water disinfected to 2.2 MPN/100 ml (total coliform organisms). Obviously, 2.2 MPN total coliform is significantly less than the 200 MPN fecal coliform bacteria criteria established for recreational waters. Undiluted surface water can be and is used to irrigate food crops. The science used to develop the bacteria limitation in the Title 22 Reclamation Criteria for the irrigation of food crops is applicable to surface waters even though the Title 22 regulatory requirements do not apply. By Memorandum to Regional Water Boards, dated August 18, 1992, the then Department of Health Services, Office of Drinking Water, issued the Uniform Guidelines for the Disinfection of Wastewater (Uniform Guidelines). The Uniform Guidelines recommend that for agricultural uses where there is less than a twenty-to-one dilution of wastewater within the receiving stream, that a tertiary level of treatment be required with a 2.2 MPN/100 ml limitation for total coliform organisms. A footnote for this situation states that where there is no dilution, the water reclamation criteria shall apply. The Uniform Guidelines further recommend that: when there is dilution available in the receiving stream of at least 20-to-1 the wastewater be treated to a secondary level and disinfected to a 23 MPN/100 ml; and when there is dilution available of at least 100-to-1 the wastewater be treated to a secondary level and disinfected to a 240 MPN/100 ml.

Municipal (Drinking) and Domestic

The Uniform Guidelines recommend that for drinking water uses where there is less than a twenty to one dilution of wastewater within the receiving stream, that no domestic wastewater discharges be allowed. Tertiary treated, 2.2 MPN/100 ml, wastewater could only be allowed to a receiving stream with a drinking water beneficial use if greater than a twenty-to-one dilution reliably exists.

Contact Recreation

The Uniform Guidelines and the Reclamation Criteria of CCR Title 22 require that for unrestricted recreational uses that wastewater be tertiary treated and disinfected to 2.2 MPN/100 ml (total coliform organisms), unless a 20 to 1 in stream dilution exists then the wastewater may be secondary treated and disinfected to 23 MPN/100 ml. This recommendation for contact recreational uses is directly comparable to the US EPA recommended bacteria criteria.

Domestic Wastewater Treatment

As stated above, the California Department of Public Health, formerly the Department of Health Services, does not support the Federal Criteria as being protective if the source of water in the receiving stream is domestic wastewater (treated or untreated). Domestic wastewater discharges are regulated under Federal NPDES permits issued by the State and Regional Boards. The federal Clean Water Act, Section 101(a)(2), states: "it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water be achieved by July 1, 1983." Federal Regulations, developed to implement the requirements of the Clean Water Act, create a rebuttable presumption that all waters be designated as fishable and swimmable. Federal Regulations, 40 CFR Sections 131.2 and 131.10, require that all waters of the State regulated to protect the beneficial uses of public water supply, protection and propagation of fish, shell fish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation.

The California Department of Health Services has developed reclamation criteria, California Code of Regulations, Title 22, Division 4, Chapter 3 (Title 22), for the reuse of wastewater. Title 22 requires that for spray irrigation of food crops, parks, playgrounds, schoolyards, and other areas of similar public access, wastewater be adequately disinfected, oxidized, coagulated, clarified, and filtered, and that the effluent total coliform levels not exceed 2.2 MPN/100 ml as a 7-day median. Title 22 also requires that recycled water used as a source of water supply for nonrestricted recreational impoundments be disinfected tertiary recycled water that has been subjected to conventional treatment. A nonrestricted recreational impoundment is defined as "…an impoundment of recycled water, in which no limitations are imposed on body-contact water recreational activities." Title 22 is not directly applicable to surface waters; however, it is appropriate to apply an equivalent level of treatment to that required by DHS's reclamation criteria if receiving waters are used for irrigation of food crops and for contact recreation. The stringent treatment and disinfection criteria of Title 22 are appropriate since undiluted effluent may be used for the irrigation of food crops and/or for body-contact water recreation. Coliform organisms are intended as an indicator of the effectiveness of the entire treatment train and the effectiveness of removing other pathogens.

Additive toxicity

Acute and chronic toxicity tests were conducted to determine the effects of metals combined as mixtures at proposed water quality criteria concentrations and at multiples of the LC50 and obtained from tests on six metals with three aquatic species. Arsenic, cadmium, chromium, copper, mercury and lead caused nearly 100% mortality rainbow trout and daphnids (C dubia) during acute exposure. These results point out the need for additional studies to determine the type and degree of interaction of toxicants because single chemical water quality criteria may not sufficiently protect some species when other toxicants are present concurrently. (US EPA publication 600/3-85/074) The Central Valley Basin Plan, Implementation, Policy for Application of Water Quality Objectives requires that: "Where multiple toxic pollutants exist together in water, the potential for toxicologic interactions exists. On a case by case basis, the

Regional Water Board will evaluate available receiving water and effluent data to determine whether there is a reasonable potential for interactive toxicity. Pollutants which are carcinogens or which manifest their toxic effects on the same organ systems or through similar mechanisms will generally be considered to have potentially additive toxicity." The EIR documents that the Delta is listed as impaired for unknown toxicity. It is reasonable to assume that additive effects of the many listed constituents could be at least contributing to toxicity within the Delta. The EIR is incomplete without an assessment of additive toxicity.

Section 8.2.2.1 Water Quality Monitoring Programs and Sources of Data list the sources of data used to assess the existing water quality in the study area. Absent are Wastewater Dischargers (NPDES permit holders) and agricultural Dischargers to surface waters which are required to sample their wastewater effluent as well as the receiving stream. These Dischargers are also required to conduct sampling for priority pollutants. This data would have been critical in assessing the conditions throughout the Delta and beyond. It is likely that use of the WWTP data set would have greatly expanded the list of constituents of concern. It seems reasonable that as additional water is removed from the Delta the remaining water would have a larger component of domestic wastewater from direct discharges making the quality of this source water of greater importance.

Salinity and electrical conductivity (EC)

Section 8.2.3.7 Salinity and Electrical Conductivity, beginning on page 8-52 states that: "Concern about salinity involves three main issues: drinking 7 water, crop irrigation, and biota/habitat… In addition, industrial processes that require low-salinity water can be negatively affected. Salt removal during the water purification process (for either drinking or process water) is presently very expensive." "When salinity concentrations in irrigation water are too high, yields for salt-sensitive crops may be reduced." (Page 8-53) "Incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, Environmental Commitments, a separate, non-environmental commitment to address the potential increased water treatment costs that could result from EC concentration effects on municipal, industrial and agricultural water purveyor operations."

Agricultural crop yields reductions will occur as salinity in the irrigation water increases, not just for salt sensitive crops but even for more tolerant plant species. (Irrigation with Reclaimed Municipal Wastewater, a Guidance Manual, SWRCG Report No. 84-1 wr, Chapter 3 and Table 3-1) The anticipated reduction in crop yields as EC levels increase is not presented. A methodology for determining crop yield reductions is not presented. The proposed commitment to address "increased water treatment costs" does not address crop yield reductions and the associated lower profits earned since it is unlikely that irrigation water would be treated.

Industrial uses of water can be the most limiting water quality objectives for salinity as shown in Water Quality Criteria (McKee and Wolf, SWRCB 1963) Chapter 5. It is currently not uncommon for industries to use reverse osmosis (RO) system to remove salts prior to use in cooling towers and boiler systems. The EIR should document how many systems are in place for industrial uses to account for elevated salt levels within the use area. How many additional salt treatment and removal system will need to be installed to account for the increased EC levels projected by some of the EIR alternatives? The existing and future costs associated with the EIR alternatives have not been accounted for.

"The Region 5 Basin Plan specifies EC objectives for the Sacramento River, Feather River, and San Joaquin River; it also contains EC objectives for the Delta, which have been superseded by the 2006 Bay-Delta WQCP… impairment by elevated EC levels, as follows: (a) southern, northwestern, and western channels in the Delta; (b) Delta export area; (c) Grasslands drainage area, Mud Slough, and Salt Slough in the San Joaquin River valley; (d) San Joaquin River from Bear Creek to Delta boundary; and (e) Suisun Marsh (State Water Resources Control Board 2011)." (Page 8-55)

The Delta currently exceeds the water quality standard for EC. Several of the options contained in the EIR will lead to worsening of this condition. However, the EIT simply states that we will look at it later and we will throw lots of money at it. There is no assessment of the current crop yield losses or those expected to occur due to implementation of the various options. There is no assessment of the current impacts to industry or those that may be anticipated by increased salinity. There is no quantification of the actual costs to agriculture, industry, local communities or individuals that may occur due to increasing salinity levels. It's easy to say there will be a commitment to offset the costs when those costs have not been assessed and a mechanism to reclaim those costs has not been developed, however this should be analyzed as a part of the EIR.

Color

CCR Title 22, Chapter 15, Article 16, Secondary Water Standards, Section 64449, states, in part, that: "The secondary MCLs shown in Tables 64449-A and 64449-B shall not exceed in the water supplied to the public by community water systems." Table 64449-A contains a MCL for color of 15 units.

Drinking water MCLs are included in the Central Valley Basin Plan by direct reference under the Chemical Constituents Objective, therefore the MCLs are applicable water quality standards.
The EIR (Section 8C.1.5.2) incorrectly states that: "Color in water has a secondary MCL of 15 color units. Secondary MCLs are established <u>only as guidelines</u> to assist public water systems in managing their drinking water for aesthetic considerations." In California the secondary MCL for color is a regulatory requirement and an applicable water quality standard.

The EIR (Section 8C.1.5.2) continues: "To the degree that color itself is a concern from an aesthetic standpoint, conventional drinking water treatment removes many of the constituents that cause high color levels in water. <u>Coagulation/flocculation and filtration remove metals like iron, manganese and zinc</u>. <u>Aeration removes iron and manganese</u>. <u>Granular activated carbon removes most of the contaminants which cause color</u> (U.S. EPA 2012b). Color in the three major source waters to the Delta does not vary considerably (see Step 1, Table SA-6). The average in the Sacramento River at Freeport/Greene's Landing is approximately <u>22 units</u>, while San Francisco Bay at Martinez and San Joaquin River at Vernalis average approximately <u>30 units</u>. The standard deviations at these locations are 22–37 units, indicating that substantial variability exists at all three locations, and no specific source waters is consistently highest in color. <u>The</u>

Delta is not 303(d) listed for color and thus no beneficial use impairment due to its current levels is occurring."

The total portions of iron, manganese and zinc may be removed by coagulation, flocculation and filtration, however the dissolved segment will likely pass through such treatment systems. The EIR does not present any information regarding the total and/or dissolved speciation of these metals. It makes no engineering sense that aeration would remove iron and manganese from a water column. Aeration is a process where air is added to a treatment process; this may result in volatile constituents to be removed to the atmosphere but not metals.

The EIR clearly shows that color exceeds the water quality standard throughout the Delta where the average levels of 22 units and 30 units clearly exceed the 15 unit standard. The fact that the 303(d) list has not been modified to include color does not indicate that the water quality standard is not being exceeded.

The State Water Resources Control Board's Policy, Resolution No. 88-63, "Sources of Drinking Water" states that All surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards…" Drinking water quality must be maintained within the waters of the State not just following extraction and treatment.

The drinking water beneficial use is impaired by color within the Delta; the EIR clearly documents this case by showing average color levels which exceed the drinking water MCL. The EIR is not only deficient with regard to the discussion of color, but it is misleading and simply incorrect.

Page 8C-19 states, in part, the following with regard to pH: "Because pH is a fundamental property of water, it affects the chemistry of numerous other constituents within the water, and thus, in addition to having potential direct effects on beneficial uses (such as municipal and domestic water supply and aquatic organisms), can also affect beneficial uses indirectly by altering the chemistry and toxicity of other constituents in the water.

Within the affected environment, pH is typically between 6.5 and 8.5. The pH within the affected environment is controlled primarily by natural factors, such as alkalinity from natural weathering of minerals and carbon dioxide concentrations controlled by algae and bacterial respiration. Figure 8C- 1 shows exceedance probabilities of historical pH data from 1975 to 2009 in the Sacramento River at Freeport/Greene's Landing, the San Joaquin River at Vernalis, and San Francisco Bay at Martinez. The data indicate that the Sacramento River and San Francisco Bay are within the Basin Blan objective range of 6.5 to 8.5 >95% of the time, while the San Joaquin River is between the limits >90% of the time. As water moves from these locations to areas within the Delta, pH changes as a result of natural factors, and therefore the pH at any given location within the Delta may have no correlation to the source waters that contribute water to that location. Given this, and given that the alternatives do not include components that would directly depress or elevate pH, it is not expected that pH would change substantially upstream of the Delta, within the Delta, or in the SWP and CVP Service Area under the alternatives, relative to Existing Conditions and (for Alternatives 1A–9) the No Action Alternative. Any negligible changes in pH that may occur in the water bodies of the affected environment would not be of frequency, magnitude and geographic extent that would adversely affect any beneficial uses or substantially degrade the quality of these water bodies, with regards to pH."

For drinking water pH levels are important due to corrosive effects and adverse impacts to water treatment processes. For aquatic life, the pH range from 6.5 to 9 is considered nontoxic, however the toxicity of many constituents can be affected by changes in pH. pH levels outside the 6.5 to 9.0 range fish suffer adverse physiological effects increasing in severity until lethal levels are reached. The degree of dissociation of weak acids or bases is affected by changes in pH, which is important since the toxicity of several compounds is affected by the degree of dissociation. EPA criteria recommends that rapid pH fluctuations should be avoided. The Central Valley Basin Plan water quality objective for pH limits shifts to no more than 0.5 pH units outside the 6.5 to 8.5 range.

The final page of Appendix 8H is Figure 8C-1, the Probability of Exceedance for pH. This shows that waters Sacramento River and San Francisco Bay are below the 6.5 objective 5% of the time and the San Joaquin River is below the pH objective 10% of the time. The EIR speaks as if this is a good record of compliance, it is not when one considers the potentially toxic impacts to aquatic life. Recall from above that EPA Water Quality Criteria are stated as: The procedures described in US EPA's "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" indicate that, except possibly where a locally important species is very sensitive, (freshwater or saltwater) aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of (name of material) does not exceed (the Criterion Continuous Concentration) µg/L more than once every three years on the average and if the one-hour average concentration does not exceed (the Criterion Maximum Concentration) µg/L more than once every three years on the average. While pH is not measured as a concentration, surely exceeding the objective 5 or 10% of the time is not an acceptable compliance record.

The EIR states that "natural factors" will alter pH levels and any changes in pH would not be of frequency, magnitude and geographic extent that would adversely affect any beneficial uses or substantially degrade the quality of these water bodies. However, there is no information in the EIR supporting this claim. To the contrary, any exceedance of a water quality objective should be considered as serious. As water is withdrawn from the Delta, water from the San Joaquin River would have a greater impact on the Delta waters under several of the EIR alternatives, this would lead to an increase in overall pH violations of the water quality objective for pH. The EIR also does not discuss pH shifts which have the potential to increase toxicity and violate the Basin Plan objective for pH. The EIR should address the conditions as lower pH waters move out of the San Joaquin River and whether shifts in pH occur.

The Basin Plan contains a narrative Toxicity objective that prohibits: "Toxic substances to be present, individually or in combination, in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."

Threatened violation

The increasing production and use of pharmaceuticals and personal care products (PPCPs) – some of which may be endocrine disrupting compounds (EDCs) – have led to a growing concern about the occurrence of these compounds in the environment. Recent studies have reported the occurrence worldwide of EDCs, PPCPs, and other organic wastewater contaminants (OWCs) – collectively referred to as "constituents of emerging concern" (CECs) or "emerging constituents" (ECs) – in wastewater treatment plant (WWTP) effluents, surface waters used as drinking water supplies, and in some cases, finished drinking waters. Of the 126 samples analyzed for the project, one sample (American River at Fairbairn drinking water treatment plant [DWTP] intake collected in April 2008) had no detectable levels of any EDCs, PPCPs, or OWCs. All other samples had one or more analytes detected at or above the corresponding MRLs. The five most frequently detected PPCPs were caffeine, carbamazepine, primidone, sulfamethoxazole, and tri(2-chloroethyl) phosphate (TCEP). At the sample sites upstream of WWTP discharges in all three watersheds, the concentrations of selected PPCPs, except for caffeine, were low (i.e., ≤ 13 ng/L), pointing to WWTP discharges as the main source of most PPCPs and OWCs in the environment. (Source, Fate, and Transport of Endocrine disruptors, Pharmaceuticals, and Personal Care Products in Drinking Water Sources in California, National Water Research Institute Fountain Valley, California, May 2010)
Over the last 10 years, reports of feminized wildlife have fueled chilling headlines. Most of these reports have focused on the many ways that estrogen in sewage effluent can distort normal male development. Now a new study reveals one way that the hormone pollutant can affect females: Too much estrogen causes subtle changes in female fish's courting behavior, which could alter a population's genetic makeup (Environ. Sci. Technol., DOI: 10.1021/es101185b).

Increase in intersex fish downstream from WWTP possibly associated with endocrine-active contaminants. (Boulder Colorado, Colorado University, 2008) Skewed sex ratio downstream from WWTP possibly associated with endocrine-active contaminants. (Boulder Colorado, Colorado University, 2006) Fluoxetine (FLX), Sertraline (SER) and their degradates NFLX, and NSER were the primary antidepressants in brain tissue samples. Little or no venlafaxine (VEN), the dominant antidepressant in both water and bed sediment, was present. Degradates were measured at higher concentrations in brain samples than parent compounds. (Boulder Creek, Colorado & Fourmile Creek, Iowa, the College of Wooster, 2010) SAR sites (with WWTP or urban runoff influent) males had significantly lower Testosterone (T) than the reference site males. Males from SAR sites had significantly higher17β-estradiol (E2) than reference site. Females from SAR sites had significantly lower E2 than the reference site females. (USGS, Santa Ana River (SAR) SAR sites, 2009).

"Several recent studies have documented endocrine disruption in Delta fish. One of the biomarkers of EDCs is intersex fish, fish with both male and female reproductive organs. A recent histopathological evaluation of delta smelt for the Pelagic Organism Decline found 9 of 144 maturing delta smelt (6%) collected in the fall were intersex males. This study provides evidence that delta smelt are being exposed to EDCs. Brander and Cherr (2008) observed choriogenin induction in male silversides from Suisun Marsh. Riordan and Adam (2008) reported endocrine disruption in male fathead minnows following in-situ exposures below the Sacramento Regional Treatment Plant. Lavado, et al. (in press) conducted studies in 2006 and 2007 to evaluate the occurrence and potential sources of EDCs in Central Valley waterways. In their study, estrogenic activity was repeatedly observed at 6 of 16 locations in the Bay-Delta watershed, including in water from the Lower Napa River and Lower Sacramento River in the Delta. Further studies are needed to identify the compounds responsible for the observed estrogenic activity and their sources." (Alameda County Water District, Alameda County Flood Control and Water Conservation District, Zone 7, Metropolitan Water District of Southern California, San Luis & Delta-Mendota Water Authority, Santa Clara Valley Water District, State Water Contractors, June 1, 2010)

A recent study by the Toxic Substances Hydrology Program of the U.S. Geological Survey (USGS) shows that a broad range of chemicals found in residential, industrial, and agricultural wastewaters commonly occurs in mixtures at low concentrations downstream from areas of intense urbanization and animal production. The chemicals include human and veterinary drugs (including antibiotics), natural and synthetic hormones, detergent metabolites, plasticizers, insecticides, and fire retardants. One or more of these chemicals were found in 80 percent of the streams sampled. Half of the streams contained 7 or more of these chemicals, and about one-third of the streams contained 10 or more of these chemicals. This study is the first national-scale examination of these organic wastewater contaminants in streams and supports the USGS mission to assess the quantity and quality of the Nation's water resources. A more complete analysis of these and other emerging water-quality issues is ongoing. Knowledge of the potential human and environmental health effects of these 95 chemicals is highly varied; drinking-water standards or other human or ecological health criteria have been established for 14. Measured concentrations rarely exceeded any of the standards or criteria. Thirty-three are known or suspected to be hormonally active; 46 are pharmaceutically active. Little is known about the potential health effects to humans or aquatic organisms exposed to the low levels of most of these chemicals or the mixtures commonly found in this study. ("Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000: A national reconnaissance," an article published in the March 15, 2002 issue of Environmental Science & Technology, v. 36, no. 6, pages 1202-1211. Data are presented in a companion USGS report, "Water-quality data for pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000" (USGS Open-File Report 02-94). These and other reports, data, and maps can be accessed on the Internet at http://toxics.usgs.gov.)

PPCPs are found where people or animals are treated with drugs and people use personal care products. PPCPs are found in any water body influenced by raw or treated sewage, including rivers, streams, ground water, coastal marine environments, and many drinking water sources. PPCPs have been identified in most places sampled. The U.S. Geological Survey (USGS) implemented a national reconnaissance to provide baseline information on the environmental occurrence of PPCPs in water resources. You can find more information about this project from the USGS's What's in Our Wastewaters and Where Does it Go? site. PPCPs in the environment are frequently found in aquatic environments because PPCPs dissolve easily and don't evaporate at normal temperature and pressures. Practices such as the use of sewage sludge ("biosolids") and reclaimed water for irrigation brings PPCPs into contact with the soil. (http://www.epa.gov/ppcp/faq.html#iftherearei ndeed)

From the recent scientific investigations and literature it is reasonable to conclude that "constituents of emerging concern" (CECs) are present in the Delta at levels that cause toxicity in violation of the narrative toxicity objective. It is also reasonable to conclude that wastewater discharges into the Delta contains CECs in concentrations that at a minimum threaten to violate the Receiving Water Limitation for toxicity which prohibits toxic substances to be present in concentrations that produce detrimental physiological responses in human or aquatic life.

US EPA has compiled a database; Treating Contaminants of Emerging Concern A Literature Review Database (August 2010). Local wastewater treatment system design Engineers, such as Dr. Robert Emerick, have also been testing treatment system capabilities for removing CECs. There appear to be treatment technologies that are capable of removing significant levels of CECs. The EIR does not sufficiently assess the current state of water quality within the Delta or compliance with the narrative toxicity objective. The Delta is 303d listed as impaired for unknown toxicity. CECs present more than a reasonable potential to be causing and/or contributing to this toxicity.

Temperature

The Water Quality section of the EIR states that: "Because the primary concern of water temperature is effects on fish and aquatic organisms, temperature is addressed in Chapter 11, Fish and Aquatic Resources." Any discussion of Water Quality is incomplete without including temperature. There are water quality objectives for temperature in the Basin Plan; Water Quality Objectives (Page III-8.00, Sacramento and San Joaquin Basins), and the Water Quality Control Plan for Temperature (Thermal Plan, an appendix to the Basin Plan). Elevated temperature is a pollutant and compliance with objectives is a relevant discussion with regard to water quality. Also, temperature directly affects the toxicity of other constituents such as ammonia. Temperature also impacts dissolved oxygen concentrations and may impact compliance with the DO objective. Strictly in terms of compliance with objectives and the impacts to other constituents, a thorough discussion of temperature must be included in the Water Quality section of the EIR. The Water Quality section must be amended to discuss temperature, compliance with limitations, protection of beneficial uses and the impacts from the various alternatives described in the EIR.

The temperature objectives in the Basin Plan and the Thermal Plan are principally based on antidegradation (changes in temperature) and not necessarily on the direct protection of beneficial uses of receiving water or the Delta. The Delta is home to numerous species of cold water fish and all life stages. Maximum temperatures for the protection of cold water fish species are well documented; and the Central Valley Regional Board has included specific temperature regimes in NPDES permits, such as for the Cities of Lincoln and Placerville. Any discussion of temperatures must not be limited to regulatory compliance with objectives but must also discuss the temperatures necessary to assure a productive population of cold water aquatic life.

The EIR, Table 4-1. Overview of BDCP EIR/EIS Modeling Tools, shows that several models were used to simulate water quality projections for the various project alternatives:

> Artificial Neural Network (ANN) for CALSIM II An ANN has been developed for CALSIM II that attempts to mimic the flow-salinity relationships in the Delta, as simulated in DSM2. The ANN attempts to statistically correlate the salinity

results from a particular DSM2 model run to the various peripheral flows (Delta inflows, exports and diversions), gate operations and an indicator of tidal energy.

CALSIM II simulates operations of the SWP, CVP and areas tributary to the Sacramento-San Joaquin Delta. The model, based on inputted priorities and constraints, determines monthly river flows and diversions, Delta flows and exports, reservoir storage, deliveries to project and non-project users, and controls on project operations. CALSIM II results are used to determine water quality, hydrodynamics, and particle tracking in the DSM2 model.

Delta Simulation Model II (DSM2) DSM2 is a one-dimensional mathematical model that simulates hydrodynamics, water quality, and particle tracking throughout the Delta based on flow data generated from CALSIM II outputs. It describes the existing conditions in the Delta as well as performs simulations for the assessment of incremental environmental effects caused by facilities and operations. The model can be used to calculate stages, flows, velocities, mass transport processes for conservative constituents, and transport of individual particles. HYDRO provides the flow input for QUAL and PTM. QUAL simulates one-dimensional fate and transport of conservative water quality constituents given a flow field simulated by HYDRO. PTM simulates pseudo three-dimensional transport of neutrally buoyant particles based on the flow field simulated by HYDRO.

Particle Tracking Model (PTM) PTM simulates fate and transport of conservative and non-conservative water quality constituents throughout the Sacramento-San Joaquin Delta given a flow field simulated by HYDRO. The model uses velocity, flow, and stage output from DSM2-HYDRO. Outputs are used to estimate the effects of hydrodynamic changes on the fate and transport of larval fish, other covered species, and toxics through the Delta, as well as entrainment of larval fish at various locations. It allows assessment of particle fate, transport, and movement rate from numerous starting points to numerous end points. It provides information on movement of planktonic larval fish, such as delta and longfin smelt, in a tidal environment and is used extensively in Central Valley fishery assessments.

DSM2-HYDRO is a one-dimensional hydraulic model used to predict flow rate, stage, and water velocity in the Delta and Suisun Marsh at a 15-minute timestep. DSM2-QUAL simulates multiple conservative and non-conservative constituents including dissolved oxygen, carbonaceous BOD, phytoplankton, organic nitrogen, ammonia nitrogen, nitrate nitrogen, organic phosphorus, dissolved phosphorus, TDS and temperature. The model is used to predict water temperature, dissolved oxygen, and salinity in the Delta and Suisun Marsh at a 15-minute timestep.

The old adage about statistics also applies to Models; you can make them say anything that you want. Models can be a black box with a “trust us” outcome. The models design parameters, assumptions, input data, calibration and validation must be transparent in order to be able to meaningfully evaluate the ability to accurately project values. Even a good model is only as reliable as the data and assumptions that are used; or garbage in, garbage out.

There is a significant amount of information available on the internet evaluating the technical merits of CALSIM II. One of the more credible documents, prepared by the University of

California, Davis, Department of Civil Engineering, cites that in interviewing DWR and USBR management and modeling technical staff: "Many interviewees acknowledge that using CALSIM II in a predictive manner is risky and/or inappropriate, but without any other agency-supported alternative they have no other option." (CALSIM II in California's Water Community: Musing on a Model, Final Report 20 January 2004, Department of Civil and Environmental Engineering University of California, Davis) (Emphasis added) The report continues that: "All users agree that CalSim II needs better documentation of the model, data, inputs, and results. CalSim II is data-driven, and so it requires numerous input files, many of which lack documentation."; "There is considerable debate about the current and desirable state of CalSim II's calibration and verification."; "Its representation of the SWP and CVP includes many simplifications that raise concerns regarding the accuracy of results."; "Many interviewees are concerned that CalSim II's monthly time step cannot capture hydrologic variability adequately and thus does not compute water exports and export capacity accurately, both of which are significant factors in system operations." and, "The model's inability to capture within-month variations sometimes results in overestimates of the volume of water the projects can export from the Sacramento- San Joaquin Bay-Delta and makes it seem easier to meet environmental standards than it is in real operations."

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 the Bay/Delta and its watershed 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.

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.

Conclusions

It is the goal of the Clean Water Act that all waters be fishable and swimmable. Implementing State and Federal Regulations require that all beneficial uses be fully protected, not that 8 out of every thousand swimmers gets sick. It is doubtful that the general public has the perception that there are good odds they will get sick after a public health official tells them that waters are "safe" for swimming. Criteria should be established that are fully (100%) protective of surface beneficial uses. As is shown in the comments above these criteria are not only necessary to protect swimmers, but irrigated food crops and domestic water supplies.

The Central Valley Regional Water Quality Control Board has issued numerous NPDES permits that allow for mixing zones for numerous constituents. Altering the flow regime in a waterbody would impact the hydraulic and perhaps the constituent assimilative capacity available for mixing zones. Failure to reevaluate and modify mixing zones within the Delta could have significant adverse impacts to the beneficial uses of receiving waters. Mixing zones were also issued based in part on the economic impact to wastewater dischargers to fully treat their wastestream to meet end-of-pipe limitations. The impacts to mixing zones, beneficial uses, the associated economics and a requirement for reissuing NPDES permits that contain mixing zones should be discussed.

Our organizations hope that you will consider and incorporate these comments in a new and re-circulated EIS/EIR.

Respectfully submitted,

Michael B. Jackson

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ATTACHMENT A - DRAFT COMBINED CRITERIA TABLES

Sacramento River Inflow

2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
BDCP alters the hydrographs of Sacramento more than current alterations exhibit. •Sacramento River at Rio Vista flows reduced relative to unimpaired flow (UF) hydrograph in February through June from North Delta Intakes' diversions in W and AN years. •Average annual flows will decrease from 66% of UF to 56% of UF under BDCP. (Attachment 1)	•Providing flows that mimic the natural hydrograph will benefit native fishess in the Delta and should be used in determining magnitude and timing of needed flows for Delta ecosystem (p. 55). •Mimicking the natural hydrograph may provide flow regimes that change habitat conditions to benefit native fish and flush some nonnatives out of the system (as occurred on Putah Creek, pp. 25-26).	•"It appears to be important to preserve the general attributes of the natural hydrograph to which the various salmon runs adapted over time (p. 115)." •All years, April through June, 75 percent of unimpaired flow for Sacramento River at Rio Vista to benefit FRCS. (Table 21, Category A, p. 132). •To reflect natural hydrograph variation, the State Water Board recommends that, when possible, the flow criteria be expressed as a % of UF. (p. 96).	•Inflows should generally be provided from tributaries to the Delta watershed in proportion to their contribution to unimpaired flow in order to assure connection between Delta flow and upstream tributaries. •Flows should be at levels to maintain flow paths and east-west salinity gradients through the Delta.	•California flows and flow variability should reflect and support complexity, connectivity, and variability of habitat conditions for native species (p. 5). •General seasonality, magnitudes and directions of flow in UF record important for native species (p. 8). •Minimum flow past Peripheral Canal intake (approximately Hood between Freeport and Rio Vista) should be no less than 10,000 cfs in all months of all years (Table 3, p. 19).	River flow transports Delta smelt to spawning migration sites and to low salinity zone rearing habitat (p. 191). Delta smelt are endemic to the Bay-Delta and live only one year, so regardless of annual hydrology, Delta must provide suitable habitat all year, every year (p. 191-192). CVP/SWP upstream reservoir operations reduced spring flows while releases for exports and flood control storage increased late summer/fall inflows (p. 199).	"The Delta has thus become a conveyance apparatus to move water from the Sacramento side...to the southwestern corner of the Delta where the CVP and SWP pumping facilities are located. The Delta has become a stable freshwater body, which is more suitable for introduced and invasive exotic freshwater species of fish, plants, and invertebrates than for the native organisms that evolved in a fluctuating and 'unstable' Delta environment." (p. 207, see also top of page)	Assumes actions in 2009 NMFS Salmonid Biological Opinion as it supplements D-1641. Two other Sac River flow criteria recommended: • Following first autumn flows exceeding 15,000 cfs at Wilkins Slough, maintain suitable rearing and migratory habitats for emigrating WRCS through Sac River and Delta through April 30.	Assumes D-1641 flow and operational criteria.

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BDCP effects analysis projects survival rates for winter-run, spring-run, Sacramento fall-run decreasing by 2060 (Attachment 2). BDCP reports flow-fate studies of particle-tracking models show strong positive correlation with Delta outflow for particles injected at Sutter Slough and Cache Slough (Figures C.A-162 and 167, Section 5C.A.9.1, Attachment 5C.A of Appendix 5C).	Lower survival of juvenile salmon associated with decreased historical flow, increased water temperature and proportion of flow diverted through Delta Cross Channel and Georgiana Slough in Delta (p. 24). Survival of hatchery smolts between Sacramento and Suisun Bay positively correlated with flow, negatively correlated with water temperatures (p. 24).	•For all other runs of salmon, 75 percent of unimpaired flow measured on a 14-day running average for Sacramento River at Rio Vista (Table 21, Category B, p. 132). •7-day pulse flows at Wilkins Slough of 20,000 cfs with storm events, November through January (Table 21, Category B, p. 132).	Smolt survival increased in Sacramento River at Rio Vista when flows reached between 20,000 cfs and 30,000 cfs.	Sacramento River at Freeport flow prescriptions: •6 of every 10 years, October through June: 10,000 cfs for adult salmon upstream migration (Table 3, p. 19). •6 of every 10 years, March through June: 25,000 cfs for juvenile salmon outmigration (Table 3, p. 19). •1 of every 10 years, January through May: 70,000 cfs flow for adult sturgeon upstream migration (Table 3, p. 19).	River flow is the most "significantly degraded of all the primary constituent elements" of Delta smelt habitat. River flow needed for transport, rearing and adult migration activities of Delta smelt larvae, juveniles, and adults (p. 199). Outflow (80% of which is from the Sacramento River) has strong effect on distribution of YOY Delta smelt and whether they can avoid entrainment to the south Delta pumps; to move out of central and south Delta before water temperatures reach lethal levels (p. 178, 199).	Average Delta survival rate of FRCS smolts by water year type and 1990 level of development: W = 0.83; AN = 0.61; BN = 0.41; D = 0.33; C = 0.12; Mean = 0.46. (Table 6-33, p. 384) Survival rates less now than in 1990 level of development estimates due to increasing upstream demands (p. 385). Acoustic tagging studies verify that survival is lower in interior Delta channels and that higher flows benefit salmonid survival down-stream migration (p. 378)	•Provide pulse flows of at least 20,000 cfs measured at Freeport periodically during WRCS emigration season to facilitate outmigration past Chipps Island (i.e., December through April).	

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BDCP projects over 80 to 90% of Sutter Slough-injected Sacramento River particles passing Chipps when Delta outflow exceeds 20,000 cfs and over 70 to 80% of Cache Slough/Liberty Island particles passing Chipps Island at flows of 20,000 cfs or greater (Figures C.A-162 and 167, p. 279 and 283, Attachment 5C.A, Appendix 5C of Chapter 5 Effects Analysis). Temperature findings here.	Smolt survival maximized in Sacramento River at Rio Vista when flows reached between 20,000 cfs and 30,000 cfs (p. 55).	•Positive flows of 13,000 to 17,000 cfs, November through June below Freeport for outmigrating juvenile salmon to avoid Georgiana Slough entry (Table 21, Category B, p. 132). •Smolt survival increased with increasing Sacramento River flow at Rio Vista, with maximum survival observed at or above about 20,000 and 30,000 cfs from April through June (p. 53, 114).	•7-day pulse flows at Wilkins Slough of 20,000 cfs with storm events until monitoring shows that most salmon smolts have emigrated, November through January (Table 15, p. 106). •Positive flows of 13,000 to 17,000 cfs, November through June below Freeport to help outmigrating juvenile salmon avoid Georgiana Slough entry (Table 15, p. 106).	•Sac River annual inflows reduced by 26% annually between 1986-2005 (p. 11). •To prevent bidirectional flows up the Sac River on food tides, 10,000 cfs min flow recommended when exports occurring at a peripheral conveyance (p. 18). •For sturgeon, 70,000 cfs could happen through natural reservoir spills in wet years. Flows could be reduced with Fremont Weir notch and ops (p. 18).	Delta smelt larvae <20 mm at great risk of entrainment, and not measured at either louvers or collection screens. Outflow (80% from Sac R) affects position of adult spawners relative to hydrodynamic influence of CVP/SWP diversions.	When Delta Cross Channel (DCC) gates are open, about 45 percent of Freeport flow is redirected into Delta interior through the DCC and Georgiana Slough. When DCC gates are closed, flows through it are prevented, and more water remains in the Sac River channel, increasing flows in Sutter and Steamboat Slough upstream of the DCC. (p. 213) Sac River loses about 15 to 20% of its flow to Georgiana Slough and the interior Delta. (p. 213)		

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Fremont Weir notched entry to Yolo Bypass upstream of Verona, operating November through June, would decrease Sac River flows at Verona about 300 to 360 cfs on average under BDCP, about 420 to 490 cfs in median flow years (Table C.A-14, Section 5C.A.3.5). Fremont Weir spill threshold rate change from 58,000 cfs to about 18,000 cfs. Floodplain inundation flows range from 24,000 cfs to 33,000 cfs for proposed notch flows of 1,000 to 6,000 cfs.	Seasonal floodplain inundation has a positive effect on growth and survival rates of juvenile salmon in the Central Valley (p. 27, 53). Successful spawning and recruitment of splittail depends on available floodplain habitat (p. 27, 54). Research indicates frequent floodplain inundation (espec. Yolo Bypass flows) will benefit numerous native species' abundance and growth rates (p. 54).	•Floodplain inundation facilitates exchange of organisms, nutrients, and sediment between river and floodplain, a medium in which biotic and abiotic activity can occur (p. 91). •Many fishes rear in floodplains and juvenile salmon grow faster and become larger on floodplains than in mainstem river channels (p. 91). •Improving Yolo Bypass for fish an opportunity to increase frequency and extent of floodplain inundation (p. 91).	•Floodplain rearing found to have positive effect on growth and apparent survival of juvenile salmon. •Increased growth rates due to combined effect of increased temperatures (but below lethality) and increased food supplies. •Promotes larger and faster growth, improving outmigration, predator avoidance, and ultimately survival (p. 57).	Yolo Bypass flow prescription: •At least 8 of every 10 years, inundation flows of 2,500 cfs from February through April to benefit juvenile salmon and adult Sacramento splittail (Table 3, p. 19). •At least 6 of every 10 years, 4,000 cfs from March through April to benefit juvenile salmon and adult Sacramento splittail (Table 3, p. 19).	Juvenile Delta smelt rear in open water habitat. "Physical habitat is needed only during the spawning season and is not associated with rearing habitat." (p. 240, 242, 243) A portion of Delta smelt population have taken to residing in the Liberty Island region of the Cache Slough complex north of Rio Vista. **CHECK CITATION IN BIOP**	Hydraulic changes to Delta altered suitability as rearing habitat & migratory corridor for juvenile salmonids (p. 385).		

San Joaquin River Inflows

2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
BDCP alters the hydrographs of San Joaquin River more in some spring and summer months than current alterations (Attachment 1). •San Joaquin River at Vernalis flows similar percents of unimpaired flow except in June and July. •Average annual flows under BDCP will be 47 to 49% of UFs, similar to current flows (46% of UF). (Attachment 1)	•Providing flows that mimic the natural hydrograph will benefit native fishess in the Delta and should be used in determining magnitude and timing of needed flows for Delta ecosystem (p. 55). •Mimicking the natural hydrograph may provide flow regimes that change habitat conditions to benefit native fish and flush some nonnatives out of the system (as occurred on Putah Creek, pp. 25-26).	•"It appears to be important to preserve the general attributes of the natural hydrograph to which the various salmon runs adapted over time (p. 115)." •60 percent of unimpaired flow reflecting a 14-day running average at Vernalis,. February through June (Category A, Table 22, p. 133).	To increase juvenile FRCS outmigration survival in spring months with •**minimum base flows** range of 1,500 cfs (C years) to 6,315 cfs (W years) from January through June. •**spring pulse flows** range of 5,500 cfs (C years) to 8,685 cfs (W years), from April 15 to May 15 in C years, and as early as March 27 to as late as June 4 in W years.	Flow prescriptions relating to juvenile salmon: •Wet: AMJ, 20,000 cfs, at least 2 of every 10 years •AN: AM ½ J, 15,000 cfs, at least 4 of every 10 years •BN: AM, 10,000 cfs, at least 6 of every 10 years •Dry: A ½ M, 7,000 cfs, at least 8 of every 10 years •Crit: A, 5,000 cfs, every year.	Long-term upstream shift of actual Fall X2 associated with similar upstream shift in E:I ratio. During fall, the E:I ratio directly affects X2, less so when E:I ratio reaches approximately 0.45, due to meeting D-1641 salinity standards (p. 236). Long-term upstream shift of fall X2 creates situation where all fall seasons regardless of WY type are uniform low-flow periods, and threatens ability of self-sustaining delta smelt population to recover and persist above current levels (p. 237).	Currently, average winter/ spring flows are reduced compared to natural conditions, while summer/fall flows artificially increased by reservoir releases. Wintertime releases for flood control space do not reach levels necessary for bed load transport and reshaping of river channels below dams. (p. 207)		

San Joaquin River Inflows

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BDCP effects analysis projects survival rates for San Joaquin River fall-run Chinook salmon decreasing by 2060 (Attachment 2). BDCP reports flow-fate studies of particle-tracking models show strong positive correlation with San Joaquin inflow and positive downstream flow at Jersey Point for particles injected at Mossdale and Jersey Point reaching Chipps Island (Figures C.A-162 and 167, Section 5C.A.9.1, Attachment 5C.A of Appendix 5C).	•Survival of juvenile FRCS shown to increase with higher San Joaquin iRiver flows at Vernalis (p. 24). •Cites AFRP Working Paper (1995) arguing for maintaining QWEST flows between October 1 and June 30 of 1,000 cfs in C and D years; 2,000 cfs in BN and AN years; and 3,000 cfs in W years.	•To reflect natural hydrograph variation, the State Water Board recommends that, when possible, the flow criteria be expressed as a % of UF. (p. 96). •Positive flows at Jersey Point (i.e., positive QWEST flows) when salmon are present in the Delta, November through June. •10-day minimum pulse flow of 3,600 cfs in late October (Category A, Table 22, p. 133).	Minimum adult salmon escapement attraction flows in October of all years of 1,000 cfs in SJR for dissolved oxygen protection, decreased straying from SJR.	Stockton Deep Water Ship Channel dissolved oxygen criterion: 2,000 cfs minimum flow, September through December.	Lower flow conditions contribute to higher water toxicity, suppression of phytoplankton production by ammonia, increased reproductive success of nonnative clams, correspond with high E:I ratios with heightened entrainment risk for lower trophic levels and entrainment at ag irrigation diversions (p. 237-238).	"The Delta has thus become a conveyance apparatus to move water from the Sacramento side...to the southwestern corner of the Delta where the CVP and SWP pumping facilities are located. The Delta has become a stable freshwater body, which is more suitable for introduced and invasive exotic freshwater species of fish, plants, and invertebrates than for the native organisms that evolved in a fluctuating and 'unstable' Delta environment." (p. 207)		

San Joaquin River Inflows

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Bimodal pattern to flow-fate relationship for particles released at Mossdale, related to E/I ratio and high versus low inflow conditions on San Joaquin River. Entrainment of particles high when San Joaquin inflow is low, and vice-versa. (Figures C.A-175 to 178, Section 5C.A.9.1, Attachment 5C.A of Appendix 5C of Chapter 5, Effects Analysis, BDCP 2013. See also Export/ Inflow Ratio and Old and Middle River Flow Tables.)	•There has been a decrease in SJR flows as a percent of total inflows since 2000 (the onset of D-1641). •South Delta barrier placement duration increased, which may have helped increase entrainment risk.		DFG does not incorporate State Water Board's 60% of unimpaired flow criterion, nor any other flow criterion based upon unimpaired flow for SJR.	Minimum San Joaquin Valley outflows at Vernalis of 2,000 cfs year-round (p. 40).		Reduced inflow to the Delta caused by water development in Sacramento Valley reduced smolt survival substantially (p. 384). Average Delta survival rate of FRCS smolts by water year type and 1990 level of development: W = 0.83; AN = 0.61; BN = 0.41; D = 0.33; C = 0.12; Mean = 0.46. (Table 6-33, p. 384) Survival rates less now than in 1990 level of development estimates due to increasing upstream demands (p. 385).		

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						Survival rates less now than in 1990 level of development estimates due to increasing upstream demands (p. 385).		

Net Delta Outflow

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BDCP alters the hydrographs of Delta outflow even more than current alterations exhibit. •Delta outflows reduced relative to unimpaired flow (UF) hydrograph in February through August by 5 to 12% of UF. (Attachment 1) •Average annual flows will decrease from 58% of UF to 56% of UF under BDCP. (Attachment 1)	•Delta outflow, Delta inflows, and X2 position are highly correlated (p. 19). •Delta outflow was reduced 34 percent from unimpaired flow conditions. •Hydrograph peak shfited from winter/ spring to summer/early fall. •See Figure 11, p. 18.	•Net Delta Outflow should be 75 percent of unimpaired flow over a 14-day running average (Category A). •2006 WQCP Delta outflow objectives in BN, D and C years (Category B). •Fall Delta outflows, September through November: W = 12,400 cfs; AN = 7,100 cfs. •Winter/spring outflows in all years, December through June, of 11,400 to 29,200 cfs.	•Fall Delta outflows, September through November: W = 12,400 cfs; AN = 7,100 cfs. •Winter/ spring outflows in all years, December through June, of 11,400 to 29,200 cfs.	•Delta smelt flows should be 48,000 cfs during March through May in at least 5 of every 10 years. •*Egeria* suppression flows in July and August of a minimum of 8,000 cfs in July and August at least 3 years of every 10. •Overbite claim suppression minimum flows in Feb, March, April of 120,000 cfs at least 3 of every 10 years.	Long-term upstream shift of actual Fall X2 associated with similar upstream shift in E:I ratio. During fall, the E:I ratio directly affects X2, less so when E:I ratio reaches approximately 0.45, due to meeting D-1641 salinity standards (p. 236).	Currently, average winter/ spring flows are reduced compared to natural conditions, while summer/fall flows artificially increased by reservoir releases. Wintertime releases for flood control space do not reach levels necessary for bed load transport and reshaping of river channels below dams. (p. 207)		

Net Delta Outflow

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•Caused by reduced Sacramento inflow to Suisun Bay by North Delta Intakes' diversions and by climate change. •Potential increases in spring and fall Delta outflow from BDCP "decision tree" process. •More spring outflow would benefit longfin smelt, and more fall outflow would benefit Delta smelt.					Long-term upstream shift of fall X2 creates situation where all fall seasons regardless of WY type are uniform low-flow periods, and threatens ability of self-sustaining delta smelt population to recover and persist above current levels (p. 237).	"The Delta has thus become a conveyance apparatus to move water from the Sacramento side...to the southwestern corner of the Delta where the CVP and SWP pumping facilities are located. The Delta has become a stable freshwater body, which is more suitable for introduced and invasive exotic freshwater species of fish, plants, and invertebrates than for the native organisms that evolved in a fluctuating and 'unstable' Delta environment." (p. 207)		

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					Lower flow conditions contribute to higher water toxicity, suppression of phytoplankton production by ammonia, increased reproductive success of nonnative clams, correspond with high E:I ratios with heightened entrainment risk for lower trophic levels and entrainment at ag irrigation diversions (p. 237-238).	Reduced inflow to the Delta caused by water development in Sacramento Valley reduced smolt survival substantially (p. 384). Average Delta survival rate of FRCS smolts by water year type and 1990 level of development: W = 0.83; AN = 0.61; BN = 0.41; D = 0.33; C = 0.12; Mean = 0.46. (Table 6-33, p. 384) Survival rates less now than in 1990 level of development estimates due to increasing upstream demands (p. 385).		

Net Delta Outflow

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						Hydraulic changes to Delta altered suitability as rearing habitat & migratory corridor for juvenile salmonids (p. 385).		

X2 Estuarine Position

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Annual maximum downstream X2 increases (i.e., moves upstream) from 63.5 km to 83 km (i.e., from well into Suisun Bay to Chipps Island under Twin Tunnels operations (Attachment 3) as operational rules for Twin Tunnels increases diversions in late winter and spring months. Annual average X2 would decrease slightly (from 86 to 83 km) under BDCP but would remain upstream of Collinsville (81 km, Attachment 3).	X2 objectives are designed to restore a more natural hydrograph and salinity pattern by requiring maintenance of the low salinity zone at a specified point and duration based on unimpaired flow conditions (p. 19). Delta outflows, Delta inflows and X2 position are highly correlated (p. 19). Since delta export operations began, X2 and Delta outflow have been highly altered (p. 19).	•Fall X2 (September through November): W years < 74 km, AN years < 81 km, to benefit longfin smelt and other desirable estuarine species, and to increase Delta smelt habitat. (Table 20, p. 131). •For many species, abundance is related to timing and quantity of flow (or the placement of X2) (p. 44).	•Fall X2 (September through November): W years < 74 km, AN years < 81 km, to benefit longfin smelt and other desirable estuarine species, and to increase Delta smelt habitat.	Current operations hold X2 upstream of 71 km 81 percent of the time (Point B, Figure 8, p. 13). Current operations hold X2 position upstream of 80 km 50 percent of the time (Point C, Figure 8, p. 13). Historically, X2 median location was at 71 km.	Under balanced conditions, CVP/SWP operations control X2 position "and are therefore a primary driver of delta smelt habitat suitability." (p. 234 Fall X2 affects surface area of suitable abiotic habitat for Delta smelt. Assumes enforcement of D-1641 on Delta outflow and spring X2. **Fall X2:** Action 4 requiring in wet and above normal years sufficient Delta outflow in September and October so that X2 is no more eastward than 79 kilometers.		Assumes 2009 NMFS Salmonid Biological Opinion as it supplements D-1641.	Recommends no changes to D-1641 on X2. •X2 and X0.5 are approximate boundaries of longfin smelt's spawning areas. •In low flow years, their spawn occurs further into the Delta upstream of Suisun Bay. •Net effect of X2 standard is that more runoff flows out of the Delta under present SWP springtime operations than typically did during the 1970s and 1980s.

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Average X2 for the period is projected to increase from 66 km to 69 km. Median X2 for the period to increase from 65 km to 70 km. Maximum X2 for the period to increase from 48 km to 52 km (Attachment 3). Annual median X2 of 89 km for existing conditions would remain about the same (88 to 89 km) under BDCP, again well upstream of Collinsville.	•Spring X2 prior to 1970s rarely exceeded 75 km from Golden Gate (p. 20). •Since 1970s, X2 shifted upstream as far as 90 km; median X2 position is just over 80 km now (1986-2005) (p. 20). •Median 1921-2003 X2 is about 70 km (Figure 16, p. 21).				Long-term upstream shift of actual Fall X2 associated with similar upstream shift in E:I ratio. During fall, the E:I ratio directly affects X2, less so when E:I ratio reaches approximately 0.45, due to meeting D-1641 salinity standards. Long-term upstream shift of fall X2 creates situation where all fall seasons regardless of WY type are uniform low-flow periods.			Juvenile entrainment in late spring may actually begin in spawning and larval stage if spring outflow is low. At low flows, longfin smelt and its LSZ habitat and food supply can be entrained at South Delta export pumps (pp. 49-54). Along the path of entrainment, they may feed and grow large enough to become salvaged at fish facilities. Variation in X2 is climate/ runoff driven while abundance is driven by the overbite clam abundance and grazing activity.

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Annual average X2 for February through June would increase from existing conditions of 66 km to 69 km under BDCP (Attachment 4). Median annual X2 for February through June would increase from 65 km to over 70 km (Attachment 4). Minimum X2 position for February through June would increase from 47 km to nearly 52 km (Attachment 4).	•Amount of suitable habitat for Delta smelt decreased 28 to 78 percent (p. 47). •Exports are largest single factor affecting Delta salinity (p. 47). •Freshwater inflow is primary determinant of the extent of salt water penetration to the Delta estuary (p. 47). •Average fall X2 position shows long-term increasing trend and corresponding reduction of amount and location of suitable Delta smelt abiotic habitat (p. 47).				Fall X2 more upstream decreases abiotic habitat for Delta smelt, affecting smelt abundance directly (p. 237) Lower flow conditions contribute to higher water toxicity, suppression of phytoplankton production by ammonia, increased reproductive success of nonnative clams, correspond with high E:I ratios with heightened entrainment risk for lower trophic levels and entrainment at ag irrigation diversions (p. 237-238).			Fall X2 and outflows is not as much of an issue for longfin smelt as it is for Delta smelt.

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X2 is an important locational criterion for habitat of both longfin smelt and delta smelt. BDCP hypothesizes tidal wetlands and channel margin habitat restoration will boost food supplies for smelts without additional flow (Section 3.3.7.1, Section 3.3.7.2). “If restoration of habitat for delta smelt is successful, there may be no need to provide fall outflows for Fall X2 (Table 3.4.1-1) to meet biological objectives for this species.” (p. 3.4-26, Chapter 3, Conservation Strategy)	•Placing X2 in Suisun Bay maximizes productivity, supports fish rearing, and reduces entrainment risk; increases quantity and quality of suitable Delta smelt abiotic habitat (p. 48). •Fall X2 important. Delta smelt abiotic habitat (i.e., flow, turbidity) is negatively correlated with X2 position (see Figure 18, p. 22). •Placement of X2 for Delta smelt: 1) improves environmental quality and 2) minimizes larval and juvenile entrainment risk (p. 48).							

Old and Middle River Flows

2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
•Would lower reverse OMR flows in W and AN years when North Delta intakes are in operation. •More negative OMR flows in drier years are expected as South Delta export pumps are used more. •Greater Delta smelt and longfin smelt entrainment risks in BN, D, and C years.	•OMR flow is a hydrodynamic metric that best characterizes effects of exports on entrainment of pelagic fish in the Delta. •Entrainment increases as OMR flows grow more negative (larger upstream flow). •Effects can be minimized by managing OMR flows during critical spawning and rearing periods.	•Net OMR flows should be > -1,500 cfs during March through July in D and C years. •Net OMR flows > 0 cfs or > -1,500 cfs in D and C years when Fall Midwater Trawl (FMWT) for longfin smelt is < 500 or > 500 April through May, respectively. •Net OMR flows > -5,000 cfs in all water years types, December through February.	•Net OMR flows should be > -1,500 cfs during March through July in D and C years. •Net OMR flows > 0 cfs or > -1,500 cfs in D and C years when Fall Midwater Trawl (FMWT) for longfin smelt is < 500 or > 500 April through May, respectively. •Net OMR flows > -5,000 cfs in all water years types, December through February.	•Continuing through-Delta exports causes reverse OMOR flow conditions 91 percent of the time. •Through-Delta exports reduce salinity of Central and South Delta OMR water, but greatly expands salinity increases upstream in SJR, contrary to natural conditions, and potentially confusing for fish migration. •Much larger flows needed to reverse this adverse water quality gradient for salinity.	**ACTION 1:** Limit exports so that the average daily OMR flow is no more negative than -2000 cfs for a total duration of 14 days, with a 5-day running average no more negative than -2,500 cfs (within 25 percent). **December 1 to December 20** - determine start date using flow, turbidity, X2 and FMWT data. **After December 20** - Action begins when 3-day average of turbidity at Prisoner's Point, Holland Cut, and Victoria Canal exceed 12 NTU.	**January 1 through June 15** - OMR flow to range between -5000 cfs to -2500 cfs (on a 14-day running average) depending on salmonid density presence until June 1. No more that 25 percent more negative flows based on a 5-day running average to limit variability in flow management. **After June 1,** when water temperature ≥ 72° for 7 days would lead to an "off-ramp" for OMR flow restrictions, **or June 15**, whichever comes first.	Assumes same actions as 2009 NMFS Salmonid Biological Opinion. (See Action 1.5.6 on pp. 157-158.).	•OMR "flow advice" to minimize take of longfin smelt: •December through February advice criteria in Condition 5.1. •January through June advice criteria in Condition 5.2. •Dry years January 15 for May 31 for Sacramento River in Condition 5.3. •Permit narrative describes "tension" between QWEST and OMR flows.

Old and Middle River Flows

2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
•Reverse OMR flows are still possible through Turner and Columbia Cut when HOR operable gates are closed. •More reverse flows also possible with climate change in later years as X2 moves upstream due to reduced upstream runoff to inflows for the Delta.	•Management of OMR flows will provide benefits for Delta smelt, longfin smelt, and juvenile salmon and smolts. •OMR flows altered from natural downstream flow 85 percent of the time to upstream (negative) flow 91 percent of the time (p. 15, and Figure 12, p. 19). •In 1992, SWRCB acknowledged importance of maintaining positive QWEST flows to protect public trust resources.	•Net OMR flows > -2,500 cfs when salmon smolts are present in the Delta, November through June.	•Net OMR flows > -2,500 cfs when salmon smolts are present in the Delta, November through June.	•Historical flows under which native fish succeeded should remain relevant for establishing fish flows for the current highly altered Delta. •In absence of more direct causual relationships, empirical evidence should be used until more specific processes can be quantified. •Historical flows show importance of spring and fall flows for avoiding negative flows inside the Delta.	**ACTION 2:** Range of net daily OMR flows will be no more negative than -1,250 to -5,000 cfs. **Suspension of Action 2:** OMR flows do not apply whenever 3-day flow averages ≥ 90,000 cfs in Sacramento River at Rio Vista and 10,000 cfs in San Joaquin River at Vernalis. Once such flows abate, OMR flows resume effect. **Off-ramps:** *Temperature:* Water temperature reaches 12°C; OR *Biological:* Onset of spawning (spent females in SKT or at export pumps).			•Management of OMR flows will provide benefits for Delta smelt, longfin smelt, and juvenile salmon and smolts. •Adult longfin smelt tend to be salvaged at export pumps in January & February while juveniles tend to be salvaged March through July. Some young larvae are salvaged from August to October too.

Old and Middle River Flows

2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
	•In 1995 the Anadromous Fish Restoration Program identified the need to maintain positive QWEST flows downstream of OMR. •Recommends the State Water Board do flow criteria for OMR positive during January through June (p. 53).			•Native fish can continue to prosper under greatly altered flow (as they did from 1969 to 1985) and habitat conditions. •Recent flow restrictions have been inadequate to support native Delta fishes.	**ACTION 3:** Provide a "VAMP-like" action: Net daily OMR flow will be no more negative than -1,250 cfs to -5,000 cfs (14-day running average with simultaneous 5-day running average within 25 percent of the applicable requirement for OMR). **Triggers:** *Temperature:* When water temperature reaches 12°C; OR *Biological:* Onset of spawning (spent females in SKT or at export pumps). **Off-ramps:** June 30th; OR *Temperature:* Water temperature reaches 25°C for three consecutive days at Clifton Court Forebay.			

Delta Cross Channel Gate Operations

2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
DCC gates would be closed if covered fish are present in October and November, with closure decisions reached through real-time operations. DCC gates are closed for a certain number of days from October 1 through Dec 14 based on Wilkins Slough flow, and gates may open if D-1641 Rock Slough salinity standard is exceeded because of gate closure. DCC gates would close if juvenile salmonids are present in October and November.	•Lower juvenile salmon survival occurs when DCC gates are open and salmon move into central Delta. •Increased risk of predation and/or entrainment to export pumps. •Increased Sacramento River flow decreases probability of juvenile salmon diverting into DCC and Georgiana Slough. •To achieve no bidirectional flow near Georgiana Slough, need Sac River flow at Freeport of 17,000 cfs.	Assumes D-1641 and 2006 WQCP. No new operational determinations on this matter.	No specific recommended actions. Assumes D-1641.	No DCC operational criteria recommended.	Assumes enforcement of D-1641 and the NMFS salmonid biological opinion on Delta Cross Channel gate operations.	The primary avenue for juvenile salmonids emigrating down the Sacramento River to enter the interior Delta, and hence becoming vulnerable to entrainment by export facilities, is by diversion into the DCC and Georgiana Slough (p. 402). Operation of DCC gates may significantly affect juvenile salmonid survival emigrating from Sac River to ocean (p. 402, pp. 375-382). Population level survival can be increased by closing the gates (p. 378).	Assumes 2009 NMFS salmonid Biological Opinion to extent it supplements D-1641.	Assumes D-1641.

Inflow to Exports Ratio

<table>
<tr>
<th>2013 Draft Bay Delta Conservation Plan</th>
<th>2010 US Department of Interior Delta Flow Criteria Comments</th>
<th>2010 State Water Board Delta Flow Criteria Report</th>
<th>2010 CDFG Biological Objectives and Flow Criteria Report</th>
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<th>October 2009 NMFS Salmonid Recovery Plan</th>
<th>2009 Department of Fish and Game Incidental Take Permit</th>
</tr>
<tr>
<td>•I:E modeling criteria for Conservation Measure 1 (Twin Tunnels), summarized in Table 3.4.1-1.

•SJR flows already inadequate, not to change under BDCP.

•Sacramento River flows to be reduced below Freeport by North Delta Intakes' diversions.

•Uncertain whether to include North Delta Intake diversions in definition of if I:E ratio in BDCP.</td>
<td>No specific recommended actions, but increased SJR flows at key times while at same time regulating OMR flows would reduce exports relative to SJR inflow, thereby increasing ratio of Inflow to Exports.

Using flows to mimic natural hydrograph would also alter ratio of inflow to exports.</td>
<td>•SJR flow to export ratio of 0.33 during fall pulse flow complementary to SJR pulse flow objective for October of Tabe 22 (#2, Category A - would result in a burst of exports during the pulse flow of up to 10,800 cfs if SWRCB means what it says here).

•No science analysis presented in State Water Board's Delta Flow Criteria report to support this criterion.</td>
<td>No specific recommended actions. Assumes D-1641.</td>
<td>No specific prescriptions on inflow to export ratio.

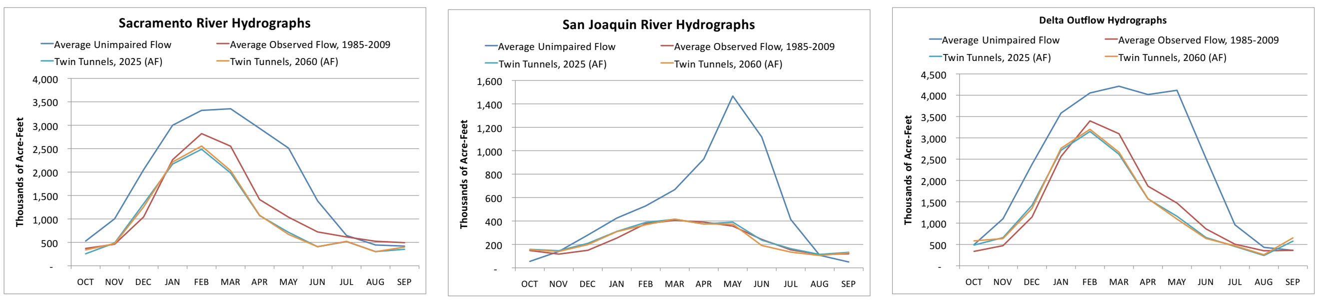
Exports increased over 450 percent on average from 1949-1968 average to the 1986-2005 period average (see Figure 6, p. 11).</td>
<td>Long-term upstream shift of actual Fall X2 associated with similar upstream shift in E:I ratio. During fall, the E:I ratio directly affects X2, less so when E:I ratio reaches approximately 0.45, due to meeting D-1641 salinity standards (p. 236).</td>
<td>April 1 through May 31 - USBR continues to implement the Goodwin flow schedule for the Stanislaus River. USBR and DWR implement the Vernalis flow-to-combined export ratios based on a 14 day running average:
<table><tr><th>San Joaquin Valley Classification</th><th>Vernalis flow (cfs): CVP/ SWP combined export ratio</th></tr><tr><td>Critically dry</td><td>1:1</td></tr><tr><td>Dry</td><td>2:1</td></tr><tr><td>Below normal</td><td>3:1</td></tr><tr><td>Above normal</td><td>4:1</td></tr><tr><td>Wet</td><td>4:1</td></tr><tr><td>Vernalis flow equal to or greater than 21,750 cfs</td><td>Unrestricted exports until flood recedes below 21,750 cfs</td></tr></table></td>
<td>Assumes 2009 NMFS Salmonid Biological Opinion as it supplements D-1641.</td>
<td>Assumes D-1641.</td>
</tr>
</table>

Inflow to Exports Ratio

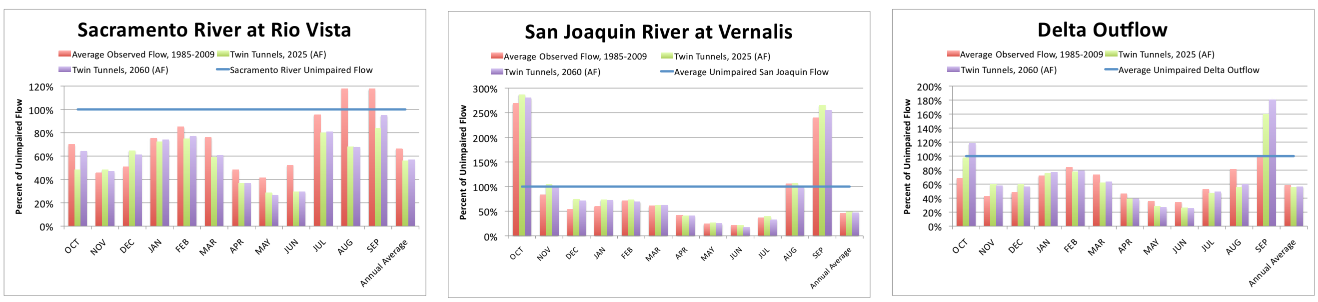
2013 Draft Bay Delta Conservation Plan	2010 US Department of Interior Delta Flow Criteria Comments	2010 State Water Board Delta Flow Criteria Report	2010 CDFG Biological Objectives and Flow Criteria Report	2010 UC Davis Expert Panel Delta Flow Criteria Comments	2008 US Fish & Wildlife Service Delta Smelt Biological Opinion	2009 NMFS Salmonid Biological Opinion	October 2009 NMFS Salmonid Recovery Plan	2009 Department of Fish and Game Incidental Take Permit
•No legal certainty about what rules should or will apply to Twin Tunnels and BDCP operations. •Biological Goals and Objectives are not considered by BDCP to be a compliance criterion for Implementing Agreement and Incidental Take Permit compliance.		•SJR flow to export ratio of > 4.0 when juvenile salmon migrating in mainstem San Joaquin River March through June. •Exports to Delta inflows in 2006 WQCP from January through December in all years (same as D-1641 - considered in this report a "Category B" flow determination) .,			Lower flow conditions contribute to higher water toxicity, suppression of phytoplankton production by ammonia, increased reproductive success of nonnative clams, correspond with high E:I ratios with heightened entrainment risk for lower trophic levels and entrainment at ag irrigation diversions (p. 237-238).	Lower survival rates when E:I ratios were high. Losses were higher in drier years and during the early season of fish migration (December through February) (p. 381). Higher levels of loss are expected with increased export levels and thus higher E:I ratios (p. 381).		

Attachment 1
Analysis of Inflow and Outflow Hydrographs

Altered Hydrographs Fail to Mimic the Natural Hydrographs of Delta Rivers and Outflow



Observed Flows and Flows under BDCP as Percent of Unimpaired Flows



Sources: Tables C.A-29, C.A-31, and C.A-44, Appendix 5C.A, Chapter 5, Effects Analysis of the Bay Delta Conservation Plan; California Department of Water Resources, *Unimpaired Flows in the Central Valley*, 2007, 4th edition; California Department of Water Resources, *Dayflow*.

Supporting data follows.

Attachment 1
Analysis of Inflow and Outflow Hydrographs

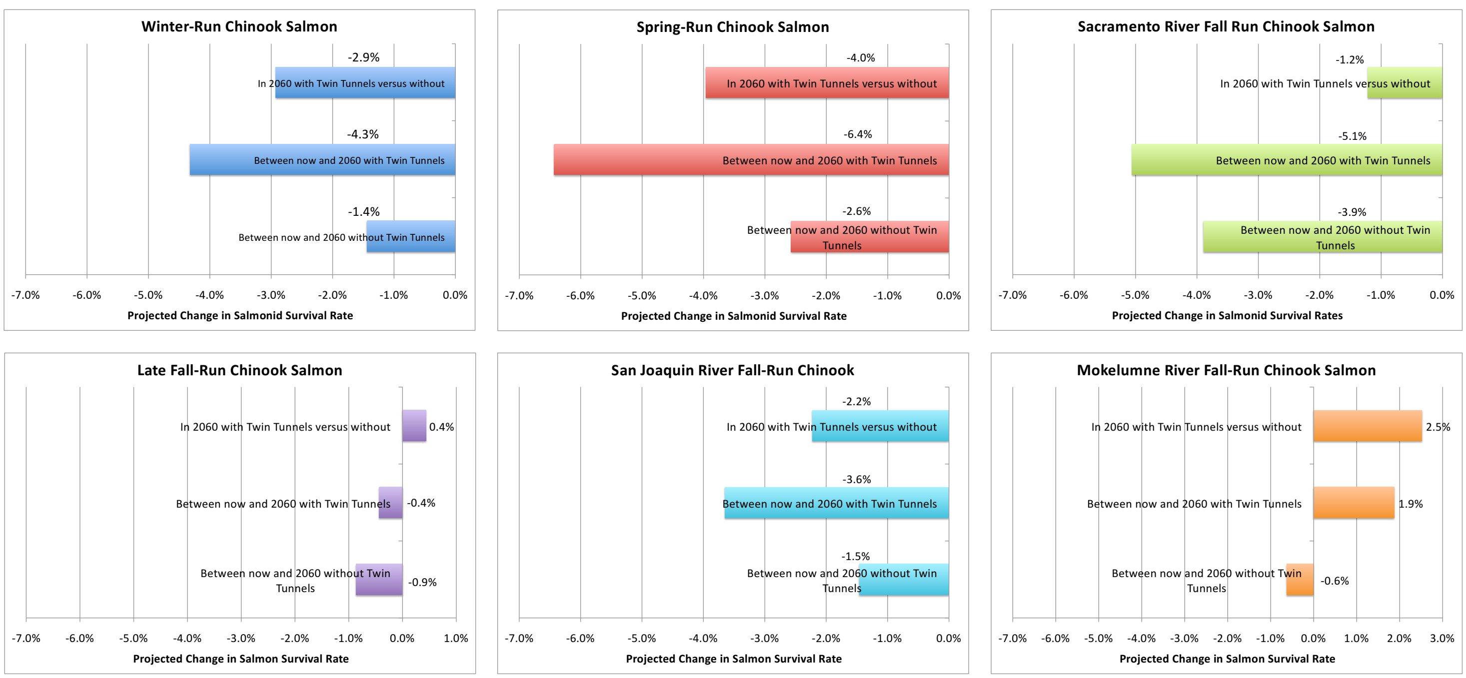
Sacramento River at Rio Vista	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Annual Average
Average Unimpaired Sacramento River Flow	528	1,003	2,051	3,000	3,317	3,352	2,934	2,511	1,386	646	444	420	21,592
Average Observed Flow, 1985-2009	370	460	1,043	2,264	2,821	2,554	1,414	1,037	723	616	523	493	14,317
Twin Tunnels, 2025	4,162	8,172	21,538	35,310	42,869	32,241	18,012	11,613	6,839	8,388	4,918	5,921	
Twin Tunnels, 2060	5,526	7,925	20,431	36,022	44,049	33,031	18,118	10,893	6,864	8,488	4,894	6,715	
Twin Tunnels, 2025 (AF)	256	486	1,324	2,171	2,487	1,982	1,072	714	407	516	302	352	12,070
Twin Tunnels, 2060 (AF)	340	472	1,256	2,215	2,556	2,031	1,078	670	408	522	301	400	12,248
Sacramento River at Rio Vista, percent of unimpaired flow	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Annual Average
Average Observed Flow, 1985-2009	70%	46%	51%	75%	85%	76%	48%	41%	52%	95%	118%	117%	66%
Twin Tunnels, 2025 (AF)	48%	48%	65%	72%	75%	59%	37%	28%	29%	80%	68%	84%	56%
Twin Tunnels, 2060 (AF)	64%	47%	61%	74%	77%	61%	37%	27%	29%	81%	68%	95%	57%
San Joaquin River at Vernalis	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Annual Average
Average Unimpaired San Joaquin River Flow	55	140	280	425	529	668	929	1,467	1,117	413	107	50	6,180
Average Observed Flow, 1985-2009	148	117	150	254	378	405	391	357	243	154	113	120	2,829
Twin Tunnels, 2025 (cfs)	2,565	2,459	3,399	5,054	6,688	6,739	6,288	6,348	3,969	2,661	1,860	2,227	
Twin Tunnels, 2060 (cfs)	2,511	2,361	3,225	5,025	6,351	6,763	6,291	6,069	3,207	2,186	1,712	2,145	
Twin Tunnels, 2025 (AF)	158	146	209	311	388	414	374	390	236	164	114	133	3,037
Twin Tunnels, 2060 (AF)	154	140	198	309	368	416	374	373	191	134	105	128	2,892

Attachment 1
Analysis of Inflow and Outflow Hydrographs

San Joaquin River at Vernalis, percents of unimpaired flow	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Annual Average
Average Observed Flow, 1985-2009	269%	84%	53%	60%	71%	61%	42%	24%	22%	37%	106%	240%	46%
Twin Tunnels, 2025 (AF)	287%	105%	75%	73%	73%	62%	40%	27%	21%	40%	107%	265%	49%
Twin Tunnels, 2060 (AF)	281%	100%	71%	73%	70%	62%	40%	25%	17%	33%	98%	255%	47%
Delta Outflow	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Annual Average
Average Unimpaired Delta Outflow	495	1,103	2,379	3,580	4,053	4,211	4,016	4,116	2,521	960	432	362	28,228
Average Observed Flow, 1985-2009	337	472	1,143	2,563	3,398	3,097	1,867	1,472	865	506	352	361	16,434
Twin Tunnels, 2025	7,889	11,085	23,042	44,053	54,312	42,524	26,355	18,888	11,138	7,376	3,926	9,708	
Twin Tunnels, 2060	9,510	10,728	21,867	44,827	55,165	43,308	26,460	17,821	10,751	7,616	4,218	10,995	
Twin Tunnels, 2025 (AF)	485	660	1,417	2,709	3,151	2,615	1,568	1,161	663	454	241	578	15,701
Twin Tunnels, 2060 (AF)	585	638	1,345	2,756	3,200	2,663	1,574	1,096	640	468	259	654	15,879
Delta Outflow, percent of unimpaired flow	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Annual Average
Average Observed Flow, 1985-2009	68%	43%	48%	72%	84%	74%	46%	36%	34%	53%	81%	100%	58%
Twin Tunnels, 2025 (AF)	98%	60%	60%	76%	78%	62%	39%	28%	26%	47%	56%	160%	56%
Twin Tunnels, 2060 (AF)	118%	58%	57%	77%	79%	63%	39%	27%	25%	49%	60%	181%	56%

Attachment 2
Salmon Smolt Survival Rates

Percentage Change in Salmon Smolt Survival Rates with and without BDCP



Attachment 2
Salmon Smolt Survival Rates

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%

Attachment 2
Salmon Smolt Survival Rates

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

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

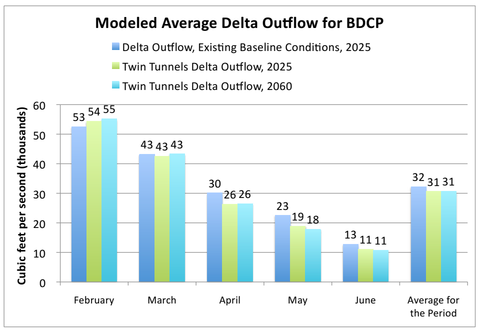
Delta Outflow and X2 Changes under Bay Delta Conservation Plan	Annual Flow Statistic from CalSIM II	Delta Outflow	X2 Position (km)
Existing Baseline with Fall X2, 2025	Median	10,555	89.0
	Average	15,743	86.4
	Maximum	59,348	63.5
Twin Tunnels Scenario by 2025	Median	10,157	89.4
	Average	15,590	83.1
	Maximum	60,200	74.0
Twin Tunnels Scenario by 2060	Median	10,270	88.0
	Average	15,767	83.0
	Maximum	58,899	74.0
Sources		Table C.A-41, p. 5C.A-174, Attachment 5C.A	Table C.A-42, p. 5C.A-176, Attachment 5C.A

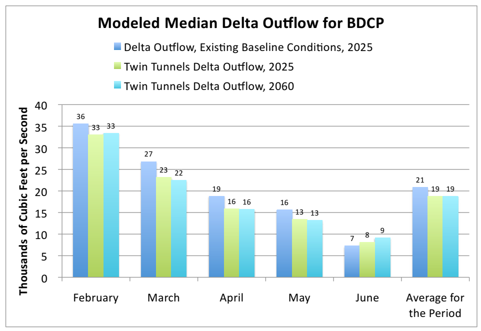
All flows are in cubic feet per second (cfs). X2 position is expressed in kilometers upstream of the Golden Gate.

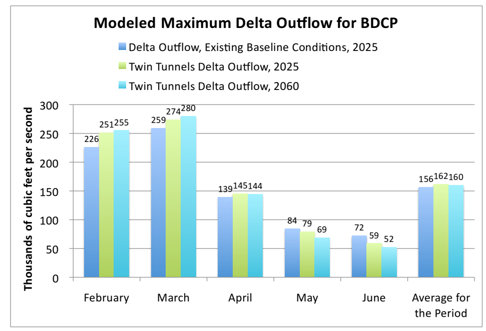
X2 position "maximum" is taken from "minimum" line of the source tables, consistent with X2 positioning further downstream at higher flows, closer to the Golden Gate.

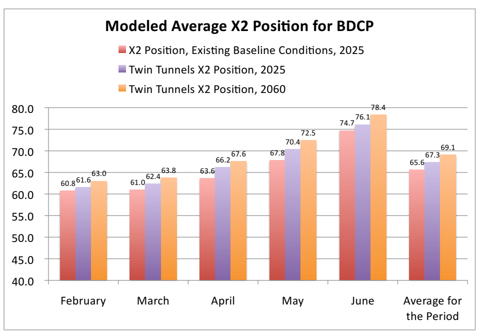
Source: Bay Delta Conservation Plan, 2013.

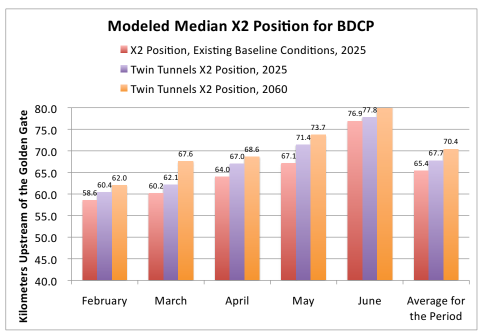
Attachment 4
Delta Outflow and X2

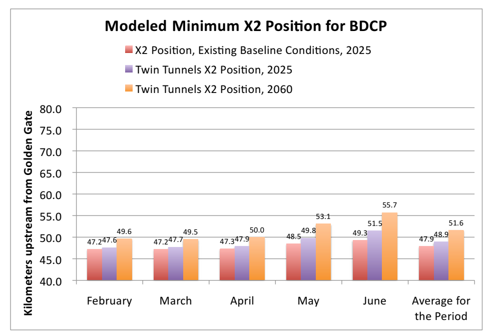












The median is the value where half of all other values in the dataset are greater than the median value, and half are less than the median value.

Delta outflow and X2 are inversely related. Greater outflow means less distance of X2 from the Golden Gate.

Supporting data follows.

Attachment 4
Delta Outflow and X2

Average Delta Outflow and X2 Position under Bay Delta Conservation Plan	February	March	April	May	June	Average for the Period
Delta Outflow, Existing Baseline Conditions, 2025	52,594	43,172	30,099	22,517	12,765	32,229
X2 Position, Existing Baseline Conditions, 2025	60.8	61.0	63.6	67.8	74.7	65.6
Twin Tunnels Delta Outflow, 2025	54,312	42,524	26,355	18,888	11,138	30,643
Twin Tunnels X2 Position, 2025	61.6	62.4	66.2	70.4	76.1	67.3
Twin Tunnels Delta Outflow, 2060	55,165	43,308	26,460	17,821	10,751	30,701
Twin Tunnels X2 Position, 2060	63.0	63.8	67.6	72.5	78.4	69.1

Median Delta Outflow and X2 Position under BDCP	February	March	April	May	June	Average for the Period
Delta Outflow, Existing Baseline Conditions, 2025	35,578	26,801	18,804	15,655	7,249	20,817
X2 Position, Existing Baseline Conditions, 2025	58.6	60.2	64.0	67.1	76.9	65.4
Twin Tunnels Delta Outflow, 2025	33,065	23,150	15,875	13,414	8,111	18,723
Twin Tunnels X2 Position, 2025	60.4	62.1	67.0	71.4	77.8	67.7
Twin Tunnels Delta Outflow, 2060	33,380	22,492	15,716	13,243	9,125	18,791
Twin Tunnels X2 Position, 2060	62.0	67.6	68.6	73.7	80.2	70.4

Attachment 4
Delta Outflow and X2

Maximum Delta Outflow and Minimum X2 Position under BDCP	February	March	April	May	June	Average for the Period
Delta Outflow, Existing Baseline Conditions, 2025	226,138	259,340	139,460	84,439	72,462	156,368
X2 Position, Existing Baseline Conditions, 2025	47.2	47.2	47.3	48.5	49.3	47.9
Twin Tunnels Delta Outflow, 2025	251,077	273,553	145,298	79,212	58,864	161,601
Twin Tunnels X2 Position, 2025	47.6	47.7	47.9	49.8	51.5	48.9
Twin Tunnels Delta Outflow, 2060	255,260	279,907	144,263	68,727	52,008	160,033
Twin Tunnels X2 Position, 2060	49.6	49.5	50.0	53.1	55.7	51.6

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