October 6, 20157

Via Email and U.S. Mail

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RE: RDEIR/SDEIS Comments and Request for BDCP Agencies to Comply with the federal Clean Water Act by protecting designated/beneficial uses, meeting and exceeding water

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quality criteria, and preventing degradation of San Francisco Bay-Delta Estuary water quality.

Dear Secretary Jewell, Secretary Pritzker, Administrator McCarthy, Secretary Laird, Director Cowin, Regional Director Murillo, and Federal and California Agencies, Officers, and Staff Members Carrying out and Reviewing the BDCP/"California Water Fix":

Summary

Restore the Delta, Earth Law Center, Friends of the River (FOR), the Center for Biological Diversity, the California Water Impact Network, the California Sportfishing Protection Alliance, and the Environmental Water Caucus (EWC, a coalition of over 30 nonprofit environmental and community organizations and California Indian Tribes) object to the adverse water quality effects which would occur under the Bay Delta Conservation Plan (BDCP)/ California Water Fix/Water Tunnels project (Water Tunnels project). Under the BDCP, three large new intakes would divert vast amounts of water from the Sacramento River between Clarksburg and Courtland through two tunnels roughly 35 miles south for export from the Central Valley and State Water Projects' pumping plants. As a result of this massive new diversion ("Water Tunnels project"), enormous quantities of freshwater which now flow through the Sacramento-San Joaquin Delta before being diverted would never even reach the Delta.

The BDCP Delta Water Tunnels project is not a permissible project under the federal Clean Water Act (CWA) because it would degrade water quality in the San Francisco Bay-Delta Estuary. This in turn will adversely impact numerous recognized beneficial uses and public health. The Water Tunnels project will require a Clean Water Act Section 401 certification, it cannot legally be given one since it will not comply with established water quality standards. We previously addressed on July 22, 2015, the failure of the BDCP agencies to develop and consider a range of reasonable alternatives increasing Delta flows by reducing exports, and on September 9, 2015, the impermissible substantive and Section 7 process violations of the Water Tunnels project with respect to the federal Endangered Species Act.

To summarize[1], ***first***, the Delta Water Tunnels project will violate water quality standards. ***Second***, because the state cannot issue a 401 certification to a Water Tunnels Project that does not meet water quality standards and objectives, the Corps of Engineers cannot legally issue a 404 permit regulating dredge and fill in waters of the United States. ***Third***, the Water Tunnels project has no defensible antidegradation analysis in either the Draft EIR/EIS or the Recirculated Draft EIR/Supplemental Draft EIS (RDEIR/SDEIS), which is required for compliance with the Clean Water Act. And the lack of an adequate antidegradation analysis is yet another reason the state will be unable to issue the 401 certification. ***Fourth,*** the Water Tunnels project threatens to dictate water quality objectives and prejudice ongoing State Water Resources Control Board's

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[1] This letter draws on previous comments in letters submitted timely on the Bay Delta Conservation Plan by Earth Law Center, July 28, 2014, accessible at http://www.friendsoftheriver.org/site/DocServer/xBDCP_Comments_Aug_2014_0003949.pdf?docID=9362; California Sportfishing Protection Alliance, No. 2 on Water Quality, July 28, 2014, accessible at http://www.friendsoftheriver.org/site/DocServer/xBDCP_Comments_Aug_2014_0002679.pdf?docID=9241; and Environmental Water Caucus, June 11, 2014, accessible at http://www.friendsoftheriver.org/site/DocServer/xBDCP_Comments_Aug_2014_0006165.pdf?docID=9585, as well as preliminary review of the Bay Delta Conservation Plan/California WaterFix 2015 RDEIR/SDEIS.

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Bay-Delta Water Quality Control Plan Phase 1 and 2 processes, in violation of the Clean Water Act.[2] ***Finally,*** the proposed project fails to meet the Clean Water Act's requirement for the Least Environmentally Damaging Practicable Alternative (LEDPA).

It deserves special mention that four million people in the five Delta counties depend on good water quality in the Delta for their livelihoods and quality of life. Nearly one million Delta residents depend on the Delta as their primary drinking water supply. To improve the Delta as a fishable, swimmable, drinkable, and farmable region will require protecting and enhancing the Estuary's water quality, pure and simple. If we are to leave generations to come an Estuary with sustained and diverse ecological fertility, the Estuary deserves and needs more flowing water, cleansed of the pollutants that now plague it, and state and federal rejection of the Water Tunnels Project will help in realizing this goal.

The Delta Water Tunnels project will violate water quality standards for flow and other parameters, preventing necessary Clean Water Act Section 401 certification.

Historically, the Bay-Delta Estuary has been enormously productive, a magnet for many aquatic species to reproduce in and migrate through. Its native species evolved to take advantage of the Estuary's annual and seasonal variations in water quality and flow. As the seasons change, the Bay Delta Estuary cycles through such ecological roles as aquatic nursery, restaurant, and crossroads. The Delta's communities and economy were built on this ecological foundation. The health of this diverse ecosystem depends on having variable and good water quality that benefits each of these roles.

Development and implementation of the Water Tunnels project must be accountable to the CWA. Sound planning dictates that implementation of the CWA's requirements should begin ***now***, to prevent violations by the Water Tunnels project. One CWA requirement that will arise during Water Tunnels project implementation is CWA Section 401 certification, which is necessary for any "[f]ederal license or permit to conduct any activity … [that] may result in any discharge into navigable waters."[3]

The California Department of Water Resources and the United States Bureau of Reclamation filed an application for a CWA Section 404 dredge and fill permit with the US Army Corps of Engineers on August 24, 2015, and they filed an application for a 401 certification on September 23, 2015 with the State Water Resources Control Board (SWRCB).[4] The 404 permit will be needed from the Army Corps of Engineers because construction of the Water Tunnels

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[2] The project may, on one hand, receive conditional permits for the north Delta intakes of the Tunnels Project, including gaping exemptions from water quality standards that undermine beneficial that should be protected by the water quality control plan. On the other hand, the Tunnels project will prejudice the Phase 1 and 2 processes with premature diversion and 404 permit requests, potential Delta island purchases by the Metropolitan Water District of Southern California, as well as the inadequate Tunnels environmental review process. Under both of these circumstances, the Tunnels Project tail threatens to wag State Water Board and Army Corps dog.

[3] 33 U.S.C. § 1341(a)(1).

[4] Accessed September 15, 2015, at http://www.spk.usace.army.milMedia/RegulatoryPublicNotices/tabid/1035/Article/616568/spk-2008-00861-california-waterfix-project.aspx.

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project will result in discharges of dredge or fill material into waters of the United States.[5] Section 401 requires that the SWRCB certify that the Corps' Section 404 permit meets CWA requirements before the permit may be legally issued.[6] State and federal agencies have long recognized the importance of this requirement, meeting several times to discuss it in the context of the preparation of the Water Tunnels project EIR/EIS.[7]

The project reduces Delta freshwater flow conditions in violation of CWA requirements to fully protect the most sensitive beneficial uses. The inadequate flow proposals of the Water Tunnels project EIR/EIS alternatives will ensure that its implementation trips over mandatory compliance with the CWA. Flow regimes that fully protect Delta ecosystems and aquatic species are necessary to avoid this result.

CWA regulations dictate that adopted criteria must protect the "most sensitive" beneficial use.[8] The SWRCB's August 2010 flow criteria report used science to identify the *minimum* amount of unimpaired flow that would protect Delta fish species and habitats. That report thus reflects flows needed to comply with CWA mandates. A new Bay-Delta Plan adopting the Water Tunnels project's proposed flow regimes would fall significantly short of this benchmark, and thereby would fail to protect the most sensitive beneficial uses as required by the CWA.

Indeed, instead of improving flow conditions in the Delta, the Water Tunnels project will actually *increase* average exports[9] and *reduce* already inadequate Delta outflow in many months. Specifically, on average for February through June, the Water Tunnels project would *decrease*

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[5] "Many of the actions that will be implemented under the Water Tunnels project will result in the discharge of dredged or fill materials into waters of the United States and will need to be authorized by USACE."Public Draft Plan § 1.3.7.1 (Nov. 2013), available at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_1_-_Introduction.sflb.ashx. This is no less true of intake construction of the "California WaterFix" version (Alternative 4A) of the Water Tunnels project.

[6] "No license or permit shall be granted until the certification required by this section has been obtained or has been waived as provided in the preceding sentence. No license or permit shall be granted if certification has been denied by the State, interstate agency, or theAdministrator, as the case may be." 33 U.S.C. § 1341(a)(1).

[7] As reflected by U.S. EPA in its comments on these discussions: "[a]lthough there is no statutory requirement that the NEPA document prepared for an HCP under the Endangered Species Act be used as the basis for permits and certifications required under CWA §404 to authorize and implement the project, EPA recognizes the importance of coordination in federal review. Toward this end, EPA and the Corps have met with the project proponent on numerous occasions over the past several years in the interest of using the BDCP EIS/EIR to inform the Corps' 404 regulatory decisions. Despite these efforts, significant unresolved issues remain about the scope of analysis for the proposed project, the level of detail required to trigger the consultation process and federal permitting, and the structure of a comprehensive permitting framework for the proposed project." U.S. EPA, "EPA's Comments on BDCP ADEIS," p. 6 (July 03, 2013), available at: www2.epa.gov/sites/production/files/documents/july3-2013-epa-comments-bdcp-adeis.pdf.

[8] 40 CFR § 131.11 ("For waters with multiple use designations, the criteria shall support the most sensitive use"); see also 40 CFR §131.6.

[9] *See* Public Draft Plan, App. 5B, Fig. 5.B.4-4, available at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_EIREIS_Appendix_5B_-_Responses_to_Reduced_South_of_Delta_Water_Supplies.sflb.ashx. See also BDCP/California WaterFix, RDEIR/SDEIS, 2015, Section 4.3.1, Figures 4.3.1-15, -16, -18, -19, -20, and -21.

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Delta outflow by about 1,000 cubic feet per second and also *decrease* the median Delta outflow by about 2,000 cfs.[10] For the period of January through June (the time period during which the August 2010 Flow Criteria from the SWRCB called for an increase of outflow to 75 percent of unimpaired Delta outflow), the BDCP *decreases* outflow. Water Tunnels project modeling shows that long-term average Sacramento River flows below the north Delta intake diversions would *decrease* between 6 to 38 percent from current and future flows without the Tunnels project, and in wet years river flows would decrease between 7 and 42 percent. Overall, monthly lower Sacramento River flows are projected by "California WaterFix" to decrease between 20 and 24 percent. (See Attachments 1, 2, and 3 to this letter.)[11]

Decreased flows and increased residence times will cause the designated beneficial uses of migratory and rare fish species to decline, according to Water Tunnels Project RDEIR/SDEIS modeling results. Through-Delta survival rates of the juvenile and smolt life stages of winter-run, spring-run, fall-run and late-fall-run Chinook salmon are all expected to decrease relative to both existing conditions and the No Action Alternative. (See Attachment 4 to this letter.) These fish species are "rare and endangered species" beneficial uses as well as "migration of aquatic organisms" beneficial uses. These reduced flows will decrease the size of critical open water estuarine habitat beneficial uses for state and federally-listed species like Delta smelt and longfin smelt, both of which count also as rare and endangered beneficial uses under the current Bay-Delta Water Quality Control Plan.[12] The U.S. EPA expressed serious concerns about the EIR/EIS Administrative Draft's (ADEIS) proposed decrease in outflow "despite the fact that several key scientific evaluations by the federal and State agencies indicate that *more* outflow is necessary to protect aquatic resources and fish populations."[13] The Water Tunnels project's flow regime will violate the beneficial uses of affected waterways and therefore violate water quality objectives. In order to receive the Section 404 permit, DWR and the Bureau of Reclamation must revise the Water Tunnels project to ensure that it fully protects all designated beneficial uses.

The project increases Delta contamination, resulting in violations of pollutant criteria. Reduced through-Delta flows will stagnate water conditions and cause Delta water quality to

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[10] *See* Public Draft Plan, App. 5C, Attachment 5.C.A, Table C.A-41, available at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_5C_-_Part_5_-_Flow_Passage_Salinity_and_Turbidity.sflb.ashx.

[11] Estimates derived by Restore the Delta from graphical analysis interpolating data in Figures 4.3.2-7 and 4.3.2-8 from the Recirculated Draft EIR/EIS, Section 4.3. See Attachment 1 to this letter. See also Appendix B, Tables B. 7-28 (downstream of north Delta intakes), B.7-30 (Sacramento River at Rio Vista), B.7-32 (Delta outflow), and B. 7-34 (San Joaquin River at Vernalis), pp. B-357 to B-370. These tables show that most changes are *decreases* in flow of 5 percent or more compared with Existing Conditions ***and*** the No Action Alternative (especially along the Sacramento River downstream of the north Delta intakes). Only slight improvements occur in just a handful of months and water year types. Most San Joaquin River flows at Vernalis between February and September in most water year types decrease greater than 5 percent relative to existing conditions as well.

[12] State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, December 13, 2006, p. 9.

[13] U.S. EPA, "EPA Comments on Administrative Draft EIR/EIS, III Aquatic Species and Scientific Uncertainty, Federal Agency Release," p. 4 (July 18, 2013) (emphasis added), available at: http://www2.epa.gov/sites/production/files/documents/july3-2013-epa-comments-bdcp-adeis.pdf.

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deteriorate badly. (See Attachment 5 to this letter, citing model results supporting this analysis.) RDEIR/SDEIS modeling documents find that the project will violate standards for boron, bromide, chloride, electrical conductivity, nitrate, dissolved organic carbon, mercury, and selenium.[14] While these constituents' concentrations will *increase* in western and central Delta locations, as well as Contract Costa Water District's Pumping Plant No. 1, their concentrations are expected to *decrease* in export waters of the North Bay Aqueduct in Barker Slough, and Jones Pumping Plant and Banks Pumping Plant in the south Delta. These results hold for both changes compared with existing conditions as well as the No Action Alternative, the latter of which factors out most sea level rise and climate change impacts.

Because it cannot meet water quality standards, the Water Tunnels Project cannot obtain the required Clean Water Act 401 Certification it needs for a 404 permit to build the project. To obtain CWA Section 401 certification, the project at issue must meet several CWA requirements, including the requirement to meet water quality standards under CWA Section 303.[15] If these requirements are met, then either the Regional Water Quality Control Boards (RWQCB) or the SWRCB may grant Section 401 certification.[16]

As implementing U.S. EPA regulations assert,[17] Section 401 certification "shall" include "a statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards." [18] In other words, the state *cannot* grant Section 401 certification to a project if there is no reasonable assurance that it will meet water quality standards. The examination of whether a project violates water quality standards does not include "balancing" factors such as economic considerations – a project either meets water quality standards, or it does not.[19] Furthermore, as confirmed by the 1994 U.S. Supreme Court decision in *PUD No. 1 of Jefferson County v. Washington Department of Ecology* (*PUD No. 1)*, CWA Section 401 certification considers the impacts of the *entire* activity – not just

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[14] RDEIR/SDEIS, Appendix B.

[15] 33 U.S.C. § 1341(a)(1), (d). A state agency may also condition, deny or waive certification under certain circumstances. See also 33 U.S.C. § 1341(a)(1)–(2), and 33 U.S.C. § 1341(d). According to § 401(d), certification "*shall* set forth any effluent limitations and other limitations … necessary to assure that any applicant"complies with certain provisions of the CWA. The Supreme Court in *PUD No. 1 of Jefferson County v. Washington Department of Ecology* held that this includes CWA §303, since § 301 incorporates it by reference. *PUD No. 1 of Jefferson County v. Washington Department of Ecology*, 511 U.S. 700, at 713–715 (1994) (PUD No. 1).

[16] In California, the Regional Water Quality Control Boards are responsible for granting water quality certification, unless the project occurs in two or more regions, in which case the SWRCB is responsible. *See* SWRCB, "Instructions for Completing the Clean Water Act Section 401 Water Quality Certification Application" (Jan. 2005), available at:www.swrcb.ca.gov/centralcoast/water_issues/programs/401wqcert/docs/instruct_401_wq_cert_app.pdf.

[17] The Supreme Court held that the EPA's interpretation is consistent with the CWA in*PUD No. 1*.

[18] 40 CFR § 121.2(a)(3); *PUD No. 1* at 712.

[19] 40 CFR § 131.11 ("For waters with multiple use designations, the criteria shall support the most sensitive use"); see also 40 CFR §131.6. As noted by the state Supreme Court, Porter–Cologne "cannot authorize what federal law forbids"; that is, California cannot allow for the "balancing away" of the most sensitive beneficial uses in a reliance on Porter–Cologne rather than the Clean Water Act. *City of Burbank v. State Water Resources Control Bd*, 35 Cal. 4th 613, 626, 108 P.3d 862 (2005).

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impacts of any particular discharge that triggers Section 401.[20] For the Water Tunnels project to receive Section 401 certification, the *entire project* must show it can be built and operated so as to meet all water quality standards. This it will not do, as we show in this letter and its attachments, because water quality standards cannot be met under the currently-proposed Water Tunnels project flow regimes and related effects on estuarine water quality and beneficial uses.

The CWA states that water quality standards "shall consist of the designated uses of the navigable waters involved *and* the water quality criteria for such waters based upon such uses."[21] In other words, "a project that does not comply with a designated [*i.e.*, beneficial] use of the water does not comply with the applicable water quality standards."[22] This fundamental CWA mandate does not change when the impact on beneficial uses arises from altered flow. The CWA was established specifically to "restore and maintain the chemical, *physical*, and biological integrity of the Nation's waters" – not solely to regulate "pollutants."[23] The U.S. Supreme Court addressed this issue directly in *PUD No. 1*, stating that:

> Petitioners also assert more generally that the Clean Water Act is only concerned with water 'quality,' and does not allow the regulation of water 'quantity.' This is an artificial distinction.[24]

The Court specifically took note of CWA Sections 101(g) and 510(2), which address state authority over the allocation of water as between users. The Court found that these provisions "do not limit the scope of water pollution controls that may be imposed on users who have

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[20] *PUD No. 1*, 511 U.S. 700 (1994). *PUD No. 1* established that so long as there is a discharge, the state can regulate an activity as a whole under §401. *PUD No. 1* at 711–712.

[21] 33 U.S.C. 1313(c)(2)(A) (emphasis added); *PUD No. 1* at 704. In addition to the uses to be protected and the criteria to protect those uses, water quality standards include an antidegradation policy to ensure that the standards are"sufficient to maintain existing beneficial uses of navigable waters, preventing their further degradation." *PUD No. 1* at 705; 33 U.S.C. 1313(d)(4)(B); 40 CFR § 131.6. EPA regulations add that "[e]xisting instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." 40 CFR §131.12.

[22] *PUD No. 1,* 511 U.S. at 715. *See also* 40 CFR § 131.3(b) (U.S. EPA stating that "[w]hen criteria are met, water quality will *generally* protect the designated use," [emphasis added] indicating that numerical criteria do not always by themselves protect a designated use). Recognized beneficial uses in the Bay-Delta Estuary include, but are not limited to, agricultural supply (AGR), groundwater recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Estuarine Habitat (EST), and Rare, Threatened, or Endangered Species (RARE).

[23] 33 U.S.C. § 1251(a). Emphasis added.

[24] *PUD No. 1,* 511 U.S. at 719. In *PUD No. 1*, the U.S. Supreme Court took up the question of whether Washington state had properly issued a CWA Section 401 certification imposing a minimum stream flow requirement to protect fish populations. The Supreme Court held that conditioning the certification on minimum stream flows was proper, as the condition was needed to enforce a designated use contained in a state water quality standard. *Id.* at 723. In reaching this decision, the court noted that the project as proposed did not comply with the designated use of "[s]almonid [and other fish] migration, rearing, spawning, and harvesting," and so did not comply with the applicable water quality standards. *Id.* at 714.

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obtained, pursuant to state law, a water allocation."[25] This conclusion is supported by the "except as expressly provided in this Act" language of Section 510(2), which conditions state water authority; and by the legislative history of Section 101(g), which allows for impacts to individual water rights as a result of state action under the CWA when "prompted by legitimate and necessary water quality considerations."[26] Accordingly, these CWA provisions are not impediments to California's implementation of its CWA mandate to ensure compliance with water quality standards, *including* within the context of flows.

As noted above, in its August 2010 flow criteria report, the Water Board found that "[t]he best available science suggests that current flows are insufficient to protect public trust resources," and that "[r]ecent Delta flows are insufficient to support native Delta fishes for today's habitats."[27] However, flow regimes proposed by the current Water Tunnels project rely on water quality (including flow) objectives that have been failing to protect Delta ecosystem and aquatic species beneficial uses for the last 15 years or more. These include: Water Right Decision 1641 (D-1641)[28]; the 2006 San Francisco Bay/Sacramento-San Joaquin Delta Estuary Water Quality Control Plan; the 2009 NMFS Biological Opinion (BiOp); and the 2008 USFWS BiOp.

Further, the Water Tunnels project notably incorporates "bypass flows" that ostensibly establish the minimum amount of water that must flow downstream of the planned north Delta intake. Rather than protecting Delta flow, the Water Tunnels project reduces average annual Sacramento River flow downstream of the North Delta intakes.[29] Reduced flows downstream of the north Delta intakes extend all the way past Rio Vista as well.[30] Because it fails to put needed flows back into failing waterways, the Water Tunnels project will violate water quality standards

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[25] *Id.* at 720.

[26] *Id.* "See 3 Legislative History of the Clean Water Act of 1977 (Committee Print compiled for the Committee on Environment and Public Works by the Library of Congress), Ser. No. 95–14, p. 532 (1978) ('The requirements [of the Act] may incidentally affect individual water rights. . . .It is not the purpose of this amendment to prohibit those incidental effects. It is the purpose of this amendment to insure that State allocation systems are not subverted and that effects on individual rights, if any, are prompted by legitimate and necessary water quality considerations')." *See also* Memorandum from U.S. EPA Water and Waste Management and General Counsel to U.S. EPA Regional Administrators, "StateAuthority to Allocate WaterQuantities – Section 101(g) ofthe Clean Water Act" (Nov. 7, 1978), available at: http://water.epa.gov/scitech/swguidance/standards/upload/1999_11_03_standards_waterquantities.pdf.

[27] SWRCB, 2010 Delta FlowCriteria Report, pp. 2, 5. Accessible at http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf.

[28] D-1641 requires the SWP and CVP to meet flow and water quality objectives, including specific outflow requirements, an export/import ratio, spring export reductions, salinity requirements, and, in the absence of other controlling restrictions, a limit to Delta exports of 35 percent total inflow from February through June and 65 percent inflow from July through January.

[29] See Attachment 1 in this letter, above, and Public Draft Plan § 5.3.1.1, available at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_5_-_Effects_Analysis.sflb.ashx. See Also BDCP Draft EIR/EIS Chapter 3, *Description of Alternatives*, Table 3-17, p. 3-186.

[30] See RDEIR/SDEIS, 2015, Appendix B, Table B.7-30, pp. B-361 to B-362.

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by failing to protect sensitive beneficial uses. These include "rare, threatened or endangered species habitat," "estuarine habitat," "spawning, reproduction, and/or early development," and other sensitive beneficial uses.[31] Chinook salmon, Central Valley steelhead, sturgeon and lamprey all migrate and spawn in this area, with Delta smelt and longfin smelt likely spawning in the lower Sacramento River, or in hydraulically connected adjacent channels. Factoring out climate change effects, juvenile and salmon smolt survival rates through the Delta to Chipps Island decrease for each run of salmon under the flow regimes put forward by proponents of the Water Tunnels project.[32] The Water Tunnels Project will thus fail as a set of flow regimes that could support Section 401 certification for necessary Section 404 permits.

Actions that "reasonably protect"[33] rather than "protect" the beneficial use are insufficient. If multiple beneficial uses are at stake, adopted flow criteria must protect the *most sensitive* beneficial use (*i.e.*, they cannot "balance" away uses) and must be based on science.[34] As the state Supreme Court found, Porter-Cologne balancing provisions[35] that provide only "reasonable" protection "cannot authorize what federal law forbids."[36] The more protective CWA water quality standard requirements take precedence over weaker Porter-Cologne language; ecosystem and species needs cannot—and must not—be balanced away.

USEPA commented last year on the Bay Delta Conservation Plan and its draft EIR/EIS that "[b]ecause the location of X2 [the estuarine habitat water quality objective] is closely tied to freshwater flow through the Delta, the proposed project would have a strong influence on this parameter, yet the Draft EIS does not analyze each alternative's impacts on aquatic life in the context of this relationship."[37] The Bay-Delta Water Quality Control Plan's estuarine habitat water quality objective will likely be violated by the Water Tunnels Project as well. In the

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[31] State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta*, December 13, 2006, p. 9.

[32] By "factoring out climate change effects," we refer to the Water Tunnels project proponents' preference for environmental impact comparisons between the No Action Alternative and Alternative 4A (either Scenarios H3 or H4). This comparison reflects the future migration prospects of these fish with and without the proposed Water Tunnels Project. Even by their preferred comparison of the Water Tunnels project with the No Action Alternative, juveniles and smolts have lower survival rates through the Delta to Chipps Island.

[33] SWRCB, "Comments on the Second Administrative Draft Environmental Impact Report/Environmental Impact Statement for the Bay Delta ConservationPlan," p. 1 (July 05, 2013), available at: baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/State_Water_Resouces_Control_Board_Comments_on_BDCP_EIR-EIS_7-5-2013.sflb.ashx (emphasis added).

[34] EPA regulations state that "criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. For waters with multiple use designations, the criteria shall support the most sensitive use." *See* 40 CFR §131.11; *see also* 40 CFR §131.6.

[35] Calif. Water Code § 13000.

[36] *City of Burbank v. State Water Resources Control Bd*, 35 Cal.4th 613, 626, 108 P.3d 862 (2005) (citing the Supremacy Clause).

[37] USEPA, "Draft Environmental Impact Statement for the Bay Delta Conservation Plan, San Francisco Bay Delta, California (CEQ# 20130365), August 26, 2014, p. 5. Accessible at http://www.friendsoftheriver.org/site/DocServer/8-26-14_EPA_Cmmnt_on_BDCP.pdf?docID=9539.

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RDEIR/SDEIS nor the Draft EIR/EIS there is no modeling of how changes in X2, the Delta's estuarine habitat water quality objective may affect a variety of estuarine species. X2, which measures the approximate center of the estuary's low salinity zone relative to the Golden Gate, was shown last year in BDCP modeling to migrate upstream under the Tunnels' influence relative to existing conditions and the No Action Alternative.[38] The modeled upstream migration of X2 means that critical habitat for estuarine species will shrink, especially relative to the No Action Alternative. Species abundance and X2 are negatively: when X2 moves further from the Golden Gate, species abundances typically decrease as the size of the Low Salinity Zone decrease (with lower flows), with few exceptions.[39] This apparently remains true of the RDEIR/SDEIS, in which no new modeling is conducted.

The State Water Board has indicated tentative interest in designating subsistence fishing as a beneficial use statewide, including in the Delta.[40] Our organizations and others would certainly welcome such a beneficial use designation in the Delta as elsewhere because protection of the most sensitive ecological and estuarine beneficial uses will also protect subsistence fishing as a beneficial use. Humans are connected to these other beneficial uses, no less so in the Bay-Delta Estuary.

The Water Tunnels Project will also violate numerous pollutant criteria mentioned above with drastic consequences for public health and vitality of the region's ecosystems and water-dependent economic sectors like tourism, recreation, agriculture, and subsistence fishing. On this score, the Water Tunnels Project will further violate water quality standards, precluding the State Water Resources Control Board from certifying the project under Clean Water Act Section 401.

In summary: implementation of the Water Tunnels project will require a CWA Section 404 permit from the Army Corps of Engineers, which it cannot receive unless the state issues a CWA Section 401 certification. The certification in turn cannot be legally issued unless the project as a whole (*i.e.*, rather than the individual discharge mandating the 404 permit) meets water quality standards, which includes meeting beneficial uses designed to protect Delta species and ecosystems. The Water Tunnels project will fails across the board; we provide more details of this failure in Attachment 5 to this letter.

There is no defensible anti-degradation analysis.

A cornerstone of the State Water Board 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 Water Tunnels project Draft EIR/EIS and RDEIR/SDEIS fail to discuss or analyze constituents which will "degrade" water quality. These documents do not evaluate

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[38] See Figure 7, p., 66 of Environmental Water Caucus comments on Bay Delta Conservation Plan, June 11, 2014; accessible online at http://ewccalifornia.org/reports/bdcpcomments6-11-2014-3.pdf.

[39] Panel Summary Report on Workshop on Delta Outflows and Related Stressors, May 5, 2014. Accessible online at http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta-Outflows-Report-Final-2014-05-05.pdf. This report identifies "key papers" in which the relationships of X2, Delta outflow, and species abundances are anchored.

[40] Email from Esther Tracy of State Water Resources Control Board, Office of Public Participation, to Andria Ventura, Clean Water Action, "State Water Resources Control Board Beneficial Uses," May 6, 2014, forwarded to Colin Bailey of Environmental Justice Coalition for Water, thence to Tim Stroshane, Environmental Water Caucus consultant. Tracy's message primarily concerns subsistence fishing by California Indian Tribes.

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whether the designated beneficial use is degraded and what it means for Clean Water Act compliance.

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 and implementing procedures.

The CWA requires the*full* protection of identified beneficial uses. The Federal Antidegradation Policy, as required in 40 CFR 131.12 states, "The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following: (1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." The Delta is classified as a Tier II, "high quality," waterbody by US EPA and the SWRCB. EPA Region 9's guidance on implementing antidegradation policy states, "All actions that could lower water quality in Tier II waters require a determination that existing uses will be fully maintained and protected." [41]

California's antidegradation policy is described in the State Antidegradation Guidance, SWRCB Administrative Procedures Update 90-004, 2 July 1990 ("APU 90-004") and USEPA Region IX, ("Region IX Guidance"), as well as Water Quality Order 86-17. [42]

California's 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 using the best practicable treatment or control of the discharge necessary to assure that neither pollution nor nuisance will occur and the highest water quality with maximum benefit to the people of the state will be maintained.

While California's Antidegradation Policy requires that, "[t]he 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 Federal Antidegradation Policy requires a "determination that existing uses will be fully maintained and protected." [43]

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[41] EPA, Region 9, Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12, page 7.

[42] "Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12" (3 June 1987).

[43] Draft BDCP EIR/EIS, 2013, page 8-408.

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The Water Tunnels project will reduce flows and result in poorer water quality for a number of constituents, including boron, bromide, chloride, electrical conductivity, nitrate, organic carbon, some pesticides, mercury and selenium. The Delta is currently impaired for many of the constituents that will increase under the proposed alternative. Several water quality constituents are detailed in Attachment 5 where degradation is expected should the Water Tunnels project be constructed and operated.

Even if DWR and the Bureau of Reclamation provide an adequate antidegradation analysis of the Water Tunnels project, the point remains that they cannot move forward on a 401 certification from the State Water Resources Control Board if any water quality standards are not met. The antidegradation analysis is supposed to ensure they comply with any and all water quality standards, but there is clear evidence that cannot and will not.

Water Tunnels project operational modeling criteria scenarios prejudice potential new water quality objectives for the Bay-Delta Estuary from the State Water Resources Control Board.

A large but wholly implicit assumption through the Water Tunnels project and its EIR/EIS is that any one of these alternatives would require wholesale revision to how water quality is regulated in the Bay Delta estuary, in order for the Water Tunnels project to move forward. The setting sections of Chapter 5, 6, 7, and 8 (comprising water supply, surface water, groundwater, and water quality) contain no descriptions of the existing water quality objectives as they apply to flow and operational actions by the state and federal water facilities in the Delta. The Draft EIR/EIS Executive Summary last year only hints at this matter, titling one section "New Rules for North Delta Diversions," but does not address this matter, making no mention of the regulatory regime change that would apparently be required of the State Water Board.[44] This year, the RDEIR/SDEIS announces "proposed new flow criteria" for north and south Delta SWP and CVP export facilities, and the proposed new head of Old River operable barrier.[45]

Such changes to Delta flows and hydrodynamics must be evaluated through public review before the State Water Resources Control Board, the only state body authorized to change water quality standards. We are concerned that the Tunnels proponents hope to circumvent the process by making Tunnels operational criteria seem inevitable and necessary; they are neither, and must be the subject of careful and critical review in the Board's Bay-Delta Plan update process, *before* the Water Tunnels Project receives permit approvals for new diversions. Put simply: water quality policy must come before plumbing decisions are made. What is best for the Bay-Delta Estuary, and the Delta's economy and communities comes first.[46]

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[44] Bay Delta Conservation Plan, Draft EIR/EIS, November 2013, *Executive Summary*, Section ES.9.1.4, "New Rules for North Delta Diversions," pp. ES-52 to ES-53.

[45] RDEIR/SDEIS, Section 4.1, pp. 4.1-11 through 4.1-13.

[46] This stance is also consistent with the Delta Protection Act of 1959.

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Further complicating this picture is the role and regulation by SWRCB of "Real-Time Operations [RTOs]."[47] Our organizations are not opposed to RTOs in principle. Water Tunnels proponents acknowledge that RTOs cannot be modeled.[48] Not only can they not be modeled, RTOs themselves will be difficult, if not impossible to regulate and monitor by state authorities when the most sensitive beneficial uses have admittedly uncertain threshold conditions that should not be exceeded.

But the Water Tunnels proponents push use of RTOs as "silver bullets" for gaps in mitigation that ought to protect listed fish species but which come up short. This implies that individual experts will be given broad discretion over project operations to make "short-term adjustments"—possibly to the usurpation of established laws and regulations in the name of optimizing or maximizing Delta exports relative to Delta inflows, water quality objectives, and Delta outflow, and potentially contrary to the SWRCB's role as the sole body with authority to change and enforce water quality objectives.

For example, real-time operations and modeling were employed in 2014 and 2015 along the upper Sacramento River by the Bureau of Reclamation to manage and control temperature conditions, but failed to prevent large scale losses of winter-run and spring-run Chinook salmon while SWRCB staff and officials could only stand by helplessly. Real-time operations can create situations in which project operators can behave as they see fit, and apologize later. That is

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[47] Real-time operational decisions "are expected to be needed during at least some part of the year at the Head of Old River gate and the north and south Delta diversion facilities." *RDEIR/SDEIS,* p. 4.1-13, lines 17-18. Real-time operations are defined in Conservation Measure 1 of the Bay Delta Conservation Plan, November 2013, Section 3.4.1.4.5, *Real-Time Operational Decision-Making Process*, p. 3.4-26, lines 14-18: "[R]eal-time operational decision-making process (real-time operations [RTOs]) allows for short-term adjustments in operations within the range of CM1 [that is, Water Tunnels operating] criteria..., in order to maximize water supply for SWP and CVP relative to the [BDCP] Annual Operating Plan and its quarterly updates subject to providing the necessary protections for covered species." The Water Tunnels project's documents expect retention of BDCP's use of RTO teams focused on each Delta facility and coordinating with each other. We note that the RDEIR/SDEIS does not specify that post hoc descriptions of RTOs would be made public through such an Annual Operating Plan.

[48] This is most explicitly noted in BDCP Appendix 5.C, Attachment 5C.A, *CALSIM II and DSM2 Modeling Results for the Evaluated Starting Operations Scenarios*, pp. 5C.A-157 to 162. Old and Middle River flow real-time operations are an example, p. 5C.A-157, lines 31-44. "The magnitude of the export restrictions [relating to Old and Middle River flows] cannot be simulated accurately with CALSIM because the limits will be adaptively specified by the USFWS smelt working group, based on real-time monitoring of fish and turbidity and temperature conditions. The assumed restrictions provide a representative simulation compared to D-1641 conditions without any OMR restrictions." Moreover, real-time operations pose dramatic uncertainties for South Delta export operations with real-time adaptive operations in place. "If the least restrictive OMR flow of -5,000 cfs were allowed for 6 months (January-June), a maximum of 1,800 taf per year could be pumped (assuming the San Joaquin River diversion to Old River satisfied the 35% of the net Delta depletion that is south of the OMR flow stations. But because of the 1,500 cfs limit on exports in April and May (2009 NMFS BiOp), the maximum exports would be 1,400 taf per year. If the OMR restriction was reduced to -2,500 cfs for the 6 months (with 1,500 cfs in April and May), a total of 780 taf could be pumped from the South Delta. This is a very dramatic reduction for the CVP and SWP exports which historically have exported about half (45%) of the total exports during these months. This uncertainty in the potential south Delta exports is a consequence of the adaptive management framework for the 2008 USFWS BiOp and 2009 NMFS BiOp actions regarding OMR flow." Since BDCP contemplates real-time operations in several other Delta and Yolo Bypass locations, uncertainties will compound for planning operations, exports, and outflows.

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unacceptable now that listed fish species are so close to extinction. We doubt that real-time operations will have sufficient margins of error to prevent catastrophe.

Instead, adjustments to water quality flow objectives should err on the side of precaution. Designated beneficial uses should be protected as required under the CWA and its implementing regulations. The most sensitive of them will be endangered further by Water Tunnels project operating criteria that reduce and reverse Sacramento River flows, and bring more polluted San Joaquin River water to Delta channels. The precautionary principle must come to the fore in state and federal fisheries and water project operations management.[49] *Sound policy preventing extinction and restoring and enhancing the integrity of Bay-Delta Estuary waters must come before new plumbing and south of Delta export deliveries.*

This is not a call to end south of Delta exports, but an appeal to state and federal officials that they realistically assess how to protect fully all beneficial uses under the CWA before reasonable quantities of Delta exports can be determined and permitted. The Water Tunnels project as proposed would put plumbing and exports first, which is neither an acceptable, lawful nor reasonable prioritization.

The Proposed Project is not the Least Environmentally Damaging Practicable Alternative (LEDPA).

Finally, the Tunnels Project also fails to meet another Section 404 requirement, "[t]he requirement [under CWA § 404(b)(1)...that the project proponent must demonstrate that the project is the [Least Environmentally Damaging Practicable Alternative] LEDPA."[50] "A proposed action is not the LEDPA simply because a federal agency is a partner and chooses that proposed action as its preferred alternative."[51] The Tunnels Project appears to be the *most* environmentally damaging alternative possible. It most definitely is not the least damaging, and therefore, it is not the LEDPA.

Over two years ago, EPA pointed out that "Chapter 8 of the [Administrative Draft EIS] ADEIS indicates that, as proposed, all project alternatives of the BDCP would result in adverse effects to one or more beneficial uses within the affected water bodies."[52] EPA also explained that "The DEIS should sharply distinguish between alternatives and evaluate their comparative merits, consistent with 40 CFR 1502.14(b)."[53]

Over one year ago, EPA explained to state agencies that:

> Other reasonable alternatives could be developed by incorporating a suite of measures, including water conservation, levee maintenance, and decreased reliance on the Delta. Such alternatives would be consistent with the purpose and need for the project, as well

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[49] Peter Montague, accessed online 11 September 2015 at http://www.precaution.org/lib/pp_def.htm.

[50] USEPA, Preliminary Administrative Draft Comments for the Bay Delta Conservation Plan DEIR/S p. 2, April 26, 2012.

[51] EPA, BDCP DEIS Corrections and Additional Editorial Recommendations, p. 1, August 27, 2014.

[52] EPA's Comments on BDCP ADEIS, p. 3, July 3, 2013.

[53] *Id.* p. 2.

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as with the California Bay-Delta Memorandum of Understanding among Federal Agencies and the Delta Reform Act of 2009.[54]

The "alternatives" of the Water Tunnels project presented in the Draft EIR/EIS and the RDEIR/SDEIS are nothing more than peas out of the same pod. As we explained in our joint letter of July 22, 2015, there has been a complete failure on the part of the Water Tunnels proponents to develop and consider a reasonable range of alternatives. That failure also includes refusal to consider and develop the Environmental Water Caucus *Responsible Exports Plan*, updated to *A Sustainable Water Plan for California*, that the Caucus provided to Water Tunnels proponents on a silver platter almost 3 years ago—as well as failure to consider and develop "The 'Portfolio Approach' developed by a diverse set of stakeholders . . . one attempt to place Delta water management into the larger context of facilities investments and integrated operations."[55]

There is more. As we explained in our joint letter of September 9, 2015 (pp. 9-10), there has been a complete failure on the part of Water Tunnels proponents to obtain and present the Reasonable and Prudent Alternatives (RPA) required under the Endangered Species Act.

Under the NEPA Regulations, "This [alternatives] section is the heart of the environmental impact statement." The alternatives section should "sharply" define issues and provide a clear basis for choice among options by the decision-maker and the public. 40 C.F.R. § 1502.14. Moreover, if "a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion."[56]

Operation of the Water Tunnels would have enormous adverse environmental impacts causing and worsening violations of water quality standards. We understand that the exporters and their supporters wish to take enormous quantities of water away from the Delta upstream. But we have a government of laws, not of men and women. It is time either to drop this horrendously damaging and expensive project or follow the law whether certain interests want to do so or not. If the project is not dropped, it is time to prepare a new Draft EIR/EIS for public and decision-maker review that presents some actual—alternatives—that would not include the Water Tunnels and that would finally began to increase flows through the Delta. The range of reasonable alternatives required by NEPA in the new Draft EIR/EIS must include the Reasonable and Prudent Alternatives (RPA) produced pursuant to the Endangered Species Act and the Least Environmentally Damaging Practicable Alternative (LEDPA) pursuant to the Clean Water Act.

Conclusion

The long-term decline of the San Francisco Bay Delta Estuary is a story of our lost connection with nature. Once a pristine ecosystem and the West Coast's largest estuary—a rich, biodiverse habitat of unspoiled grasslands, riparian forests, willow thickets, and other features, with an abundance of native fish species such as salmon—the Delta has suffered tremendously from the misguided belief that nature can be endlessly exploited and degraded. As a first step

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[54] EPA Detailed Comments on the Draft Environmental Impact Statement for the Bay Delta Conservation Plan; August 26, 2014, p. 13.

[55] *Id.*

[56] 40 C.F.R. § 1502.9(a).

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towards recovery, we must enhance flow, which is essential for aquatic species populations, the larger health of the Delta, and Delta communities.

The Water Tunnels project instead reinforces the objective of increasing Delta exports, while reducing Delta outflow and San Francisco Bay inflow. As such, it fails to achieve its purpose of conserving the Delta ecosystem and recovering threatened and endangered species. The Water Tunnels project also will violate the CWA, by harming designated beneficial uses of water (especially the most sensitive uses like migrating and spawning rare fish) and violating pollutant numeric criteria. The Water Tunnels will lead to the degradation of water for human use by millions in the region of the San Francisco Bay-Delta Estuary.

Fortunately, we can still restore and enhance the integrity and health of the Bay-Delta Estuary by adopting (at a minimum) sufficient flows to support healthy fish species and Delta habitats. Moreover, the time is overdue to establish a comprehensive instream water rights program that ensures the longevity of the Delta ecosystem and species, and serves as a model for the state as a whole.

Should you have any questions, please contact Tim Stroshane or Barbara Barrigan-Parrilla, Restore the Delta, 209-475-9550; Linda Sheehan, Executive Director, Earth Law Center, (650) 877-2710; and Robert Wright, Senior Counsel, Friends of the River at (916) 442-3155 ext. 207 or bwright@friendsoftheriver.org.

Sincerely,

/s/ Barbara Barrigan-Parilla
Executive Director
Restore the Delta

/s/ E. Robert Wright
Senior Counsel
Friends of the River

/s/ Linda Sheehan
Executive Director
Earth Law Center

/s/ Bill Jennings
Executive Director
California Sportfishing Protection Alliance

/s/ Carolee Krieger
Executive Director
California Water Impact Network

/s/ Chelsea Tu
Staff Attorney
Center for Biological Diversity

/s/ Conner Everts
Co-Facilitator
Environmental Water Caucus
Southern California Watershed Alliance

Attachments

Additional Addressees, all via email:

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Attachment 1 Modeled Flow Reductions below the North Delta Intakes on the Lower Sacramento River

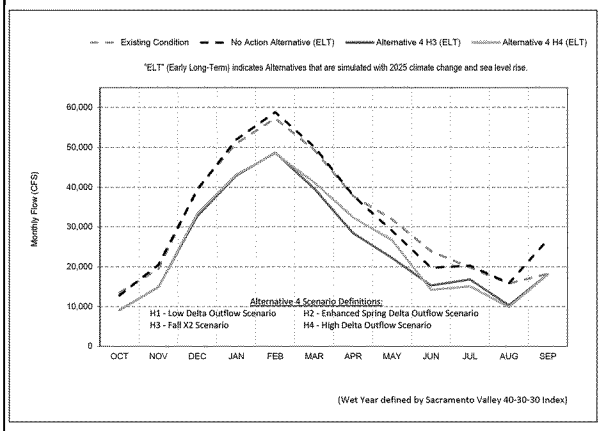

Figure 4.3.2-7
Sacramento River Flow downstream of North Delta Intakes for Alternative 4A, Average Wet Years

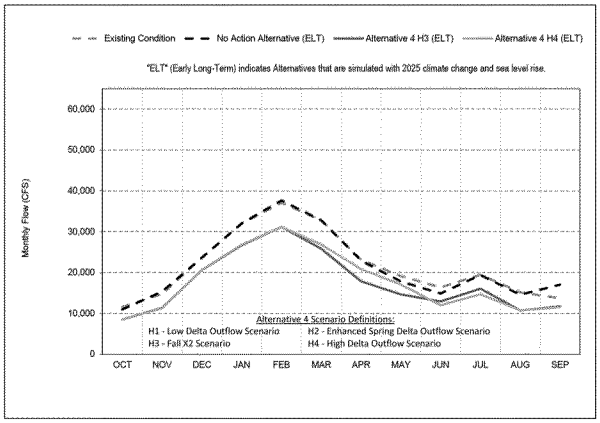

Figure 4.3.2-8
Sacramento River Flow downstream of North Delta Intakes for Alternative 4A, Long-Term Average

Source: Bay Delta Conservation Plan/California Water Fix, Recirculated Draft EIR/Supplemental Draft EIS, July 2015.

Monthly Long-Term Average Estimates of Flow for Lower Sacramento River Downstream of North Delta Intakes Interpolated from Figure 4.3.2-8

	Existing Conditions	No Action Alternative	Alt 4A - Operational Scenario H3	Alt 4A - Operational Scenario H4	Percent Change from EC to H3	Percent Change from EC to H4	Percent Change from NAA to H3	Percent Change from NAA to H4
October	11,667	11,333	8,667	8,667	-26%	-26%	-24%	-24%
November	15,333	16,000	11,667	11,667	-24%	-24%	-27%	-27%
December	23,333	23,333	20,667	20,667	-11%	-11%	-11%	-11%
January	36,000	36,000	25,667	25,667	-29%	-29%	-29%	-29%
February	37,000	37,667	31,333	31,333	-15%	-15%	-17%	-17%
March	33,000	33,000	26,333	27,333	-20%	-17%	-20%	-17%
April	23,333	23,667	14,667	21,000	-37%	-10%	-38%	-11%
May	19,000	18,000	14,667	17,000	-23%	-11%	-19%	-6%
June	16,667	15,000	13,000	12,000	-22%	-28%	-13%	-20%
July	19,333	19,333	16,000	14,667	-17%	-24%	-17%	-24%
August	15,333	15,000	11,000	11,000	-28%	-28%	-27%	-27%
September	14,000	17,000	11,667	11,667	-17%	-17%	-31%	-31%
Average	22,000	22,111	17,111	17,722	-22%	-20%	-23%	-20%

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Monthly Long-Term Average Estimates of Flow for Lower Sacramento River Downstream of North Delta Intakes Interpolated from Figure 4.3.2-8								
	Existing Conditions	No Action Alternative	Alt 4A - Operational Scenario H3	Alt 4A - Operational Scenario H4	Percent Change from EC to H3	Percent Change from EC to H4	Percent Change from NAA to H3	Percent Change from NAA to H4

Source: Bay Delta Conservation Plan/California Water Fix Recirculated Draft EIR/EIS, Section 4.3, Figure 4.3.2-8; Restore the Delta.

Monthly Wet Year Average Estimates of Flow for Lower Sacramento River Downstream of North Delta Intakes Interpolated from Figure 4.3.2-7								
	Existing Conditions	No Action Alternative	Alt 4A - Operational Scenario H3	Alt 4A - Operational Scenario H4	Percent Change from EC to H3	Percent Change from EC to H4	Percent Change from NAA to H3	Percent Change from NAA to H4
October	13,333	12,667	9,000	9,000	-33%	-33%	-29%	-29%
November	20,000	21,000	14,667	14,667	-27%	-27%	-30%	-30%
December	40,000	40,000	33,333	34,000	-17%	-15%	-17%	-15%
January	51,333	52,000	42,667	43,333	-17%	-16%	-18%	-17%
February	56,667	55,333	48,000	48,000	-15%	-15%	-13%	-13%
March	49,333	50,000	39,333	41,333	-20%	-16%	-21%	-17%
April	38,333	38,333	28,667	32,667	-25%	-15%	-25%	-15%
May	32,000	28,667	22,000	26,667	-31%	-17%	-23%	-7%
June	24,000	20,000	14,667	14,000	-39%	-42%	-27%	-30%
July	20,000	20,333	16,667	15,000	-17%	-25%	-18%	-26%
August	16,000	16,000	10,667	10,000	-33%	-38%	-33%	-38%
September	18,000	25,333	18,000	18,000	0%	0%	-29%	-29%
Average	31,583	31,639	24,806	25,556	-23%	-21%	-24%	-22%

Source: Bay Delta Conservation Plan/California Water Fix Recirculated Draft EIR/EIS, Section 4.3, Figure 4.3.2-7; Restore the Delta.

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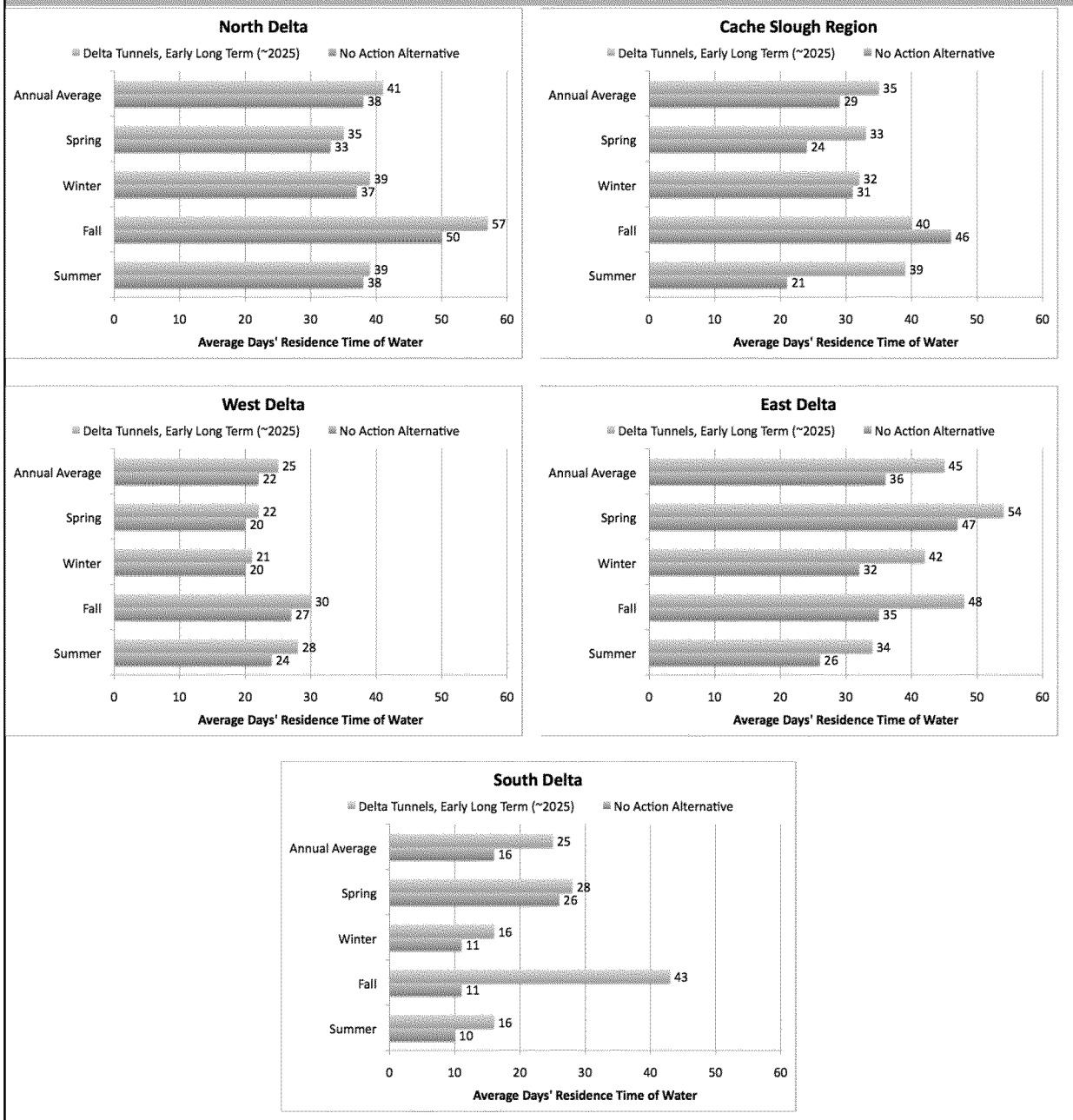
Attachment 2
Average Residence Time of Water in Delta Regions, Alternative 4 (and 4A) and No Action Alternative, 2015 Analysis



Source: Bay Delta Conservation Plan RDEIR/SDEIS, 2015, Table 8-60a, p. 8-82.

Reducing flows in the Sacramento River is not a "waterfix," certainly not for the Bay-Delta Estuary. This will increase residence time of water in the Bay-Delta Estuary relative to current conditions and to a future without the Tunnels; salinity violations and will increase with the Water Tunnels Project as well.[57] (See Attachments 2 and 3.) DWR and its partners opted not to model residence time behavior for Alternative 4A and the other "California WaterFix"

[57] RDEIR/SDEIS, Section 4.3.4, p. 4.3.4-67, lines 4-12.

alternatives (2D and 5A). However, the water source "fingerprinting" analyses in both last year's and this year's modeling appendices show replacement of good quality Sacramento River water with lower-flow and poorer quality San Joaquin River water, so it is reasonable, in the absence of more definitive modeling, that relative to existing conditions residence times will increase with the Tunnels project under both Alternatives 4 and 4A. This is borne out in our analysis of criteria pollutants in Attachment 5.

The lower-flowing and more polluted San Joaquin River will make up greater fractions of water flowing into the western Delta, Franks Tract, and at Contra Costa Water District's Rock Slough intakes.[58] Meanwhile, better quality Sacramento River water diverted into the Tunnels will improve state and federal export water quality, making Delta water quality elsewhere the poorer.[59]

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[58] This reasoning is confirmed by source-water fingerprint modeling provided in both the 2013 Draft EIR/EIS and the 2015 RDEIR/SDEIS. The source water fingerprint modeling results are found in Bay Delta Conservation Plan, Draft EIR/EIS/ November 2013, Appendix 3D, pp. 147-168, 8D-171 to 8D-192; and in Bay Delta Conservation Plan, Recirculated Draft EIR/Supplemental Draft EIS, Appendix B, pp. B-191 to B-256.

[59] Bay Delta Conservation Plan Draft EIR/EIS, November 2013, Appendix 8D (figures for Alternative 4, Scenarios H3 and H4), 2013; BDCP/California WaterFix, Recirculated Draft EIR/Supplemental Draft EIS, Appendix B, Section B.4.2 (figures for No Action Alternative, Alternative 4A, Scenarios H3 and H4), 2015; analyzed by Restore the Delta.

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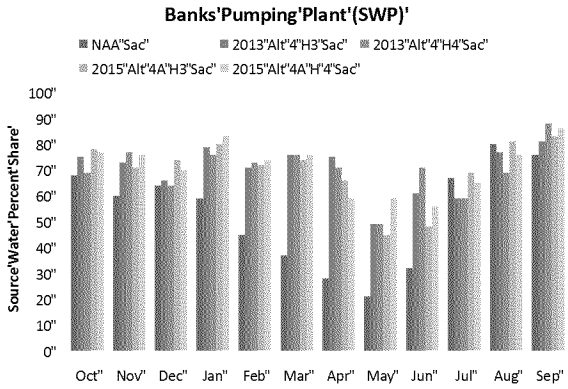
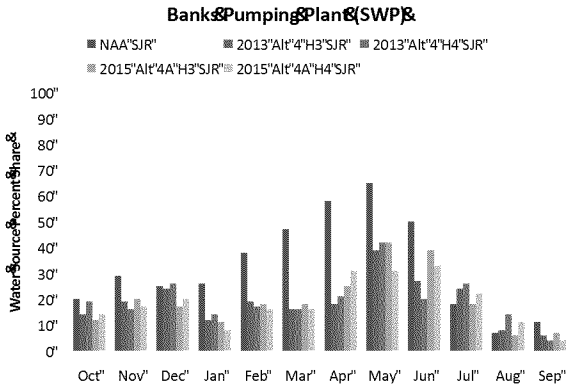
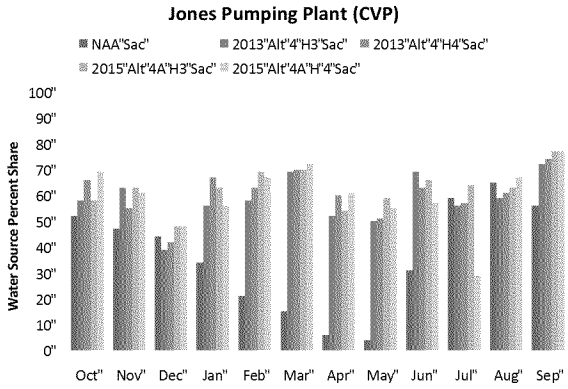
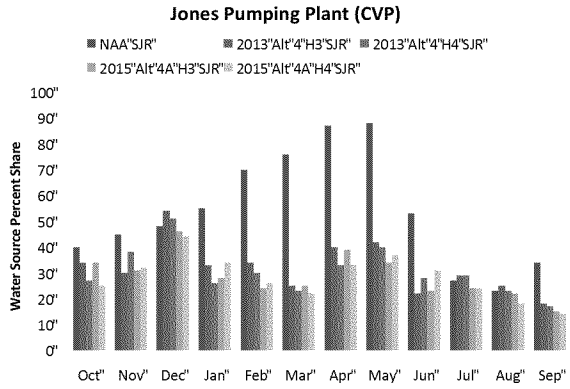
Attachment뀀□ŋ2뀀□ŋ(cont.)
Share뀀□ŋof뀀□ŋDelta뀀□ŋLocation뀀□ŋRiver뀀□ŋSources뀀□ŋfrom뀀□ŋ"Fingerpri
No뀀□ŋAction뀀□ŋAlternative,뀀□ŋ2013뀀□ŋBDCP뀀□ŋConservation뀀□ŋMe
뀀□ŋand뀀□ŋ2015뀀□ŋTunnels뀀□ŋProject

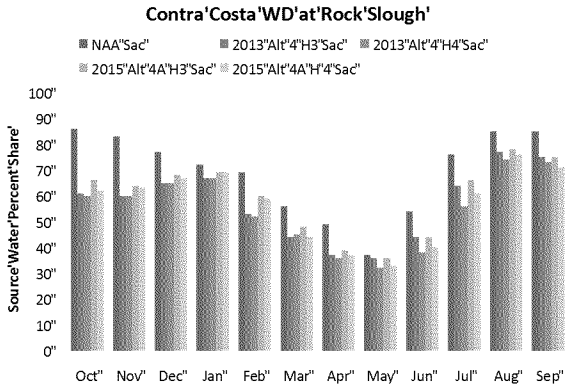
Sacramento뀀□ŋRiver **San뀀□ŋJoaquin뀀□ŋRiver**

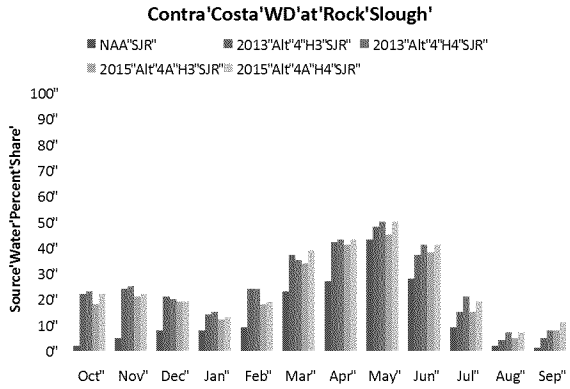












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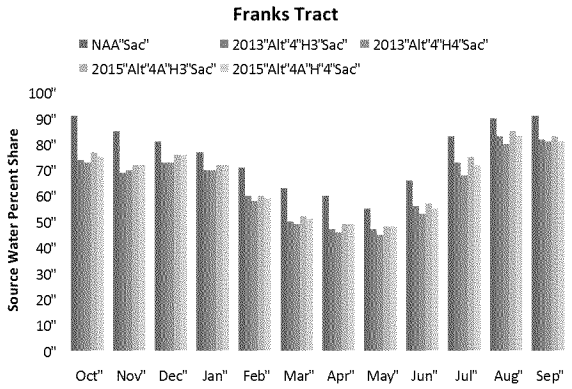
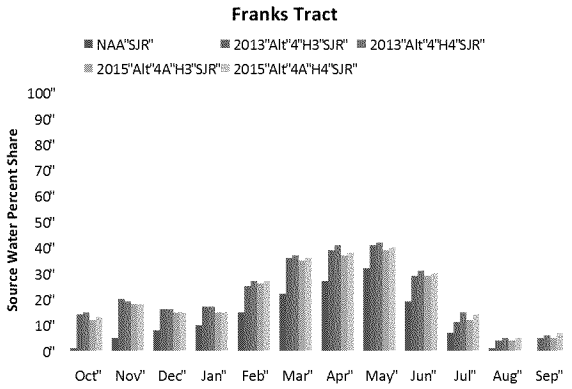
Attachment꿯□ŋ2꿯□ŋ(cont.)
Share꿯□ŋof꿯□ŋDelta꿯□ŋLocation꿯□ŋRiver꿯□ŋSources꿯□ŋfrom꿯□ŋ"Fingerpri
No꿯□ŋAction꿯□ŋAlternative,꿯□ŋ2013꿯□ŋBDCP꿯□ŋConservation꿯□ŋMe
꿯□ŋand꿯□ŋ2015꿯□ŋTunnels꿯□ŋProject

Sacramento꿯□ŋRiver **San꿯□ŋJoaquin꿯□ŋRiver**





Sources:꿯□ŋBDCP꿯□ŋDraft꿯□ŋEIR/EIS,꿯□ŋAppendix꿯□ŋ8D꿯□ŋ(>igures꿯□ŋfor꿯□ŋAlternative
California꿯□ŋWaterFix,꿯□ŋRecirculated꿯□ŋDraft꿯□ŋEIR/Supplemental꿯□ŋDraft꿯□ŋEIS,꿯□ŋAp
No꿯□ŋAction꿯□ŋAlternative,꿯□ŋAlternative꿯□ŋ4A,꿯□ŋScenarios꿯□ŋH3꿯□ŋand꿯□ŋH4);꿯□ŋ

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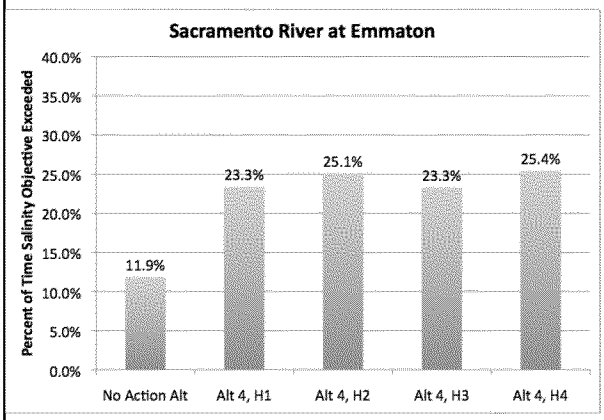
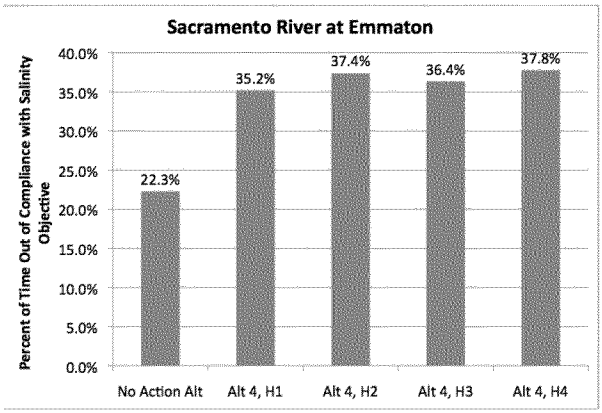
Attachment 3
Projected Salinity Effects by 2060
of the Tunnels Project/Bay Delta Conservation Plan
Percentage of Time Salinity Exceedances and Violations Would Occur

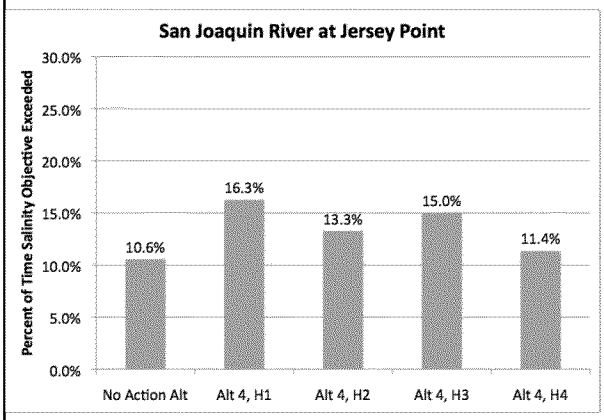
Exceeding Water Quality Objectives | **Out of Compliance with Water Quality Objectives**

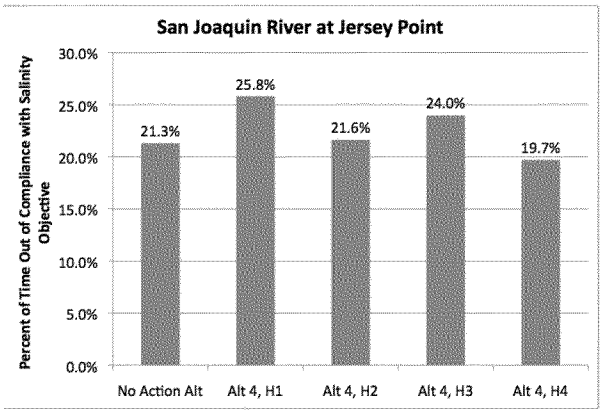
Delta Agricultural Beneficial Use Water Quality Objectives





- **Sacramento River at Emmaton:** Exceedances increase over the No Action Alternative by nearly to over 100 percent of the time in the Alt 4 scenarios, while noncompliance with the objective increases by over 50 percent of the time over the No Action Alternative.





- **San Joaquin River at Jersey Point:** exceedances increase over the No Action Alt by nearly 15 to 80 percent, while non compliance with the objective increases similarly, and decreases slightly in the High Outflow Scenario (where both Spring and Fall X2 apply).

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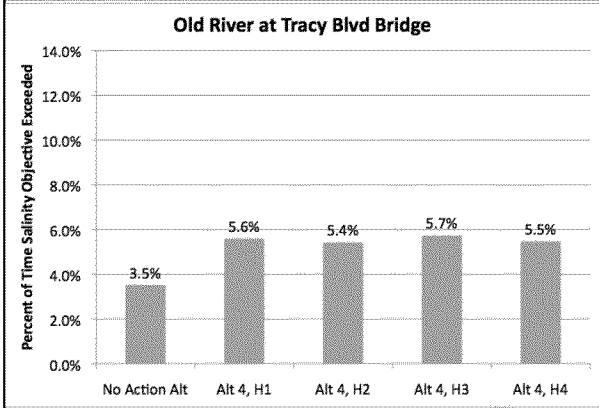
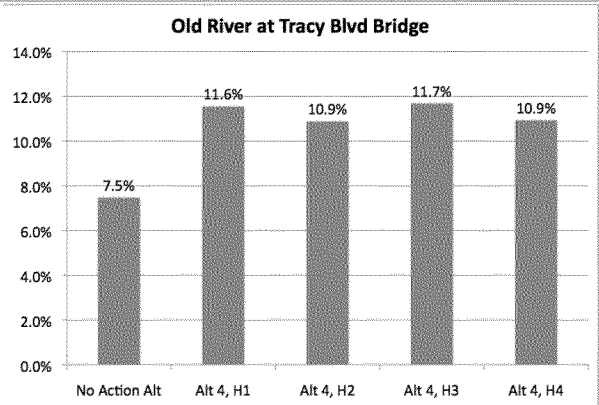
Attachment 3
Projected Salinity Effects by 2060
of the Tunnels Project/Bay Delta Conservation Plan
Percentage of Time Salinity Exceedances and Violations Would Occur

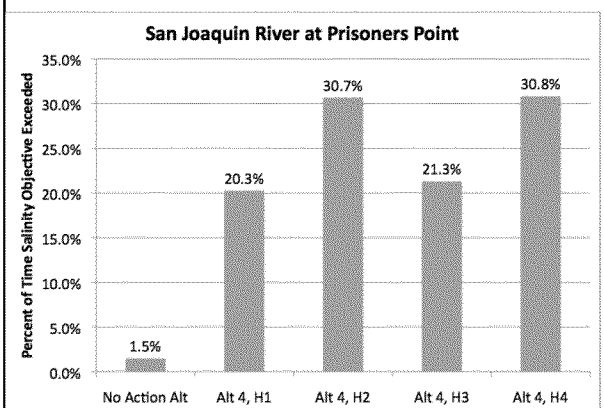
Exceeding Water Quality Objectives | **Out of Compliance with Water Quality Objectives**

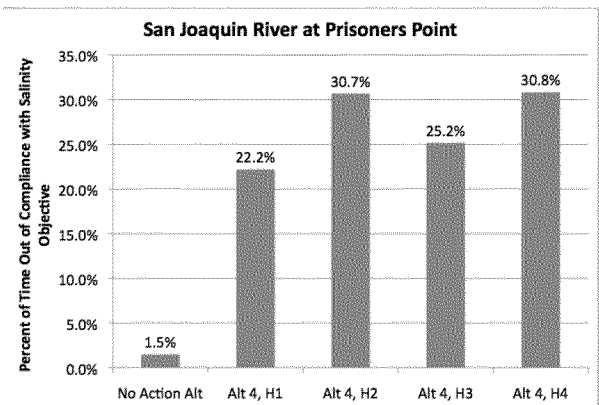




- **Old River at Tracy Blvd Bridge:** Exceedances increase by about two-thirds typically over the No Action Alternative. Noncompliance with the objective would increase by one-third to 40 percent. These percents are lower because as shown above (Table 2) the existing rate of violations is already high.

Delta Fish and Wildlife Water Quality Objective





- **San Joaquin River at Prisoners Point:** The percent of time exceedances would occur increases sharply —1200 to 1900 percent increase in exceedances and a similar similar range for noncompliance. This is a fish and wildlife-related salinity objective, while the other three are agricultural beneficial use salinity objectives.

Source: Bay Delta Conservation Plan EIR/EIS, Appendix 8H, *Electrical Conductivity,* Table EC-4, p. 8H-5.

Note: Percentage of time is based on a 16-year hydrology modeled using DSM2 in Appendix 8H. Being "out of compliance" is the number of days that the 30-day running average at the monitoring site registers violations of the salinity objective. "Exceeding Water Quality Objective" refers to the number of days that the monitoring equipment actually registers salinity exceeding the threshold level the objective.[224]

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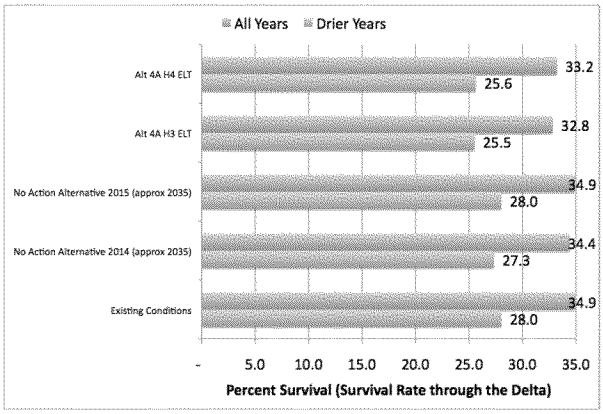
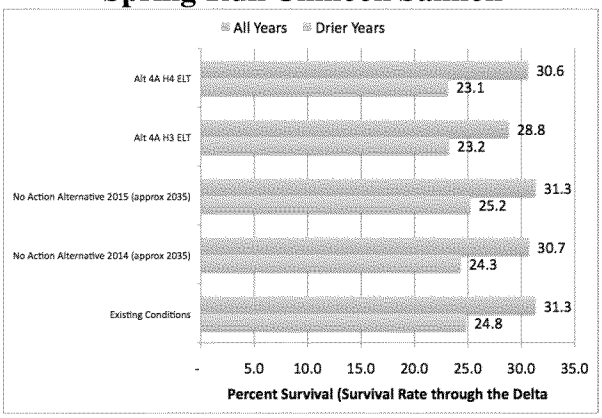
Attachment 4
Through-Delta Survival Rates of Emigrating Juvenile Salmon Races Under Alternative 4A ("California WaterFix")

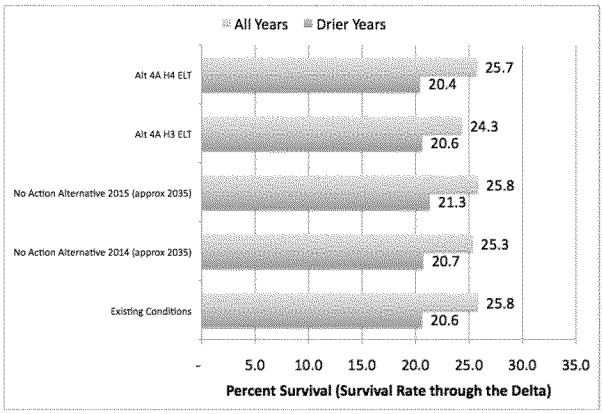
Winter Run Chinook Salmon



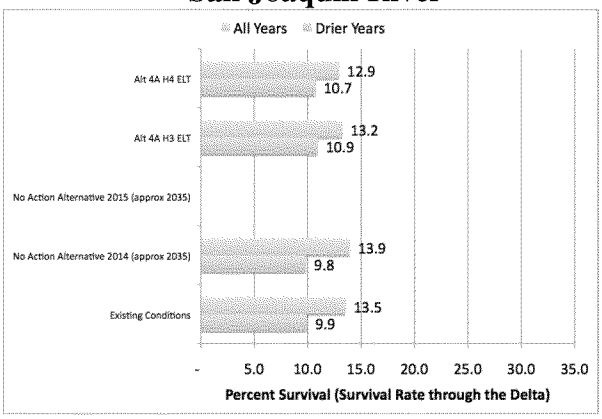
Spring-Run Chinook Salmon



Fall Run Chinook Salmon - Sacramento River



Fall Run Chinook Salmon - San Joaquin River



Source: Bay Delta Conservation Plan/California WaterFix RDEIR/SDEIS, 2015, Tables 11-4A-23, -51, and -74; Environmental Water Caucus.

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Attachment 5
Water Quality Constituents for which "California WaterFix" Would Violate Designated Beneficial Uses and/or Numeric Criteria

Boron

Although period average concentrations decrease with Tunnels operations (except for Sacramento River at Emmaton and Contra Costa Water District's Pumping Plant No. 1), agricultural (that is, crop sensitivity) threshold of 500 micrograms per liter (μg/L) would see exceedances a substantial percentage of the time at San Joaquin River at Antioch and Sacramento River at Mallard Island.[60] The Tunnels Project will increase boron concentrations throughout the year at the south fork of the Mokelumne River, as well as at Franks Tract and Old River at Rock Slough, relative to both existing conditions and No Action Alternative.[61] In the western Delta, boron concentrations increase with Tunnels operation relative to existing conditions and No Action Alternative between February and September, most months of the year. Finally, boron concentrations increase at the Contra Costa Water District's Pumping Plant No. 1, while boron concentrations decrease the North Bay Aqueduct intakes at Barker Slough and at Banks and Jones pumping plants of the state and federal water projects.

Bromide

For both human health and aquatic life criteria, the Tunnels project would increase the frequency of criteria violations in the interior and western Delta, but would decrease bromide violations 25 to 305 percent of the time at Banks and Jones pumping plants. Western Delta bromide concentrations are a proble for Antioch diversions as well. One method of evaluating the Tunnels Project's bromide concentrations suggests that wet years may see increases rather than decreases.[62]

Chloride

The Mokelumne River south fork at Staten Island sees significant increases in chloride concentrations all year, every year. This is closely influenced by reduced flow through Georgiana Slough downstream of the north Delta intakes. Other interior and western Delta areas will see increased chloride concentrations relative to both existing conditions and No Action Alternative by the Tunnels during March through June (for interior locations) and March through August for Sacramento River at Emmaton, San Joaquin River at Antioch and Sacramento River at Mallard Island.[63]

Salinity

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[60] RDEIR/SDEIS, Appendix B, Table Bo-3, p. B-71.

[61] RDEIR/SDEIS, Appendix B, Table Bo-4 and Bo-5, pp. B-73 and B-74.

[62] RDEIR/SDEIS, Appendix B, Table Br-1 and Table Br-2, pp. B-84, and Tables Br-5 and Br-6, p. B-87.

[63] RDEIR/SDEIS, Appendix B, Tables Cl-6 through Cl-9 for two estimation methods and the two operational scenarios (H3 and H4), pp. B-93 and B-96.

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The "California WaterFix" Tunnels will more than triple the number of spikes in excess of salinity objectives along the Sacramento River downstream of the Tunnels, and along the San Joaquin River at Prisoners Point. Outright violations of salinity objectives are expected to more than double with the Tunnels in place.[64] These violations will degrade water quality for Delta agriculture and for fish and wildlife beneficial uses. This means that the State Water Resources Control Board cannot issue a 401 certification regardless of whether it has adequately assessed the project's propensity to degrade water quality.

Along the lower Sacramento River, salinity violations will more than double, and will occur about a quarter of the time that salinity objectives are in effect, up from about 11 percent of the time now and with the "California WaterFix" Tunnels in place. These conditions will worsen relative to current and future conditions between May and September, especially in drought years (which are expected to increase in frequency). Interior Delta salinity will also worsen between March and September (such as along the South Mokelumne River and at San Andreas Landing on the San Joaquin), as well as between February and June at Prisoners Point along the San Joaquin.[65]

The Tunnels will be the opposite of a "WaterFix" for Suisun Marsh. "California WaterFix"modeling results show that every month's average salinity will increase about 56 percent over present conditions and about 60 percent over future conditions in the Beldon Landing area, 28 percent over present conditions and 27 percent over future conditions near Sunrise Duck Club, and 27 percent over present conditions and 26 percent over future conditions along Suisun Slough near Volanti Slough.[66] This altered salinity regime will result in less habitat for fish and other aquatic species native to the Bay-Delta Estuary, as well as affect agricultural soils and vegetation in Suisun Marsh.

Nitrates

Tunnels Project modeling results indicate increases of nitrates relative to the No Action Alternative of 19 to 34 percent for interior Delta locations in all years (except for San Joaquin River at Buckley Cove near Stockton). Similar modeling results are shown for the western Delta as well, 16 to 30 percent increases in salinity. And Contra Costa Water District's Pumping Plant No. 1 is projected to see a 25 percent increase in nitrates. This would likely result in significant increases in water treatment costs for the District. In all of these locations the monthly period average changes were almost all increases in the range of 10 to 30 percent. As with other pollutants, nitrate concentrations are expected in Tunnels modeling results to decrease significantly at Barker Slough, Jones and Banks.[67]

Harmful Algal Blooms

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[64] RDEIR/SDEIS, Appendix B, Table EC-1, p. B-129. "Spikes" here means daily exceedances of a salinity objective, while compliance with objectives is determined by comparing multi-day running averages with an objective. When the running average is exceeded, a violation is then deemed to occur by regulators.

[65] RDEIR/SDEIS, Appendix B, Tables EC-8A and EC-8B, pp. B-134 to B-135.

[66] RDEIR/SDEIS, Appendix B, Tables EC-5, EC-6, and EC-7, pp. B-131 to B-132.

[67] RDEIR/SDEIS, Appendix B, Tables N-4 and N-5, pp. B-162 and B-163.

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Algae occur naturally in all fresh and marine water environments. Most species are harmless under normal circumstances, but some "cyanobacteria" (also known as "blue-green algae") which use photosynthesis can "bloom" or undergo a rapid population boom during periods of slack flow, nutrient pollution conditions (such as from nitrates, nitrogen and phosphorus), and rising temperatures. Their sheer biomass can cause, according to the USEPA, a dramatic reduction or complete consumption of all dissolved oxygen in the water, suffocating oxygen-respiring organisms like fish, and can produce "cyanotoxins" that pose a significant potential threat to human and ecological health and affect taste, odor and safety of drinking water. They can degrade water ways used for recreation and as drinking water supplies.[68]

When these conditions combine, harmful algal blooms can result. These conditions are ripest in August and September in the Estuary, but drought can increase harmful algal bloom activity. The most common blue-green algae species in the Bay-Delta Estuary is called *Microcystis*. In 2014, *Microcystis* algal blooms lasted beyond October into December due to low flows and warm temperatures—water residence time was that long.[69] Its toxin is deadly to wildlife, dogs, and human beings, and exposure can cause liver cancer in humans. It is a dangerous ecological and public health threat.

The Tunnels are likely to increase residence times and slow flows in the western and central Delta. The recirculated Draft EIR/S this year acknowledges that "it is possible that increases in the frequency, magnitude, and geographic extent of of *Microcystis* blooms in the Delta would occur relative to Existing Conditions" [70] as well as compared with the "no action alternative" (or the future condition of the Delta without "California WaterFix" Tunnels).

Pesticides

The San Joaquin River is an impaired water body for chlorpyrifos, diazinon, diuron, DDT, and Group A pesticides (human carcinogens) under the Clean Water Act.[71] Increasing that river's fraction of water contributed to the Delta will result in more concentrated pesticides reaching central and western Delta water ways from the San Joaquin, and with longer residence times, its pesticide burdens stay longer. The Bay-Delta Estuary will be left with a worsening pesticide "cocktail" supplied by the San Joaquin River's agricultural effluent.

Mercury

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[68] USEPA Region 9, *Frequently Asked Question and Resources for Harmful Algal Blooms and Cyanobacterial Toxins*, Version 1, July 2015. Accessible at http://www2.epa.gov/sites/production/files/2015-07/documents/habs_faqs-and-resources_v1-july2015.pdf.

[69] Peggy Lehman, Staff Environmental Scientist, California Department of Water Resources, presentation to IEP 2015 Workshop, Folsom, California, "Response of Microcystis to Drought," , March 20, 2015.

[70] RDEIR/SDEIS, Section 4.3, p. 4.3.4-67.

[71] US EPA, 2010 California California 303(d) List of Water Quality Limited Segments. Accessible online at http://gispublic.waterboards.ca.gov/pub/303d/2010_USEPA_approv_303d_List_Final_122311wsrcs.xls.

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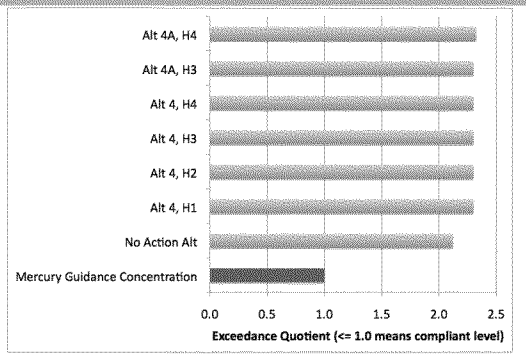
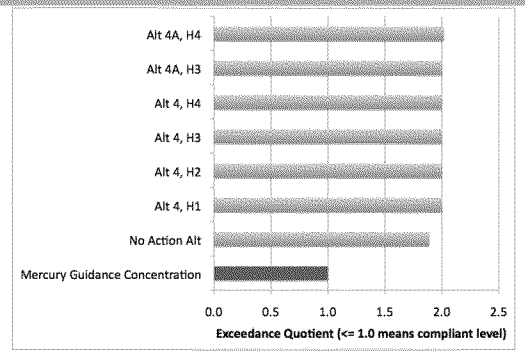
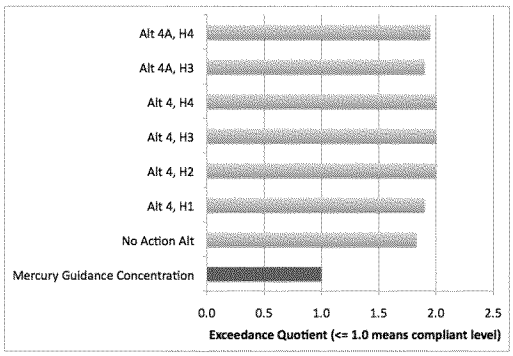
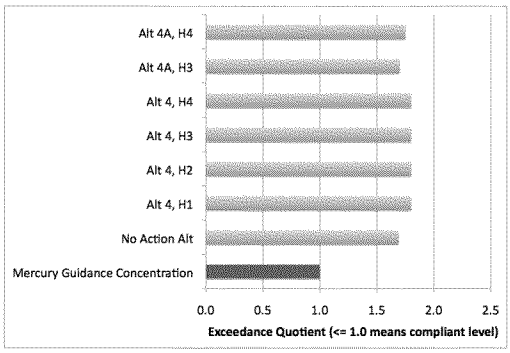
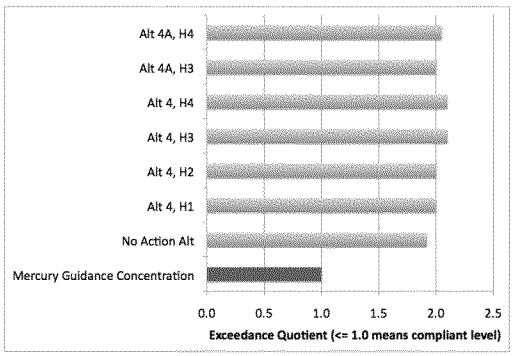
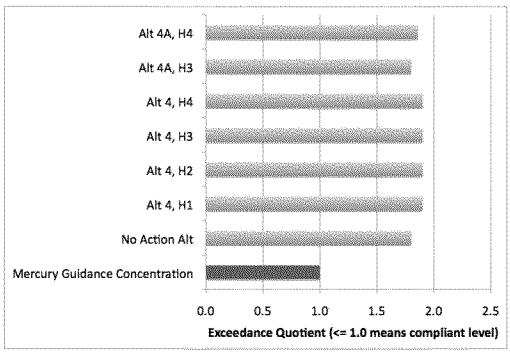
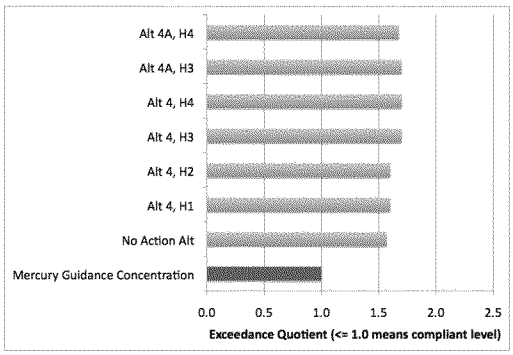
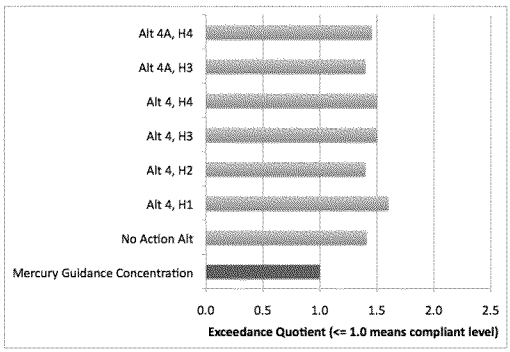
Mercury Concentrations in Largemouth Bass (350 mm) Tissue Exceed Toxicity Thresholds in Future Condition with and without Tunnels Project

Location	Average of All Years	Average of Drought Years
Mokelumne River (S Fork) at Staten Island		
Franks Tract		
Old River at Rock Slough		
San Joaquin River at Antioch		

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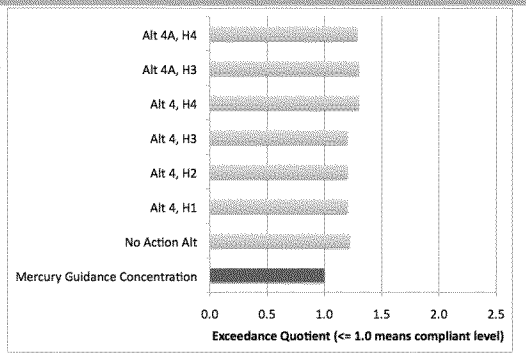
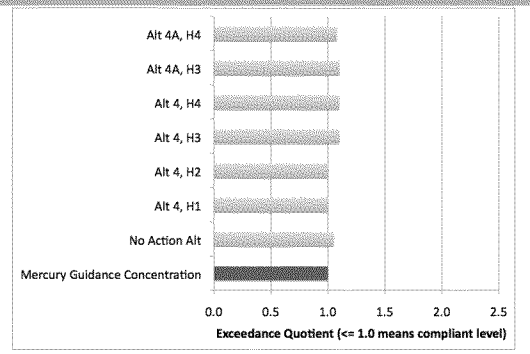
Mercury Concentrations in Largemouth Bass (350 mm) Tissue Exceed Toxicity Thresholds in Future Condition with and without Tunnels Project

Location	Average of All Years	Average of Drought Years
Sacramento River at Mallard Island		

Notes: "Exceedence Quotient" is the ratio of estimated concentrations of mercury (mg/kg of wet weight) to the Delta TMDL guidance concentration of 0.24 mg/kg ww of mercury. In every alternative and existing conditions, "Exceedance Quotients" are greater than 1.0, meaning that in every case, the guidance concentration recommended by USEPA is violated. All Exceedance Quotients reported here are based on Equation 1 calculations according to Appendix 8I of the Bay Delta Conservation Plan Draft EIR/EIS and Appendix B (Tables Hg-5, p. B-147, and Hg-7, p. B-149) and Appendix 8I of the Recirculated Draft EIR/Supplemental EIS. A ratio of 1.0 or less would mean compliance with the mercury guidance concentration.

As shown in the table of charts above, the ratio of mercury concentrations in largemouth bass tissue was for Alternative 4 Tunnels scenarios well over 1.5 to *twice or more* the toxicity threshold.[72] (DWR and its partners try to divert attention from the toxicity threshold by comparing these levels to continuation of the status quo No Action Alternative[73], but the important comparison is to the toxicity threshold for ecological and public health protection.)

Alternative 4A modeling in 2015 shows that the Tunnels project despite having less habitat restoration and no Yolo Bypass improvements would have only slightly less effect on fish tissue concentrations of mercury. Moreover, fish tissue concentrations at several Estuary locations would still be more than 1.5 to 2 times the USEPA's mercury guidance concentration. This analysis, however does not reflect "California EcoRestore's" habitat restoration efforts, which cumulatively can be expected to have impacts similar to the Tunnels and the Bay Conservation Plan last year.[74]

The Bay Delta Conservation Plan states that "at this time… there is no proven method to mitigate methylation and mobilization of mercury into the aquatic system resulting from

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[72] Environmental Water Caucus, *Comment Letter on Bay Delta Conservation Plan and Draft Environmental Impact Report/Statement*, June 11, 2014, Figure 9, pp. 85-86. Accessible online at http://ewccalifornia.org/reports/bdcpcomments6-11-2014-3.pdf.

[73] Bay Delta Conservation Plan/California WaterFix, Recirculated Draft EIR/Supplemental EIS, 2015, Section 4.3.4, p. 4.3.4-33, lines 15-45.

[74] Based on Equation 1 calculations according to Appendix 8I of the Bay Delta Conservation Plan Draft EIR/EIS in 2013-2014 and Appendix B (Tables Hg-5 and Hg-7) and Appendix 8I of the Recirculated Draft EIR/Supplemental EIS in 2015. See also Environmental Water Caucus, *Comment Letter*, June 11, 2014, above.

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inundation of restoration areas. *The mitigation measures...are meant to provide a list of current research that has indicated potential to mitigate mercury methylation."*[75]

The Water Tunnels project provides no mitigation method at all, just a list of "adaptive management" research issues to be handled later.[76] *Calling the Tunnels project "California WaterFix" plus DWR's premature application to the Corps of Engineers are not real adaptive management, but political prejudging of scientific outcomes.*

For both tunnels construction and habitat restoration work in and around the Bay-Delta Estuary, DWR and its partners would have to handle MeHg on a case by case basis.[77]

Selenium

Selenium concentrations in water are expected to change only slightly under the Tunnels Project's flow regimes, annual average selenium concentrations in whole-body sturgeon are expected to increase substantially, according to Tunnels Project modeling results in the RDEIR/ SDEIS. These results are summarized in the table below. In addition, the RDEIR/SDEIS reports that protective toxicity thresholds recommended by Presser and Luoma will be exceeded under Tunnels Project flow regimes relative to No Action Alternative conditions. In particular, their "low" threshold of 5 mg/kg, dry weight would see an exceedance quotient of 1.1 for both operational scenarios of the Tunnel Project, relative to the No Action Alternative condition of 0.95 for the San Joaquin River at Antioch. Under the higher protective threshold they recommend, the exceedance quotient would not rise above 1.0, but would nonetheless increase from 0.59 to about 0.7. For Sacramento River at Mallard Island, average annual exceedance quotients under Tunnels Project flow conditions would increase over the No Action Alternative from 0.88 to 0.99, very close to exceedance. Modeling results do not report the error rate for the

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[75] Charles N. Alpers, et al, *Sacramento-San Joaquin Delta Regional Ecosystem Restoration Implementation Plan, Ecosystem Conceptual Model: Mercury*, prepared January 24, 2008, pp. 12-13. Accessible online at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=6413. "The net formation of …(MeHg) in sediment and/or water is the result of competing microbiological and abiotic reactions…"

[76] These research approaches include: Characterize soil mercury concentrations and loads on a project-by-project basis; sequester MeHg using low-intensity chemical dosing techniques using metal-based coagulants like ferric sulfide or poly-aluminum chloride. These floculants bind with dissolved organic carbon and MeHg to flocculate and deposit mercury out of solution; minimize microbial methylation activity in restored wetlands; design restored wetland habitat to enhance photodegradation of MeHg; remediate sulfur-rich sediments with iron to prevent the biogeochemical reactions that methylate mercury; cap mercury-laden sediments (essentially entomb and bury them permanently to keep from mobilizing and methylating mercury). The research "measures" that BDCP proposes do not include basic toxicological research into mercury's effects on these and other fish and aquatic species found in the Delta.

[77] Bay Delta Conservation Plan Environmental Impact Report/Environmental Impact Statement, Chapter 8, *Water Quality*, p. 8-260, lines 30-35; p. 8-446, lines 39-42, and p. 8-447, lines 1-2. "Because of the uncertainties associated with site-specific estimates of methylmercury concentrations and the uncertainties in source modeling and tissue modeling, the effectiveness of methylmercury management...would need to be evaluated separately for each restoration effort, as part of design and implementation. Because of this uncertainty and the known potential for methylmercury creation in the Delta this potential effect...is considered adverse."

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modeling here performed, so these results could represent exceedance, since they are so close to 1.0.[78]

Retirement of the drainage impaired lands of the western San Joaquin Valley has been found time and again to be the most cost-effective solution to the problem of selenium-tainted irrigation drainage.[79] Land retirement is the best and cheapest option for slowing the rate at which selenium loads and concentrations reach the Delta, and for sequestering selenium in its source rock and soils longer into the future. The natural reservoir of selenium has been documented to hold up to at least another 300 years' worth of tainted drainage at current rates.[80] The National Research Council's 2012 report on Bay-Delta sustainable water management cited this selenium reservoir as well, stating in part:

> *Irrigation drainage, contaminated by selenium from those soils, is also accumulating in western San Joaquin Valley groundwaters. The problem is exacerbated by the recycling of the San Joaquin River when water is exported from the delta. While control of selenium releases has improved, how long those controls will be effective is not clear because of the selenium reservoir in groundwater.*
>
> *...Other aspects of water management also could affect selenium contamination. For example, infrastructure changes in the delta such as construction of an isolated facility could result in the export of more Sacramento River water to the south, which would allow more selenium-rich San Joaquin River water to enter the bay. The solutions to selenium contamination must be found within the Central Valley and the risks from selenium to the bay are an important consideration in any infrastructure changes that affect how San Joaquin River water gets to the bay.*[81]

Of course, ending application of Delta waters to irrigate western San Joaquin Valley drainage impaired lands could reduce the need for deliveries to the San Luis Unit of the Central Valley Project by up to a million acre-feet per year. ***This reduction could provide by itself dramatically improved reliability for all other CVP contractors' allocations, without the investment of billions for the Tunnels project and "California WaterFix."***

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[78] RDEIR/SDEIS, Appendix B, Table Se-7, p. B-186.

[79] Presser, T.S. and S.E. Schwarzbach. 2008. *Technical Analysis of In-Valley Drainage Management Strategies for the Western San Joaquin Valley*, US Geological Survey Open File Report 2008-1210. Accessible online at http://pubs.usgs.gov/of/2008/1210/.

[80] T.S. Presser and S.N. Luoma, 2006. *Forecasting Selenium Discharges to the San Freancisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension,* United States Geological Survey Professional Paper 1646, cited in: T. Stroshane, *Testimony on Recent Salinity and Selenium Science and Modeling for the Bay-Delta Estuary*, plus appendices, prepared for the California Water Impact Network, August 17, 2012, for Workshop #1, Ecosystem Changes and the Low Salinity Zone, before the State Water Resources Control Board.

[81] National Research Council, Committee on Sustainable Water and Environmental management in the California Bay-Delta, *Sustainable Water and Environmental Management in the California Bay-Delta*, Washington, DC: The National Academies Press, 2012, p. 94. Accessible online 8 May 2014, at http://www.nap.edu/catalog.php?record_id=13394.

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