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Attachment to San Joaquin River SED Comment Letter, dated March 26, 2013

Specific Comments of the Environmental Water Caucus on the Draft Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality

The Environmental and Regulatory Settings Omit Important Context, Obscuring the Deteriorated State of Delta Ecosystems and Saline Water Quality, and Obscuring the Necessary Public Trust Protection Tasks the Board Should Perform in Water Quality Control Planning.

The following narrative discussing "Setting" omissions from the Draft SED are based on review of the following sections of the Draft Substitute Environmental Document:

I. Executive Summary, Section 3: Sections ES3.1 and ES3.2
II. Chapter 1: Section 1.4, "State Water Board Actions"
III. Environmental and Regulatory Setting sections of Chapters 5, 7, 9, 11, and 13.

Environmental Setting Omissions – San Joaquin River Flows

Failure to evaluate and disclose results of the Vernalis Adaptive Management Program experiments between 2000 and 2011.

A key environmental setting omission concerning San Joaquin River flow is the failure of the State Water Resources Control Board to fully evaluate and disclose the lessons of the failed Vernalis Adaptive Management Plan (VAMP) experiment that originated with implementation of Water Rights Decision 1641 (D-1641) in 2000. This section recounts and evaluates the Board's record regulating inflows to the Delta from the San Joaquin River Basin. The Board acknowledges in the Draft SED's executive summary that San Joaquin River flows were identified as an emerging issue requiring additional review and water quality control planning to address ongoing population declines of salmonids "despite implementation of VAMP, which have been largely attributed to inadequate flow conditions." Salmon population declines and expiration of the San Joaquin River Agreement "and with it the VAMP experiment," contributed to the Board revisiting San Joaquin River flow objectives.[1]

It fell to the Bureau of Reclamation to provide most of the flows to Vernalis from the Basin to meet the Board's objectives there. The bulk of the flows the Bureau has available for this purpose come from its New Melones Dam and Reservoir facility on the Stanislaus River. This strategy has been largely unsuccessful for the Bureau, the Department and the Board. Migratory fish populations and open water fish populations endemic to the Delta have crashed over the last decade since D-1641 was implemented. An experiment to provide

[1] Draft SED, p. ES-6.

helpful spring flows for migratory salmon, called the Vernalis Adaptive Management Plan (VAMP), has achieved only limited results.[2]

Table 1 State Water Resources Control Board D-1641 Flow Regulations at Vernalis

Compliance Location	Water Year Type	Time Period	Minimum Monthly Average Flow Rate (cfs)
Sacramento River at Rio Vista	All	September	3,000
	W, AN, BN, D	October	4,000
	Critically Dry	October	3,000
	W, AN, BN, D	Nov-Dec	4,500
	Critically Dry	Nov-Dec	3,500
San Joaquin River at Airport Way Bridge, Vernalis	W, AN	Feb-Apr 14 and May 16-Jun	2,130 or 3,420
	BN, D		1,420 or 2,280
	C		710 or 1,140
	W	Apr 15 to May 15	7,330 or 8,620
	AN		5,730 or 7,020
	BN		4,620 or 5,480
	D		4,020 or 4,880
	C		3,110 or 3,540
	All	October	1,000

Source: State Water Resources Control Board, 2000.
Key to Water Year Types: W = Wet; AN = Above Normal; BN = Below Normal; D = Dry; C = Critically Dry.

Table 1 summarizes the State Water Resources Control Board's present river flow objectives set for compliance at Vernalis and Rio Vista. These flow criteria were adopted as part of its Water Right Decision 1641 (D-1641) in 2000 and remain the same in the existing 2006 Bay-Delta Plan. Under D-1641, the Board currently regulates flows on the San Joaquin River at Vernalis during two main periods of the year: February 1 through June 30, and throughout the month of October. Within the February to June period, there are two regimes as well. One flow regime is in place from February 1 through April 14 and then again from May 16 through the end of June. The second flow regime occurs generally from April 15 to May 15, a 31-day period in which spring pulse flows are required to increase over the early and late spring periods. The spring pulse flow is intended to aid young salmon smolts migrating to the ocean by improving their chances of survival as they pass through the Delta. Minimum flow criteria in this spring regime vary depending on the water year type, and the water year type is generally finally forecasted by May 1. Note that these flow rates are a monthly average, which allows for great variability as long as the average is maintained throughout the 30-day running average during these flow regimes.

[2] Review Panel, *The Vernalis Adaptive Management Program (VAMP)*, prepared for the Delta Science Program, May 11, 2010, 45 pages. Accessible online at http://www.sjrg.org/peerreview/review_vamp_panel_report_final_051110.pdf.

October minimum flows must be 1,000 cubic feet per second or greater using a 30-day running average. This is a period of time when adult fall-run Chinook salmon return from the ocean to migrate upstream and spawn in their natal streams. Again, as with the February through June regime, the use of a 30-day running average allows upstream water right holders wide latitude in providing flows that meet the Vernalis flow standard for October as long as the 30 day running average during October is not less than 1,000 cubic feet per second of flow.

Instead of implementing D-1641 San Joaquin River flow objectives to benefit fish and wildlife, the State Water Resources Control Board approved the San Joaquin River Agreement under which the major water right holders of the San Joaquin River Basin agreed to provide spring pulse flows intended to benefit outmigrating salmon smolts.[3] The Board agreed to its provisions as a voluntary approach to achieve the objectives. In exchange for providing these spring pulse flows totaling up to 110,000 acre-feet, the Agreement called upon the state and federal pumps in the south Delta to limit their export rates to certain specified levels. The Agreement further called upon the state, federal and San Joaquin River Group Authority member agencies to participate in an annual experimental study of the effects of these pulse flows on salmon smolt survival and other ecological indicators in the San Joaquin River in the Vernalis area. That study was called the Vernalis Adaptive Management Plan (VAMP).

The State Water Resources Control Board hoped that by using VAMP to implement its D-1641 flow criteria for the San Joaquin River at Vernalis, the scientific study would find salmon smolt survival is closely related to the humanly manageable actions of river flow, export limits at the pumps, and maintaining a barrier at the head of Old River to direct smolts toward Suisun Bay and the Pacific Ocean via the most direct and safest route. The Board also hoped that increased smolt survival would contribute to increased salmon escapement (that is, fish leaving the ocean in late summer and early fall to spawn in the fall).

The VAMP seeks to test the hypothesis that increasing San Joaquin River flows, sharply limiting Delta export pumping during the spring pulse flow period, and blocking fish access to Old River (which leads to the state and federal export pumps) will increase survival rates of young salmon juveniles and smolts migrating through the Delta to the Pacific Ocean.[4]

The 110,000 acre-feet of water from these agencies was intended for use in reaching "target flows" under VAMP at Vernalis that increased flow in the San Joaquin at Vernalis over defined "existing flows" that would occur in the River in the absence of the VAMP flows. The

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[3] The parties to the agreement included California Departments of Water Resources and Fish and Game; United States Department of the Interior agencies Reclamation and Fish and Wildlife; and member agencies of the San Joaquin River Group Authority: South San Joaquin and Oakdale irrigation districts on the Stanislaus River; Modesto and Turlock irrigation districts on the Tuolumne; Merced Irrigation District on the Merced River; and Central California Irrigation District, Firebaugh Canal Water District, Columbia Canal Company, and San Luis Canal Company on the upper San Joaquin River. Other parties included state and federal water contractors south of the Delta export pumps, and two environmental community parties: the Natural Heritage Institute and the Bay Institute of San Francisco.

[4] San Joaquin River Group Authority, *San Joaquin River Agreement,* 2000, Section 2.5. Includes links to original documents on the Vernalis Adaptive Management Plan, as well as annual technical reports on VAMP results. Accessible online at http://www.sjrg.org/agreement.htm.

VAMP flows were intended to be released during the spring pulse flow period coinciding with the State Water Resources Control Board's flow criteria period of April 15 through May 15 (or a reasonable 31-day period thereabouts based on the presence or absence of migrating salmon). The Agreement employs the State Board's water year classification scheme as an indicator for determining target flows. Wet years would have an indicator of 5, decreasing by one to Critical years having an indicator of 1. Double step target flows could be invoked under VAMP in situations where the sum of present plus current water year indicators added to 7 or greater. When that occurred, a "double step" target flow, showed in Table 2, would become the new target flow.

Table 2 Vernalis Adaptive Management Plan Target Flows

Existing Flow (cfs)	*Single Step Target Flow (cfs)*	*Double-Step Target Flow (cfs)*
0 to 1,999	2,000	3,200
2,000 to 3,199	3,200	4,450
3,200 to 4,449	4,450	5,700
4,450 to 5,699	5,700	7,000
5,700 to 6,999	7,000	Existing Flow
7,000 or greater	Existing flow	Existing flow

Source: San Joaquin River Agreement, 2000, Articles 5.5 and 5.6.

The Agreement also limits Central Valley Project and State Water Project export pumping during this same mid-April to mid-May period. Combined export rates for the pumps would be limited to no more than 1,500 cubic feet per second when Vernalis target flows are between 2,000 and 4,450 cubic feet per second. When the target flows reach 5,700 cubic feet per second, combined export rates are limited to no more than 2,250 cubic feet per second. And when target flows reach 7,000 cubic feet per second, the pumping plants are limited either to 1,500 or 3,000 cubic feet per second.[5] The rationale for this "either/or" export rate at the high VAMP target flow is explained in Appendix A of the Agreement as a matter of safety and operational capacity of installing the barrier at the head of Old River and minimum pumping capacity of the export pumps, as well as the intent of the US Fish and Wildlife biological opinion that export rates in this period be less than 50 percent of the required Vernalis standard. Hence, the export pumping rate at a target flow of 7,000 cubic feet per second would be able to go as high as 3,000 cubic feet per second (cfs).[6]

[5] *Ibid*., Article 6.4.
[6] *Ibid.*, Appendix A, p. 3.

At present, VAMP is a 12-year study. Through 2010, double step target flows have been invoked once.[7] Table 3 summarizes VAMP flow activity from 2000 to 2010.[8] This table shows that over the course of the VAMP experiments through 2010, average supplemental VAMP flow contributions have averaged just 40,543 acre-feet per year, about 37 percent of the maximum annual commitment by SJRGA agencies of 110,000 acre-feet for VAMP. Previous studies have shown that salmon smolt survival could be enhanced if increased flows were directed primarily down the main stem of the San Joaquin River below Vernalis

Table 3
VAMP Flows Summary, 2000-2010
(cubic feet per second, except where noted otherwise)

Year	VAMP Target Flow Period	Target flow Condition	VAMP Target Flow	Actual Mean Flow	Existing Flow	VAMP Supplementing Flows (AF)	Delta Export Target	Actual Delta Exports
2000	4/15-5/15	Double-step	5,700	5,869	4,800	77,680	2,250	2,155
2001	4/20-5/20	Single-step	4,450	4,224	2,909	78,650	1,500	1,420
2002	4/15-5/15	Single-step	3,200	3,301	2,757	33,430	1,500	1,430
2003	4/15-5/15	Single-step	3,200	3,235	2,290	58,065	1,500	1,446
2004	4/15-5/15	Single-step	3,200	3,155	2,088	65,591	1,500	1,331
2005	5/1-5/31	na[a]	>7,000	10,390	10,390	0	2,250	2,986[b]
2006	5/1-5/31	na[a]	>7,000	26.220 to 24,262[c]	26,020	0	1,500 to 6,000	1,599 to 5,748[c]
2007	4/22-5/22	Single-step	3,200	3,263	2,721	33,330	1,500	1,486
2008	4/22-5/22	Single-step	3,200	3,163	1,939	75,250	1,500	1,520
2009	4/19-5/19	Off-ramp	na	2,260	2,260	0	na	1,990
2010	4/25-5/25	Single-step	4,450	5,140	4,830	23,980	1,500	1,515
		Average VAMP Supplementing Flows				**40,543**	**Acre-feet**	

Source: San Joaquin River Group Authority 2011: Table 2-8; California Water Impact Network. Notes: [a] Existing flow greater than maximum VAMP Target Flow of 7,000 cfs; [b] May 1 through 25 average was 2,260 cfs; exports were increased starting May 26 in conjunction with increasing existing flow; May 26 through 31 average was 6,012 cfs; [c] "First fish release-recapture period"/"Second fish release-recapture period"; "na" means not available or not applicable.

[7] San Joaquin River Group Authority. 2011. *2010 Annual Technical Report on Implementation and Monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan (VAMP)*. Prepared for the California Water Resources Control Board in compliance with D-1641. September. 167 pages, Table 2-8. Accessible online at http://www.sjrg.org/technicalreport/2010/2010_SJRGA_Annual_Technical_Report.pdf.
[8] *Ibid.*

past Stockton.[9] To facilitate fish using that route, the San Joaquin River Agreement called upon the Department of Water Resources to install a fish barrier at the head of Old River (which is a direct route for San Joaquin River water to the state and federal export pumps near Old River at the export pumps where fish can be all too easily entrained and killed).

In the event that more water than the 110,000 acre-feet was needed to meet target flows, the US Bureau of Reclamation and the California Department of Water Resources could approach the agencies making up the San Joaquin River Group Authority as willing sellers of additional water. As Table 3 reveals, neither the Bureau nor the Department needed to purchase additional water for VAMP flows, since no VAMP flows exceeded 110,000 acre-feet.

VAMP results have largely been inconclusive because there have been only a narrow range of flows subject to VAMP researchers. The State Water Resources Control Board permitted the VAMP experiment to proceed in D-1641 for over a decade. Table 4 compares spring pulse flow range criteria set by the State Board in D-1641 with mean (average) VAMP flows. For years with VAMP results (of which there were only 8 of 11 total), only four years

Table 4

Comparison of D-1641 Spring Pulse Flow Criteria and Mean Actual VAMP Flows, 2000-2010 (Years with VAMP Results Only)

Year	*San Joaquin River Basin Water Year Type*	*Spring Pulse Flow Range Criteria, D-1641 (cubic feet per second)*	*Mean Actual VAMP Flows (cubic feet per second)*
2000	Above Normal	5,730 or 7,020	5,869
2001	Dry	4,020 or 4,880	4,224
2002	**Dry**	**4,020 or 4,880**	**3,301**
2003	**Below Normal**	**4,620 or 5,480**	**3,235**
2004	**Dry**	**4,020 or 4,880**	**3,155**
2007	Critically Dry	3,110 or 3,540	3,263
2008	Critically Dry	3,110 or 3,540	3,163
2010	**Above Normal**	**5,730 or 7,020**	**5,140**

Source: SJRGA, 2011; State Water Resources Control Board, 2000; California Water Impact Network. **Years in bold did not comply with minimum D-1641 flow criteria.**

yielded VAMP results that actually complied with D-1641 flow criteria at Vernalis (2000, 2001, 2007, and 2008). Four other VAMP flow years were *beneath* the D-1641 flow criteria, and did not comply with the Board's adopted objective. It appears that VAMP as a regulatory experiment performs adequately only half the time when it can be invoked. Of the three years with no VAMP flow results, two were wet years (2005 and 2006) where high flows on the San Joaquin overwhelmed the need to regulate or experiment. The remaining

[9] Review Panel, *op. cit.*

year (2009) was considered an "off-ramp" year (that is, a dry year following two critically dry years). VAMP and Agreement requirements were in part short-circuited by prolonged dry weather in order to protect upstream water supply reliability. It appears from these results that VAMP and the San Joaquin River Agreement have failed to "provide the environmental benefits in the lower San Joaquin River and Delta at a level of protection equivalent to the San Joaquin River portion of the 1995 WQCP for the duration of this Agreement."[10] In effect, protective flows for Delta public trust resources such as Chinook salmon populations have been delayed for the sake of seeking greater scientific certainty.

Failure to disclose how rarely the San Joaquin River reaches Delta outflow and is routinely exported through state and federal pumps near Tracy.
Omitted from the environmental setting sections is any account of the known hydrodynamic fate of San Joaquin River flows in the presence of Delta export pumping by the federal Central Valley Project and the State Water Project. The fate issue affects the Board's understanding of the San Joaquin River's actual hydraulic connection or connectivity to the rest of Delta inflows and Delta outflow. These hydraulic relationships in turn affect the dynamic size of the low salinity zone on which many estuarine species in the Bay-Delta depend. They also affect the volume of Delta outflow, rates of fish entrainment and death at the export pumps, survival of migrating salmon smolts and the survival of sensitive open water (pelagic) fish like longfin smelt, Delta smelt, and threadfin shad.

Two different modeling studies show that the fate of San Joaquin River flows during late winter into spring months is in the hands of the Delta export pumps. Both studies show that less than 1 percent of San Joaquin River water passing Vernalis ever reaches Chipps Island as part of Delta outflow. Well over 80 to 90 percent of San Joaquin River flows are instead exported at the state and federal pumps near Tracy.[11]

Omission of information about the fate of existing San Joaquin River flows means the public cannot discern from the Draft Substitute Environmental Document (Draft SED) whether the San Joaquin River is hydraulically connected to the rest of the Bay-Delta Estuary and eventually whether the Board's proposed flow objectives for the River's tributaries will actually protect fish beneficial uses once they pass Vernalis.

Failure to disclose the likely fate of fish beneficial uses in the San Joaquin River tributaries once they pass Vernalis and reach the southern Delta.

Given the fate of water in San Joaquin River flows, what is the likely fate of small fish residing in that water, which are vulnerable to strongly variable, and sometimes reversed, flow dynamics in the south Delta? Particle tracking model studies done for the South Delta Improvement Program by the Bureau of Reclamation and the Department of Water

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[10] *San Joaquin River Agreement*, *op. cit.*, Section 2.5.3.
[11] Flow Science Incorporated, *Evaluation of the fate of San Joaquin River Flow, Water Years 1964 and 1988*, prepared for the San Joaquin River Group Authority, June 2, 2005, Table 2 and Figures 1 through 4; and Jim Wilde, Michael Mierzwa, and Bob Suits, *Using Particle Tracking to Indicate Delta Residence Time*, poster presentation for the CalFED Science Conference, October 23-25, 2006, Step 2 data for June 15, 2003 through July 23, 2003. Accessible online at http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/presentations/DeltaResidenceTimeMethodology_wildej.pdf.

Resources found very high rates of fish entrainment due to the large percentage of San Joaquin River flows that get exported by the state and federal pumps near Tracy.

> During the springtime VAMP conditions (April 15-May 15), higher SWP diversions, even with commensurate San Joaquin River inflow, resulted in higher entrainment. Without the head of Old River barrier, entrainment of passive particles increased from 65% at 2,000 cfs San Joaquin inflow and SWP and CVP pumping to about 80% at 7,000 cfs inflow and pumping. With the head of Old River barrier, entrainment of passive particles was nearly the same as without the barrier. Particles were transported into Old River without the barrier and were transported through Turner Cut [downstream on the San Joaquin River opposite Stockton] and Middle River with the barrier in place.
>
> *…The indications from these particle-tracking simulations are that pumping has the strongest effect on entrainment of passive particles injected at Mossdale.*
>
> Under VAMP conditions, a San Joaquin River inflow of 7,000 cfs and CVP and SWP pumping at 7,000 cfs resulted in entrainment of about 70% of the particles injected at Turner Cut (citation). Closing the head of Old River barrier increased the simulated entrainment of particles injected at Turner Cut by 10% to 20%. Increased CVP and SWP pumping draws more net flow down Turner Cut, Middle River, and Old River.
>
> During VAMP conditions, with a Delta outflow of more than 15,000 cfs, much less entrainment was simulated for particles injected at Prisoners Point (citation). About 50% of the passive particles were entrained at a San Joaquin River inflow of 7,000 cfs and SWP and CVP pumping at 7,000 cfs with the head of Old River fish control barrier installed. Entrainment was reduced to 15% when SWP and CVP pumping were reduced to 3,000 cfs with the head of Old River barrier installed. Entrainment was less than 2 percent when the barrier was open.[12]

The take-away points from these findings are:

A. Export pumping has the strongest effect on fish entrainment given channel configurations, flow characteristics, and hydrodynamics in the South Delta.
B. At lower export rates, the risk of entrainment decelerates faster relative to lowering of San Joaquin River flow.
C. At higher export rates, the risk of entrainment accelerates dramatically relative to San Joaquin River flow.
D. Installation of the head of Old River barrier can actually increase entrainment at higher export rates because of the strong reverse flows they generate in Turner Cut, Middle River, and Old River.

It must be borne in mind that the average observed flow rate for the San Joaquin River is well below 7,000 cfs, and that the particle tracking modeling assumptions were examining something approximating best case scenarios. As Table 3 above illustrates, the VAMP experiment itself saw no years where actual flows during the VAMP 31-day period averaged 7,000 cfs. This period, it should also be noted overlaps closely with the periods observed in both the Flow Science and DWR poster studies of San Joaquin River fates, resulting in excess of 90 percent of the river's flow being exported. The particle tracking study for the South Delta Improvement Program further confirms the dominating power the state and federal

[12] U.S. Department of the Interior, Bureau of Reclamation and California Department of Water Resources, "Methods for Assessment of Fish Entrainment in State Water Project and Central Valley Project Exports," *Draft Environmental Impact Statement/Environmental Impact Report, Appendix J*, prepared by Jones & Stokes, October 2005, pp. J-25 to J-26.

export pumps exert on the hydrodynamics of San Joaquin flow distribution in the South Delta.

Failure to disclose the relationship of post-VAMP and non-plan amendment water quality objectives that bear on the performance of the proposed San Joaquin River flow objective in the Draft SED, Appendix K.

The Draft SED fails to specify that the expiration of VAMP brings with it the return of non-plan amendment D-1641 and 2006 Bay Delta Plan water quality objectives that had been suspended while VAMP was operating, the Export Limits between April 15 to May 15 (variable). These limits range from the greater of either 1,500 cfs or 100 percent of the 3-day running average of San Joaquin River flow at Vernalis. Presumably, the maximum pumping that would occur would be the export pumps' water rights permit conditions (as distinct from their engineered design capacity) of no more than 4600 cfs at the federal Jones Pumping Plant and 6680 cfs at the state's Banks Pumping Plant, for a total allowable combined pumping rate of 11,280 cfs. This greatly exceeds average observed flows of the San Joaquin River at Vernalis, which only in extremely wet years reach this high a flow rate. Footnote 19 of D-1641, Table 3, also conditions the maximum combined pumping rate on approval by a committee of representatives from the US Fish and Wildlife Service, NOAA Fisheries and the California Department of Fish and Wildlife. The objective of this footnote is to establish "no net loss to exports" while somehow accommodating the needs of fish:

> *This flexibility [of the Export Limit during the April 15 to May 15 period] is intended to result in no net water supply cost annually within the limits of the water quality and operational requirements of this plan.* Variations may result from recommendations of agencies for protection of fish resources, including actions taken pursuant to the State and federal Endangered Species Act. Any variations will be effective immediately upon notice to the Executive Director of the State Water Board. If the Executive Director does not object to the variations within 10 days, the variations will remain in effect. The Executive Director of the State Water Board is also authorized to grant short-term exemptions to export limits for the purpose of facilitating a study of the feasibility of recirculating export water into the San Joaquin River to meet flow objectives.[13]

The relationship between the fates of San Joaquin flows relative to the export pumps spotlights a fundamental flaw with the Board's segmenting of San Joaquin flows from the rest of its reconsideration of the Bay-Delta Plan. This is a violation of the California Environmental Quality Act for failing to consider the "whole of an action" in defining the project subject to environmental review under the act. The Board fails to disclose in the Draft SED whether it intends to retain this seemingly protective water quality element and the Export Limit water quality objective along with it, but this is defined separately from the plan amendment set forth in Appendix K of the Draft SED; it is defined as part of the "comprehensive review" of the Bay-Delta Plan in Phase II.

Environmental Setting Omission—South Delta Salinity

Omissions compromise the reasonableness of the Plan Areas that the State Water Board has chosen for designing these plan amendments. In justifying omitting the upper San Joaquin River above the Merced River confluence, the Board cites the lack of fish beneficial uses in the upper San Joaquin River at this time, though it acknowledges that the San Joaquin River Restoration Program "will be" introducing Chinook salmon back into this reach of the river

[13] 2006 Bay-Delta Plan, p. 17, footnote 19.

in hopes of restoring salmon populations there by December 31, 2012. Has this been accomplished, and does it change the Board's determination of its plan area?

This Draft SED is about proposed amendments affecting both flow and salinity in both the South Delta and the San Joaquin River. Omitted from the setting is any analysis of how much water from the upper San Joaquin River is diverted out of the Delta's watershed, lowering flows and concentrating salts that are drained into the San Joaquin River above the Merced confluence from salty lands irrigated with imported water from the tidally influenced Delta. On average, Friant-Kern Canal deliveries are about 1 million acre-feet per year between 1986 and 2010, according to delivery data from the Central Valley Project Operations Office. The Draft SED confirms this amount in Chapter 2.[14]

Also omitted from the Setting discussion of Chapter 2 on the upper San Joaquin River is the flow rates, dams, reservoirs, and water diversions and water quality of western San Joaquin Valley creeks and sloughs (e.g., Salt Slough, Mud Slough, and several creeks) that carry irrigation drainage to the River above the Merced River confluence. This omission reveals the depth of unwillingness by the Board to address the salty irrigation drainage that pollutes the lower San Joaquin River and makes it so difficult for the Bureau and the Department to comply with existing South Delta salinity objectives. Why has the Board omitted this area from its planning?

In the San Joaquin River Basin, the salinity (the salt concentration in water) of its water bodies was historically very low, and in some of its water bodies continues to be of high quality. This is because the Basin's river flows were dominated by higher quality runoff from the snowpack of the Sierra Nevada, while natural flows on the west side were low as a result of the Coast Range rain shadow. Prior to 1951, according to the California Department of Water Resources, salt concentrations in the upper San Joaquin River near Mendota were typically less than 50 parts per million (sea water salt concentrations are generally about 3.5 percent salt or about 35,000 parts per million).[15] On the Stanislaus River, a 1953 pollution study found chloride concentrations ranging between 1 to 10 parts per million of chloride in that river.[16] However, additional salts are imported to the San Joaquin River Basin as a result of mixing with salty tidal flows with water in the western Delta before being exported by large pumps located near Tracy. These saltier supplies arrive in the western San Joaquin Valley via the Delta Mendota Canal.

The conveyance of water through the Delta Mendota Canal is made possible legally by State Water Board-issued water rights permits to the US Bureau of Reclamation to operate the Central Valley Project and by the Exchange Contract by which senior San Joaquin River water rights holders "exchange" their upper San Joaquin River water rights for imported Sacramento River water delivered to them via the Delta Mendota Canal. The "Exchange Contract" for this imported water recognized from the outset that salinity in the imported water would be greater than salts naturally occurring in San Joaquin River water. The original Exchange Contract stated that it should not exceed a five-year mean salt concentration of 400 parts per million. Thus, planned importation of water into the San

[14] Draft SED, p. 2-6, Section 2.3.2.
[15] California Department of Water Resources, *Bulletin No. 127: San Joaquin Valley Drainage Investigation: San Joaquin Master Drain*, Preliminary Edition, January 1965, p. 8.
[16] Central Valley Regional Water Pollution Control Board, *Pollution Study, Stanislaus River, San Joaquin River Watershed*, Sacramento, CA, 1953, Table ST-1.

Joaquin River Basin would allow as much as a *nine-fold increase in salt concentration* in water applied to western San Joaquin Valley lands. This is the direct water quality impact of the exchange arrangement at the heart of the creation of the Central Valley Project's Friant Division, the Delta Mendota Canal, and the Jones Pumping Plant. Large amounts of imported water brought large loads of salt to the Basin as well.

Table A-1 San Joaquin River Exchange Contract Water Quality Provisions

Contract Version	*Total Dissolved Solids (parts per million)*	*Season/ Time Step*
1939 Exchange Contract	200	Fall, winter, spring
	300	Summer
1956 Amendatory Exchange Contract	800	Daily maximum
	600	Monthly maximum
	450	Annual maximum
	400	5-year maximum
1968 Second Amendatory Exchange Contract	800	Daily maximum
	600	Monthly maximum
	450	Annual maximum
	400	5-year maximum

Sources: Central California Irrigation District 2011; US Bureau of Reclamation 2011; California Water Impact Network

Beyond the 1950s, there emerged serious drainage problems in the western San Joaquin Valley, as well as support for a regional or valley-wide salt disposal solution.

As additional political and economic pressure grew to expand irrigated agriculture further south along the Valley's west side toward the Tulare Lake Basin, a new set of water facilities called the San Luis Unit was planned. Its projects would consist of San Luis Reservoir, and San Luis Canal/California Aqueduct, and associated pumping plants which would be jointly owned by the state and federal governments. South of Mendota, however, there is no consistent or direct path for drainage water to reach the ocean by gravity; these lands drain mainly to Tulare Lake. Only when Fresno Slough drains the Lake and the Kings River in high runoff years does excess surface flows reach the Pacific Ocean.

In the 1950s, growers and government officials recognized that a drainage canal would be needed to rid the western and southern San Joaquin Valley of its salt-laden drainage return flows. State planning was undertaken for a San Joaquin Master Drain as an "integral part of

the State Water Project draining lands as far south as near Bakersfield, and which was authorized by California voters in 1960s through Proposition 1. A federally-owned drain, the San Luis Drain, would serve the lands of the San Luis Unit in western Fresno County and link with the state's master drain to convey salty and polluted drain water all the way to the western Delta where it would be discharged into either the Carquinez Strait or San Pablo Bay. Beginning in the late 1940s, farmers installed on-farm tile drains to relieve drainage from the root zones of their fields, and by the mid-1970s, the Bureau had installed about 120 miles of collector drains that connected to the San Luis Drain.

However, in 1965 strong concerns from the San Francisco Bay Area and Delta regions about the quality and potential environmental effects of conveying agricultural drain water to the Delta and the Bay led Congress to make it national policy that "...the final point of discharge for the interceptor drain for the San Luis Unit shall not be determined until development by the Secretary of the Interior and the State of California of a plan which shall conform to the water quality standards of the State of California" and is approved by the Administrator of the US Environmental Protection Agency.[17] Such joint approval has yet to occur.

The State of California withdrew from development of the San Joaquin Master Drain when the State failed to receive assurances in 1967 from irrigators in the State Water Project service area that they would repay the State's expenses for drainage service. Since 1968, the US Bureau of Reclamation, as required by the San Luis Unit authorization act in 1960, proceeded alone with construction of the San Luis Drain. Originally, this drain would have been 188 miles long from Kettleman City to the Delta, but only 85 miles were completed between Five Points and Gustine.[18] In the mid-1970s, the Drain was connected to Kesterson Reservoir. This reservoir was a series of shallow ponds that was to store and evaporate drainage water until the rest of the Drain could be built to the Delta where drainage flows would be disposed of. During the 1981 to 1985 period that Westlands Water District discharged agricultural drain water to the San Luis Drain and Kesterson Reservoir, about 42,000 acres of Westlands service area were served by the Drain. After the contamination of wildlife was discovered in 1983, however, the State Water Resources Control Board issued a clean-up and abatement order for Kesterson reservoir against the Bureau of Reclamation and the Department of the Interior closed Kesterson Reservoir in 1986.[19] Upon closure, Westlands Water District lands that had received service from the Drain began storing irrigation drainage underground. Between 1986 and 1996, the San Luis Drain went unused until the growers in the Grassland area between Firebaugh and Gustine (in what is the northern portion of the San Luis Unit service area) contracted with the Bureau to use the San Luis Drain as part of a system through which their drainage would be routed around the wildlife refuges and wetlands of the Grassland region, a project called the Grassland Bypass Project (discussed in the chapter on Government Actions). For now, this section of the San Luis Drain empties effluent from the Grassland Bypass Project into Mud Slough (North) which drains into the San Joaquin River.

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[17] United States Bureau of Reclamation, *San Luis Unit Drainage Program, Central Valley Project, Draft Environmental Impact Statement*, Filed December 20, 1991, p. 6.
[18] *Ibid.*, p. 5.
[19] State Water Resources Control Board. 1985. *In the Matter of the Petition of Robert James Claus for Review of Inaction of California Regional Water Quality Control Board, Central Valley Region, Order No. WQ 85-1*, February 5, 65 pages. Accessible online at http://www.swrcb.ca.gov/board_decisions/adopted_orders/water_quality/1985/wq1985_01.pdf.

The cost of providing drainage facilities from these lands is high and and the difficulty of finding funding contributes to delays in providing some kind of drainage service there. A 2008 feasibility study of San Luis Drainage alternatives found that neither of the "in-valley" alternatives were economically justified nor financially feasible within existing authorizations by Congress. The cost of these alternatives was $2.24 to $2.69 billion at the time. The feasibility study had to rely on large contingency allowances to account for the cost of unproven reverse osmosis treatment plants for removing salts and selenium from drainage water. The lower cost alternative involves retiring more land (a total of about 200,000 acres) and more imported water from the San Luis Unit, while the higher cost alternative calls for greater use of reverse osmosis treatment of drainage water, as well as other treatment methods (but also including about 100,000 acres of land retired from applying imported water to crops).

Moreover, the feasibility study found that the three northern water districts can afford to pay neither the capital nor annual operating, maintenance, research, and engineering costs of both drainage service alternatives. Westlands Water District was found to be unable to pay a portion of the capital repayment obligation if either alternative is implemented.[20] The Bureau's preferred alternative is also the more expensive one that relies on greater use of reverse osmosis treatment and less land retirement. This means greater taxpayer subsidies would be needed to sustain San Luis Unit lands in privately controlled production. To address the contractors' inability to pay the Bureau's feasibility report recommends expansion by Congress of subsidies to the San Luis Unit through:

1. Authorizing federal appropriations to pay the operating and maintenance charges needed to implement the preferred alternative *for which the northern water districts (Panoche, Pacheco, and San Luis Water Districts) are unable to pay*.
2. Authorizing the Interior Secretary to *defer without interest each San Luis Unit contractor's obligation to repay all capital and operating and maintenance costs for the preferred alternative* "until the Secretary determines that such contractor has the independent ability to repay its share of such costs without unduly burdening its water users, provided such determinations are made at not more than 5-year intervals."[21]

The Bureau and Westlands Water District (the largest water district in need of drainage service in this region) have long had difficulty coming to terms on the District's long-term water service contract due in part to the cost of repaying the federal government for all federally-constructed drainage facilities.[22] According to Westlands, the District pays about $7.50 per acre-foot of water it receives for irrigation service and another $0.50 per acre-foot for drainage service.[23]

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[20] United States Bureau of Reclamation, *San Luis Drainage Feature Re-evaluation Feasibility Report*, March 2008, pp. 95-96. Accessible online at http://www.usbr.gov/mp/sccao/sld/docs/sldfr_report/index.html.

[21] *Ibid.*, p. 99.

[22] Kelley, R.L., and R.L. Nye, *Historical perspective on salinity and drainage problems in California*, in *California Agriculture* October 1984, p. 6. Accessible online at http://ucanr.org/repository/CAO/fileaccess.cfm?article=72377&p=ROVQYW&filetip=pdf.

[23] United States Court of Federal Claims, Complaint of Westlands Water District in *Westlands Water District v. The United States*. Case 1:12-cv-00012-ECH (2012), Document 1, pages 12, 14.

Neither the Bureau nor Westlands Water District have adequately taken responsibility for the lack of drainage service to date for the San Luis Unit service area. Matters seem to be at a standstill on both sides. It has been five years since the Bureau adopted an alternative from its San Luis Drainage Feature Re-Evaluation process of the decade of the 2000s. The drainage problems of the Valley continue to mount.

State Board Inaction

The State Water Resources Control Board is also involved in this drainage fiasco for its inaction. While the Bureau of Reclamation's Central Valley Project operations are the primary cause of the salinity problems, the State Water Resources Control Board has so far been timid about trying to design and enforce regulatory solutions for this portion of the San Joaquin River Basin.

Historians Jackson and Paterson reported in 1977 that the California Department of Water Resources initiated the San Joaquin Valley Drainage Investigation in 1957 after legislative hearings on drainage and water quality issues associated with the 1957 California Water Plan.[24] The Burns Porter Act, authorized by the California voters in November 1960, contained language calling for the California Department of Water Resources to build "facilities for removal of drainage water from the San Joaquin Valley."[25]

C-WIN offers a chronology of the State Water Resources Control Board's treatment (and those of its predecessor agencies) of southern Delta salinity standards in Appendix C of this report. The Board's own 2006 Cease and Desist Order states regarding this period of State Water Rights Board regulation:

> During a twelve-year period the State Water Board adopted six difference decisions (Decisions 893, 990, 1020, 1250, 1308, and 1356) approving permits for various components of the federal CVP operated by USBR. The permits issued as a result of the decisions included a term by which the Water Board reserved jurisdiction to revisit salinity control requirements. (Decision 893, p. 71, Condition 12; Decision 990, p. 86, Condition 25; Decision 1020, p. 21, Condition 9; Order Extending Time in Which to Formulate Terms and Conditions Relative to Salinity Control Pursuant to Decision 990 and Decision 1020, p. 2; Decision 1250, p. 5, Condition 9; Decision 1308, p. 11-12, Condition 8; Decision 1356, p. 17, Condition 21.)[26]

Beginning with its Decision 893 in 1958, and extending through its Decision 1379 in 1971, the State Water Resources Control Board (and its predecessor the State Water Rights Board) declined to establish southern Delta salinity standards even though salinity data available to the 1980 South Delta Water Agency study of the San Joaquin River existed at that time. The State Water Boards of the past, however, preferred instead to reserve jurisdiction in the matter of salinity control (and fish protection in several decisions) to some unspecified future date.

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[24] Jackson, W.T. and A.M. Paterson, *The Sacramento-San Joaquin Delta: The Evolution and Implementation of Water Policy: An Historical Perspective*, University of California, Davis, California Water Resources Center Contribution No. 163, June 1977, pp. 136-139.
[25] California Department of Water Resources, *Bulletin 200: California State Water Project: Volume I: History, Planning, and Early Progress*, November 1974, Appendix B, p. 123.
[26] These water rights decisions are all accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/ where they may be searched by order or decision number.

In Water Rights Decision 1020 (which addressed water rights on Old River in the South Delta; State Water Rights Board 1961), adopted by the State Water Rights Board in 1961, the Board acknowledges a warning from the Delta Water Users' Association and the San Joaquin County Flood Control and Water Conservation District that water quality in the San Joaquin River was deteriorating, and had since 1950 (and presaging the water quality results identified in the joint SDWA/USWPRS 1980 study). These parties pointed out in 1961 that (in the words of D-1020):

> …the development of the San Luis Unit will further degrade water quality in the San Joaquin River and in the Delta. It is contended that return flow from the San Luis service area will contain high concentrations of salts and if added to those already found in the San Joaquin River northward from Mendota Pool, will adversely affect the water quality for diverters along the stream and in the Delta. At the same time, the parties [the Delta Water Users Association and the flood control district] point out that the construction of a master drainage system envisioned as one possible solution to the problem...will intercept all return flows for conveyance northward to San Francisco Bay, thereby reducing the flow of water in the lower San Joaquin River.[27]

The Board took note in D-1020 of the 1960 Burns-Porter Act's proposed San Joaquin Valley drainage water facilities and dismissed the Delta and San Joaquin County water users' concerns by observing that reduced San Joaquin River flows from drainage return water being diverted to the "drainage facilities":

> will result in the interception of drainage water north of Mendota Pool rather than the interception of the drainage water from the San Luis Unit [north of the expected route of the San Luis Drain]. [citation] Therefore the contention that the construction of a master drainage system will reduce the quantity of water available in the lower San Joaquin River is clearly outside of the issues under consideration in connection with [D-1020].[28]

Six years later, California withdrew from the San Joaquin Valley master drain. The State Water Rights Board did reserve its continuing jurisdiction concerning salinity control in Term 9 of D-1020, but it would be another 17 years before south Delta salinity concerns would be addressed in the water quality objectives of the 1978 Water Quality Control Plan. The Board continued to reserve its jurisdiction on salinity control matters in water right decisions through 1970.[29] It would be another 27 years before the State Water Board attempted to enforce them in D-1641.

This record of delay in establishing salinity control policy is compounded by a lack of accountability of regional boards to the State Water Board, again in the area of salinity

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[27] State Water Rights Board, *Water Rights Decision 1020: In the Matter of Application 15764, United States of America, Bureau of Reclamation, Applicant; and Union Properties, Inc., et al, Protestants*, June 30, 1961, p. 15. Accessible online at http://www.swrcb.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1000_d1049/wrd1020.pdf.

[28] *Ibid.*, pp. 15-16.

[29] State Water Resources Control Board. 2006a. *Order WR 2006-0006: In the Matter of Draft Cease and Desist Order Nos. 262.31-16 and 262.31-17 Against the Department of Water Resources and the United States Bureau of Reclamation Under their Water Right Permits and License*, adopted February 15, Figure 2, pp. 8-9. Accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/2006/wro2006_0006.pdf.

control. The State Water Resources Control Board in WQ 85-1 (relating to selenium pollution of Kesterson National Wildlife Refuge in the early 1980s) directed the Central Valley Regional Water Quality Control Board to "initiate a process to develop specific water quality objectives for the San Joaquin River basin that will result in the adoption of appropriate basin plan amendments by the Regional Board and the development of a program to regulate agricultural drainage discharges."[30] The Board's order characterizes the drain water that accumulated at Kesterson Reservoir as meeting the definition of "hazardous waste" and that the Bureau had created a "public nuisance" there.[31] (State Water Resources Control Board 1985: Conclusion 1, 61)

Unfortunately, in 1985 the State Board allowed the Central Valley Regional Board to consider using not just waste discharge requirements to regulate drainage discharges from irrigated lands, but also "waivers of discharge requirements in appropriate circumstances" which C-WIN and others believe has been used by the Central Valley Regional Board to excess in allowing heavily saline (and other problem constituents like selenium, discussed below) drainage discharges in the San Joaquin River basin to continue. The State Board in 1985 required no preparation of a plan for ending the degradation of San Joaquin River and west side tributaries' water quality by agricultural drainage flows, only monthly "progress reports."

In D-1641, adopted by the State Water Board in 2000, the Board recalled that it had directed the Central Valley Regional Board to "initiate a process to develop specific water quality objectives for the San Joaquin River basin that will result in the adoption of appropriate basin plan amendments by the Regional Board and the development of a program to regulate agricultural drainage." The Board also acknowledges in D-1641 that a long-term solution for drainage management in the San Joaquin River Basin remains to be developed.

Also in D-1641, the Board described salinity problems of the San Joaquin River system as having two principal causes: lack of sufficient diluting flows, and drainage discharges largely from western San Joaquin Valley agricultural irrigators. The Board continued:

> Although releases of dilution water could help meet the southern Delta objectives, regional management of drainage water is the preferred method of meeting the objectives. The Central Valley RWQCB is currently in the process of setting salinity objectives for the San Joaquin River. [cite] The Central Valley RWQCB is hereby directed promptly to develop and adopt salinity objectives and a program of implementation for the main stem of the San Joaquin River upstream of Vernalis.[32]

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[30] State Water Resources Control Board. 2000. *Revised Water Right Decision 1641: In the Matter of Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; A Petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and A Petition to Change Places of Use and Purposes of Use of the Central Valley Project*, December 29, 1999, revised in accordance with Order WR 2000-02, March 15, p. 85. Accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf; State Water Resources Control Board, *Order No. WQ 85-1*, *op. cit.,* Conclusion 11, p. 63.

[31] *Order No. WQ 85-1*, *ibid.*, Conclusion 1, p. 61.

[32] State Water Resources Control Board, *Revised Water Right Decision 1641, op. cit.*, p. 84.

The Board offers no explanation as to what "regional management of drainage water" means exactly, or why it is the preferred method. *Twenty-seven years after WQ 85-1, California still awaits this important basin plan amendment.* It is over twelve years since the State Water Board issued its directive in D-1641 to the Central Valley Regional Water Quality Control Board. The Central Valley Regional Board appears still to hold committee meetings to gather stakeholder input for the basin plan amendment. Meanwhile, the San Joaquin River continues delivering an average of 922,000 tons of salt to the southern Delta each year.[33] There are additional instances of inaction by the State Water Resources Control Board and its Central Valley Regional Water Quality Control Board on selenium issues detailed in the next section, and in Appendix C. We could find no schedule or work plan on the Regional Board's CV-SALTS website indicating when an effective basin plan amendment is to be accomplished by the Central Valley Regional Board and delivered to the State Water Resources Control Board for imminent consideration.

Rather, the State Water Resources Control Board in D-1641 gives support for a San Luis Drain without endorsing it overtly as its preferred method of regional drainage management. D-1641 reports that Central Valley Regional Board staff testified in support of extending the San Luis Drain to the Delta, and that Board's water quality control plan for the Central Valley Region "states that a valley-wide drain will be the only feasible long-term solution to drainage problem *[sic]*," concluding that "the drain has numerous benefits including the maintenance of productivity and the export of salts."[34] The Board expressed dismay towards the Bureau that Public Law 86-488 "required assurance that the San Luis Drain would be constructed. In 1963 and 1967, the SJREC [the Exchange Contractors] filed suit against the US Bureau of Reclamation. The Bureau assured the judge that a drain would be constructed. Nevertheless, the USBR continues to delay making progress on an out-of-valley plan." However, a Bureau witness in the D-1641 evidentiary hearings testified that the Bureau has no specific plans to "improve quality of the river upstream of Vernalis." The Board in D-1641 then prods the Bureau:

> The USBR has been directed by the court to initiate activities to resolve the drainage problems in the San Joaquin Valley. It should proceed promptly to initiate such activities and file any necessary applications.[35]

In its 2006 Water Quality Control Plan, the State Water Resources Control Board reported that among the "emerging issues" of the Bay-Delta Estuary was "Delta and Central Valley Salinity." The Board announced there was "broad stakeholder support" for a new Salinity Management Plan for the Central Valley and Delta to protect beneficial uses of both surface and ground waters. How this process is supposed to relate to the Department of Water Resources ongoing San Joaquin Valley Drainage Monitoring Program was not stated. The process, the Board reported:

> ***is expected to take 40 to 50 years*** and to reduce economic hardship related to managing salinity. The Board will develop regulations and provide regulatory encouragement to ensure that infrastructure is developed that improves and maintains Central Valley and Delta salinity

[33] California Regional Water Quality Control Board, Central Valley Region, *Salinity in the Central Valley: An Overview*, May 2006, p. 30. Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/centralvalley_salinity_alternatives_archives/initial_development/swrcb_02may06_ovrvw_rpt.pdf.
[34] State Water Resources Control Board, *Revised Water Right Decision 1641, op. cit.*, p. 85.
[35] *Ibid.*, p. 86.

> while providing certainty to local and regional planners, municipalities, agriculture, water suppliers, food processors and others."[36]

The 2006 Water Quality Control Plan makes clear that elevated salinity in the South Delta has many large and small sources, including low flows, salts imported to the San Joaquin River Basin in irrigation water, municipal discharges, subsurface accretions from groundwater, tidal action; local, state, and federal water diversions, channel capacity, and "discharges from land-derived salts, primarily from agricultural drainage." The Plan makes no attempt to assign portions to these various sources, but the shares associated with these sources were analyzed by the Department of Water Resources in 2006 and reported here in Tables 2 and 3 in the body of our testimony above. The vast majority of salt sources in the San Joaquin River originate from agricultural irrigation practices that flush salts from the soils, increase surface and subsurface return flow to the River, and raise the elevation and hydraulic head of groundwater tainted with salts. The Plan itemizes a number of methods for addressing salinity problems of the River and the South Delta, but enforcement actions are not contemplated. Its recommended projects, studies and actions omit enforcement, but include a committee to "address salinity issues" through a committee-designated "task force" that will "conduct meetings" to "gather public input" and produce an economic study that will "highlight the major salinity-related issues and their statewide impacts.[37] (State Water Resources Control Board 2006: 32; Howitt et al 2009)

To implement South Delta salinity objectives, the Board's actions focus on

> the need for an updated independent scientific investigation of irrigation salinity needs in the southern Delta….The scientific investigation should address whether the agricultural beneficial uses in the southern Delta would be reasonably protected at different salinity levels, whether management practices are available that would allow for protection of the beneficial uses at a higher salinity level in the channels of the southern Delta, and whether such management practices are technically and financial feasible. The investigation could address the feasibility of providing an alternative method of delivering fresh water to agricultural water users in the southern Delta. The scientific investigation must be specific to the southern Delta.[38]

In the same plan, the Board continues its implicit support for completing the San Luis Drain, stating almost in passing that "The salinity objectives at Vernalis can be attained by releasing dilution water from New Melones [Reservoir on the Stanislaus River] and other sources, *completing a drain to remove the salts generated by agricultural drainage and municipal discharges from the San Joaquin Valley*, and conducting measures in the San Joaquin Valley such as...state regulatory actions, state funding of projects and studies, regulation of water diversions, pollutant discharge controls, improvements in water

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[36] State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, December 13, 2006, p. 6. Emphasis added. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/index.shtml.

[37] *Ibid.*, p. 32; Howitt, R.E., J. Kaplan, D. Larson, D. MacEwan, J. Medellin-Azuara, G. Horner, and N.S. Lee, *The Economic Impacts of Central Valley Salinity.* University of California, Davis, Final Report to the State Water Resources Control Board Contract 05-417-150-0, March 20, 2009, approx. 200 pages. Accessible online at http://swap.ucdavis.edu/SWAPfiles/ReportsPapers/MainDocument_031909.pdf.

[38] State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 2006, *op. cit.,* p. 32.

circulation, and long-term implementation of best management practices to control saline discharges."[39]

Planning for More Delay

The State Water Resources Control Board wrote a Strategic Work Plan for the Delta Estuary in 2008 that laid out five year work plans Delta and San Joaquin Valley related programs, "characterizing discharges from Delta islands," and south Delta salinity. These Work Plan elements are a road map for further delay addressing salinity issues that entwine the fates of the San Joaquin River Basin and the Bay-Delta Estuary.[40]

The Irrigated Lands Regulatory Program is perhaps the single most graphic example of the failure of the State and Central Valley Boards to protect water quality in the San Joaquin River and Delta. Monitoring data collected by the Central Valley Regional Water Quality Control Board, UC Davis and agricultural coalitions, among others, established that discharges from irrigated lands represent the largest source of toxic and other pollutants to Central Valley waters. In 2006, the Central Valley Board released a landmark draft report presenting the first region-wide assessment of data collected pursuant to the Irrigated Lands Program since its inception in 2003. Data collected from some 313 sites throughout the Central Valley reveals that: 1) toxicity to aquatic life was present at 63 percent of the monitored sites (50 percent were toxic to more than one species); 2) pesticide water quality standards were exceeded at 54 percent of sites (many for multiple pesticides); 3) one or more metals violated criteria at 66 percent of the sites; 4) human health standards for bacteria were violated at 87 percent of monitored sites and 5) more than 80 percent of the locations reported exceedances for general parameters (dissolved oxygen, pH, salt and TSS). While the adequacy of monitoring varied dramatically from site to site, the report presents a dramatic panorama of the epidemic of pollution caused by the uncontrolled discharge of agricultural wastes.

Since conditional waivers were originally adopted in 1982, and subsequently in 2003 and 2006, the Central Valley Regional Board has been unable to identify a single improvement in water quality or, indeed, a single pound reduction in the mass loading of agricultural pollutants that has been achieved by the Program (other than a reduction in application of organophosphate pesticides as farmers switched to more potent and less expensive pyrethroids). Under the agricultural waivers, the Central Valley Board does not know who the major polluters in the Central Valley are because it has required no farm-level water quality management plans, preferring instead to organize and rely on a regional monitoring approach. The Board has misinterpreted the state's "Statement of Policy with Respect to Maintaining High Waters in California" which provides that:

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[39] *Ibid.*, p. 28.

[40] California Water Impact Network, *Comments on the Draft Strategic Workplan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.* Joint letter to the State Water Resources Control Board with California Sportfishing Protection Alliance, July 8, 2008, 25 pages; California Sportfishing Protection Alliance, *Comments on Draft Irrigated Lands Regulatory Program - Program Environmental Impact Report*. Joint letter To Pamela Creedon and Adam Laputz, California Regional Water Quality Control Board, Central Valley Region, with the California Water Impact Network, September 27, 2010, 63 pages.

> any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in *the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.*[41]

To comply with this policy, the Central Valley Regional Board must require the discharger to demonstrate that their manner of compliance is the best practicable treatment and control for the discharge. Not one irrigated lands discharger has complied with the State Board's resolution. Because it requires no farm water quality management plans, the Regional Board is entirely in the dark regarding what, if any, measures have been implemented let alone whether they amount to the best practicable treatment and control methods.[42]

The same problem with the Board's Irrigated Lands Regulatory Program clouds the prospects for its planned effort to "characterize discharges from Delta islands" called for in the Strategic Work Plan. The discharge of some 430,000 acre-feet of return flow from approximately 680,000 acres of Delta farmland clearly presents a serious problem. "Characterization" of the pollutants in these discharges is fundamental to any serious effort to protect Delta water quality. However, the State Board's proposal is a searing indictment of both the Central Valley Regional Board and the Irrigated Lands Regulatory Program. *Had requirements to submit Reports of Waste Discharge not been waived for agricultural dischargers, outflow from Delta islands would have been "characterized" years ago.* Similarly, had the State Board insisted that agricultural dischargers, coalitions, and water districts comply with the same monitoring requirements it routinely demands from virtually every other segment of society (that is, cities, industries, and businesses), then discharges would have already been "characterized" by now. Indeed, had the Board complied with its regulatory responsibility to protect the water quality of Delta and San Joaquin River water ways, the receiving waters would have also been fully "characterized" by now. While the State Board seems focused on agricultural discharges in the Delta, it inexplicably ignores the agricultural discharges from millions of acres of farmland along water ways upstream of the Delta. Targeting Delta farmers while ignoring those who discharge upstream is simply hypocritical. The State Board should direct the Central Valley Board to immediately issue California Water Code Section 13267 letters requiring all agricultural dischargers to "characterize" their discharges. The time is long past due.

This critique of the State and Central Valley Regional Boards records a consistent pattern of delay and inaction that favors process and voluntary compliance over results. Both methods have been ineffective if not actively harmful to the San Joaquin River Basin and the Bay-Delta Estuary. As the State Water Resources Control Board is well aware, the Bureau and the Department have great difficulty achieving compliance with salinity standards at interior South Delta compliance stations. We see in the State Board's proposal to relax interior South Delta salinity objectives an implicit admission that all other State and Regional Board activity to control and reduce salinity has been an abject failure and that the only option left is for the State Board to "move the goalposts" or "lower the bar" in order to

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[41] State Water Resources Control Board. 1968b. Resolution No. 68-16 (Oct. 28,). Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/laws_regs_policies/rs68-016.pdf. Emphasis added.

[42] California Sportfishing Protection Alliance, *Comments on Draft Irrigated Lands Regulatory Program - Program Environmental Impact Report, op. cit.*

help the Bureau and the Department to get over a lower regulatory hurdle. Before adopting this change, however, the Board must justify this proposed relaxation in light of the Board's longstanding antidegradation policy. This policy is required under the federal Clean Water Act. Our organizations do not believe that the proposed relaxation of South Delta salinity objectives is consistent with Board antidegradation policy and with the requirements of the federal Clean Water Act.

These proposed revisions to South Delta salinity objectives will not solve South Delta water quality problems. Null zones (areas where net stream flow in channels stagnates and residence times are lengthy) occur near each of the interior compliance points. Positive (net downstream) flows over time and during key seasonal periods are needed to improve water quality conditions in these zones. Temporary barriers (and proposed permanent operable gates) impede such flows, as do exports from the Banks and Jones pumping plants. In the absence of sufficient net downstream flows, reverse flows occur and interior South Delta water levels fall to where Delta irrigators cannot divert their flows.

A key mitigation for the Board to consider in the Bay-Delta Water Quality Control Plan is reduction or cessation of Delta pumped exports to allow instream flows to facilitate fish migration and turbid open water conditions needed by Delta smelt. The State Water Resources Control Board must determine through the Plan whether and how operational and flow options would create internal Delta hydrodynamics that more closely mimic natural flow conditions that benefit fish and reduce residence times, exposure to toxic stressors, and predation while in transit.

The Bureau's chronic salinity objective violations result from its continued adherence to the terms of the Exchange Contract and its failure to use any method of source control in order to comply with the D-1641 condition to reduce salinity discharges at Vernalis and in the South Delta. In 2006, the Board imposed a cease and desist order, but the Board then relaxed the order in 2010. It now offers in the April 2011 Notice of Preparation proposed language that would permanently relax the interior South Delta salinity objectives themselves. The proposed new, relaxed interior South ?Delta objectives are a sorry perpetuation of the Board's backpedaling and delay.

Central Valley water regulators acknowledge that "salinity impairments" of the state's water bodies "are occurring with greater frequency and magnitude. Such impairments in the past have led to the fall of civilizations."[43] The Central Valley Regional Water Quality Control Board estimates that the Delta Mendota Canal imports about 900,000 to 1 million tons of salt each year into the San Joaquin River Basin while the San Joaquin River returns about 922,000 tons of salt to the Delta annually.[44] The Central Valley Regional Board is clearly concerned about salts building up in western San Joaquin Valley soils, but it has estimated no timetable by which the productivity of these soils would be exhausted from salinization.

However, in 1981 the White House Council on Environmental Quality offered an estimate. The Council found at that time that some 400,000 acres of land in the San Joaquin Valley

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[43] California Regional Water Quality Control Board, Central Valley Region, *Salinity in the Central Valley: An Overview*, May 2006, p. 5. Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/centralvalley_salinity_alternatives_archives/initial_development/swrcb_02may06_ovrvw_rpt.pdf.
[44] *Ibid*., Tables 2 through 5.

were poorly drained, and that crop yields had declined 10 percent since 1970. The Council stated that with no action the amount of poorly drained land would increase to about 700,000 acres by 2000. The Council reported too that "over the next 100 years" (or by about 2080) "about 1 million acres of agricultural land in the San Joaquin will undergo desertification" if groundwater salinization is not addressed.[45]

The salinization of the western San Joaquin Valley keeps pace with the Council on Environmental Quality's projection: From sworn testimony it received in preparing its Water Rights Decision 1641 (D-1641) in 2000, the State Water Resources Control Board found that "the total acreage of lands impacted by rising water tables and increasing salinity is approximately 1 million acres."[46] The San Joaquin Valley Drainage Monitoring Program reported to the Department of Water Resources for 2005 that there are about 1.324 million acres of land with present and potential drainage problems. About three-tenths (30.4 percent) of these lands (about 403,000 acres similar to findings of the Council on Environmental Quality in 1981) has very shallow groundwater levels of between 0 to 5 feet. These lands can be considered to have current drainage problems, while another 857,000 acres have water tables between 5 and 15 feet below the surface, or about 65 percent of lands. These lands can be considered to have present and potential drainage problems.[47]

The Central Valley Project's importation of Delta water establishes a vicious cycle of cropland salinization. The lands of the western San Joaquin Valley (on which Delta Mendota Canal water is applied largely for irrigation) seldom experience a net leaching of salts out to the ocean through the Delta because the imported water applied to it always has a relatively high salt content. And irrigating with that water serves to further concentrate salts in the soils and return flows. The Central Valley Regional Water Quality Control Board describes this as "recirculation":

> Such recirculation can have a large effect on salt fluxes [i.e., movement] because rather than completely leaving the system, such recirculated salts continued to contribute to any impairments and costs associated with elevated salinity in supply water.[48]

Echoing the State Water Resources Control Board's finding in 2000, salts in the Delta Mendota Canal are found by the Central Valley Regional Board to be the primary source of

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[45] Sheridan, D., *Desertification of the United States*. Washington, DC: White House Council on Environmental Quality, 1981, 142 pages.

[46] State Water Resources Control Board, *Revised Water Right Decision 1641: In the Matter of Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; A Petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and A Petition to Change Places of Use and Purposes of Use of the Central Valley Project*, December 29, 1999, revised in accordance with Order WR 2000-02, March 15, 2000, p. 82. Accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf

[47] California Department of Water Resources, *San Joaquin Valley Drainage Monitoring Program, 2003-2005 District Report*, December 2010. 132 pages, Table 1, including appendices. Accessible online at http://www.water.ca.gov/pubs/drainage/2003-2005_drainage_monitoring_report__san_joaquin_valley/sjv_dmr_2003-2005_final.webfile.pdf.

[48] California Regional Water Quality Control Board, Central Valley Region, *Salinity in the Central Valley: An Overview*, May 2006, p. 36. Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/centralvalley_salinity_alternatives_archives/initial_development/swrcb_02may06_ovrvw_rpt.pdf.

salt circulating in the San Joaquin River Basin. While the Canal supplies most of the surface irrigation water to this part of the Basin, the Board states that "the quality of this supply may be impaired by the recirculation of salts from the San Joaquin River to the [Canal's] Delta pumping plant."[49] In addition to 1 million tons per year of salt recirculating through the San Joaquin River and the Delta Mendota Canal, the Board estimates that application of salts from soil amendments and groundwater pumping for irrigation in the River Basin adds an *additional 500,000 tons of salt per year* to the River.

Table 5 summarizes how the degree to which the San Joaquin River Basin's hydrology has been dramatically altered by water development over the period 1984-2009. It does this in two key ways.

Table 5
Changes in Flows of San Joaquin River Basin Tributaries, Unimpaired and Observed Conditions, 1984 to 2009

Statistics for 1984-2009	Stanislaus River	Tuolumne River	Merced River	San Joaquin River	Chowchilla, Fresno, Valley Floor, Tulare Combined	San Joaquin River at Vernalis (Sum of flows)
Median Unimpaired Flows	922	1,514	721	1,311	231	4,699
Percent of Flow at Vernalis	20%	32%	15%	28%	5%	
Median Observed flows	429	398	271	137	416	1,651
Percent of Flow at Vernalis	26%	24%	16%	8%	25%	
Percent Flow Change from Unimpaired Conditions	**-53%**	**-74%**	**-62%**	**-90%**	**80%**	**-65%**

Source: State Water Resources Control Board 2011: Tables 2.9 through 2.14); California Water Impact Network.

First, when comparing unimpaired with observed (that is, actually measured) flow conditions for the Basin's rivers, it is apparent that the unimpaired flow conditions have been greatly reduced on the major tributaries by water project operations. For the Stanislaus, actual median flow has fallen relative to unimpaired flows by about 53 percent; on the Tuolumne, by 74 percent; on the Merced by 62 percent; and on the Upper San Joaquin River (above the Merced River confluence) by 90 percent. (Median flows are employed for this analysis to avoid the skewing effects of the statistical averages.)

For the Chowchilla, Fresno, Valley floor, and Tulare (e.g., Fresno Slough and Kings River) streams combined, observed flow conditions *dramatically increased* over their unimpaired conditions—*by 80 percent* during this 25-year period. Table 5 includes median unimpaired and observed flow conditions for an aggregation of the flows of the much smaller Chowchilla, Fresno, Valley floor, and Tulare (Fresno Slough) streams in the San Joaquin

[49] *Ibid., p. 41.*

River Basin. According to US Geological Survey data available online, the largest Valley floor sources of median observed annual flows were from Salt Slough, Mud Slough, the Fresno River, and Chowchilla River, from largest to smallest. Median annual flows for other west side creeks (Pacheco, Orestimba, and Del Puerto) are only about about one-eighth of Mud and Salt Slough observed flows. Median observed flows along the James Bypass to Fresno Slough are likewise small.

The median observed annual flow of the San Joaquin River at Vernalis during 1984 to 2009 is just 1.65 million acre-feet, just 35 percent of median unimpaired annual flow of 4.7 million acre-feet at Vernalis. (Table 1 sums the flows from only the major tributaries in the table as an approximation of unimpaired and observed flow conditions at Vernalis.)

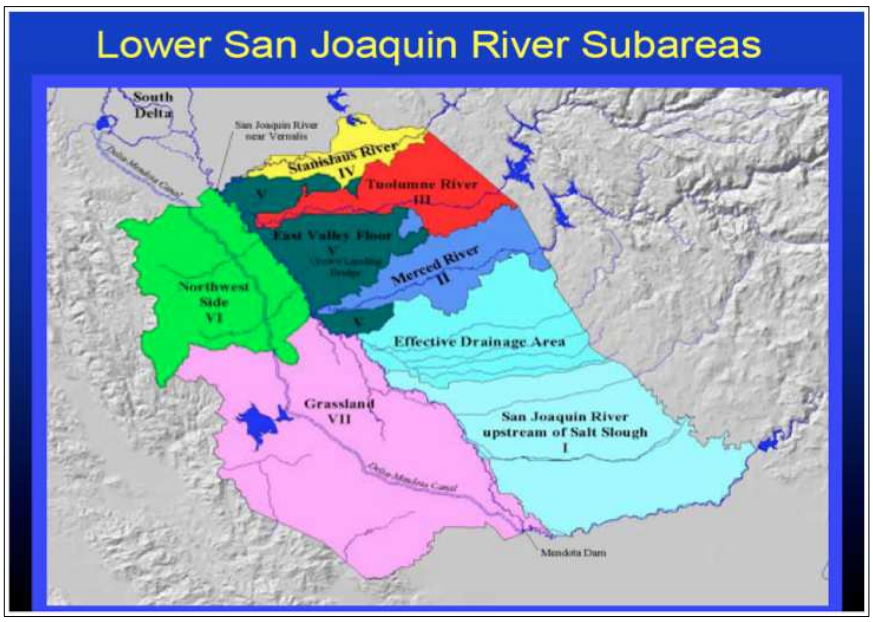
Second, Table 5 shows that the composition (or stream source) of flows reaching Vernalis, (unimpaired compared with actual observed flows) also changed dramatically. (Keep in mind that observed flows are actually *decreasing* from unimpaired conditions.) The Stanislaus River's *share of flow* at Vernalis increases under water development from 20 percent of unimpaired flow to 26 percent of observed flow. The Tuolumne decreases from 32 percent of unimpaired flow to 24 percent of observed flow conditions under water development. The Merced River's *share of flow* at Vernalis barely changes (15 percent of unimpaired; 16 percent of observed), while the Upper San Joaquin River's share of Vernalis flow decreases dramatically from 28 percent under unimpaired conditions, to just 8 percent under developed flow conditions. The Valley floor sources, however, represent a sharply increased share of flow at Vernalis, rising from just five (5) percent of unimpaired flow conditions to 25 percent of actual observed flows under developed conditions.

Table 6
Sources of Salt in the San Joaquin River as Measured at Vernalis

Approximate Sources of Salt	Share of Load
Sierra Nevada Tributaries	18%
Groundwater	28%
Agricultural Surface Return Flow	26%
Agricultural Subsurface Return Flow	17%
Managed Wetlands	9%
Municipal and Industrial Discharges	2%

Source: California Department of Water Resources, 2006: Table C-3; California Water Impact Network.

This radically altered flow pattern from unimpaired to observed flow in the San Joaquin River Basin changes the Basin's handling of salt circulation as well. According to the California Department of Water Resources, the sources of salt loads recirculating through the San Joaquin River measured at Vernalis as shown in Table 6. Agriculture's use of both surface and groundwater sources is the largest source by which salt is mobilized. Adding together groundwater, and surface and subsurface return flows, these sources account for 71 percent of the salt load in the San Joaquin River as measured at Vernalis.



The geographic origins of the river basin's salt loads are illustrated in Figure 1 and summarized in Table 7. This figure shows the "effective" drainage area of the San Joaquin River Basin and its sub basins while tacitly acknowledging the export of upper San Joaquin River flows from the Basin via the Friant-Kern Canal. For the "San Joaquin River upstream of Salt Slough" sub region in Table 7, Figure 1 indicates that the "effective drainage area" for this watershed is a handful of creeks together with the Chowchilla River area. Flows in this area amount to just 9 percent of all salt contributions to total flows at Vernalis. In dark blue-green are "East Valley Floor" creeks that drain the plains between the Merced, Tuolumne, and Stanislaus rivers, which in turn drain the Sierra Nevada. The East Valley Floor creeks contribute just 5 percent of the salt detected at Vernalis on an annual basis. The combined salt loads of the Merced, Tuolumne, and Stanislaus rivers are also just 19 percent of the total salt load measured at Vernalis. Combined, the streams that "effectively" drain the east side of the San Joaquin River Basin contribute just 33 percent of the total salt load at Vernalis.

Table 7
Sources of Salt in the San Joaquin River Basin as Measured at Vernalis by Contributing Geographic Area of the Basin

Approximate Source of Salt	Share of Load by Contributing Area
I. San Joaquin River upstream of Salt Slough	9%
II. Merced River III. Tuolumne River IV. Stanislaus River	19%
V. East Valley Floor Streams	5%

Table 7 Sources of Salt in the San Joaquin River Basin as Measured at Vernalis by Contributing Geographic Area of the Basin	
Approximate Source of Salt	**Share of Load by Contributing Area**
VI. Northwest Side	**30%**
VII. Grasslands	**37%**
Source: California Department of Water Resources, 2006: Table C-4; California Water Impact Network.	

Meanwhile, the two west side subareas (the Northwest Side and Grasslands) contribute 67 percent—*two-thirds*—of the salt load measured at Vernalis on an annual basis. Recall from Table 5 above that the Valley floor streams entering the San Joaquin River above the Merced River confluence contribute just 25 percent of observed flow at Vernalis (essentially accounting for much of "Grasslands" flows in Table 6, above). ***This means that just one-quarter of flows reaching Vernalis carries about two-thirds of the salt load of the San Joaquin River as measured at Vernalis***.

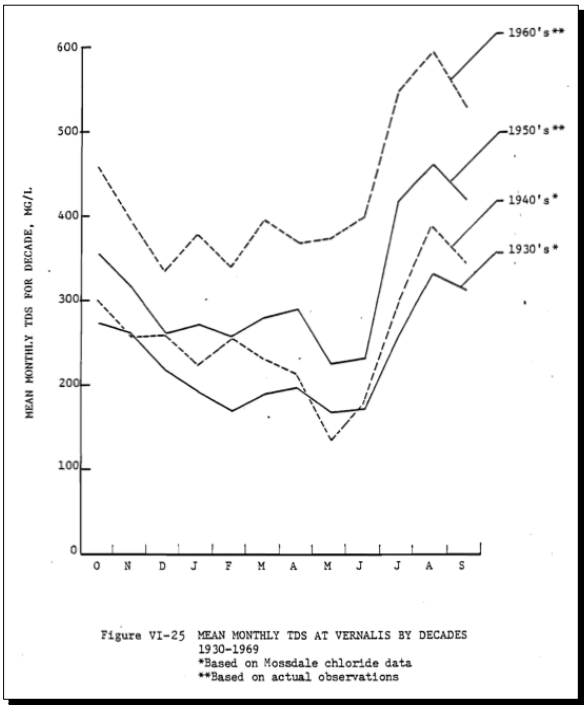


Figure 2: Decadal changes in salinity conditions for the San Joaquin River as measured at Vernalis, 1930s through 1960s. Source: US Water and Power Resources Service and South Delta Water Agency, 1980.

Historical data, illustrated in Figure 2 below, strongly suggest that higher proportions of unimpaired fresh water flows in the San Joaquin River earlier in the 20th century maintained lower salinity conditions before completion and operation of the Central Valley Project in the 1950s and 1960s. The 1930s and 1940s had lower average annual and monthly salinities than the 1950s and 1960s when the Central Valley Project facilities of the San Joaquin Valley were completed and began operating. Figure 2 shows that while total dissolved solids (or TDS, a measure of salinity in units of milligrams per liter [mg/L]) generally declined in high flow spring months when snowmelt runoff is peaking, there occurred across-the-board increases in average salinity conditions on the timescale of decades as Central Valley Project development reached full operation. The average salinity for the 1930s was 228 mg/L; for the 1940s it increased about 13 percent to 257 mg/L.

But with the advent of Friant Dam and Friant-Kern Canal exports of low salinity San Joaquin River water to Kern and Tulare counties, and the arrival of saltier Delta imported water to the west side of the San Joaquin Valley in the 1950s, average salinity of the River in the 1950s jumped 23 percent over the 1940s to 315 mg/L (38 percent higher than the 1930s salinity levels). By the end of the 1960s, the average salinity level for that decade was 427 mg/L, an 87 percent increase in salinity levels over the 1930s (and the 1930s had five drought years in it, 1930 to 1934).[50] ***In other words, salinity conditions in the San Joaquin River at Vernalis nearly doubled in 30 years, a period in which export of high quality and low salinity San Joaquin River water coincided with import of similar quantities of saltier Delta Mendota Canal imports from the Delta, which were, in turn, applied to lands heavily burdened with salts.***

The burdens of salt loads increased over time. Salinity is a function of both available salt load and the river flows available to carry it. The share of salinity effects attributable to reduced flows declined relative to the growth of salt loads in return flows in the San Joaquin River:

> Comparing the average monthly TDS (over the entire year), load-flow regressions show a 1950-1969 increase of 43 percent—from 259 mg/L to 371 mg/L. For the 1950s alone the percentage increase is about 22 percent and for the 1960s, 65 percent....Thus, according to this analysis, in this first decade after the CVP went into operation, about 56 percent of the increase in average TDS was caused simply by a reduction in flow from upstream sources; the remaining 44 percent was a result of increased salt burden, perhaps associated with an expansion of irrigated lands in the basin. Similarly in the 1960s (compared to the 1930s and 1940s) about 27 percent of the average increase in TDS...can be accounted for by a reduction in flow and 73 percent attributed to increased salt burden. It is of interest to note here that the absolute change apparently caused by reduction in flow changed relatively little from the 1950s to the 1960s...while that charged to an increase in salt burden increased about four times [...]. This is consistent with other analyses that indicate a progressive buildup in salt load in the San Joaquin system.[51]

Salt concentrations in the San Joaquin River reaching the Delta are greatly increased by the loss of San Joaquin River Basin fresh water flows to exports. The major exports of water from the San Joaquin River basin are from the Upper San Joaquin River via the Friant-Kern Canal to Tulare and Kern counties, and via San Francisco's Hetch Hetchy Aqueduct to the San Francisco Bay Area. (By far, the larger of the two exports is that of the Friant-Kern

[50] United States Water and Power Resources Service and South Delta Water Agency, *Effects of the CVP [Central Valley Project] Upon the Southern Delta Water Supply, Sacramento-San Joaquin River Delta, California*, June 1980, Table VI-17, p. 107.
[51] *Ibid.*, p. 126.

Canal.) Omission of this environmental setting information represents an abuse of discretion that extends to the Board's definition of the plan area, described in sections ES5.2 and 1.2 of the Draft SED, for the proposed plan amendment in Appendix K of the Draft SED.

Environmental Setting Omissions—Selenium Issues

Where there is salt in the San Joaquin Valley, there is typically also selenium. The State Water Resources Control Board has steadfastly dragged its feet when it comes to addressing selenium toxicity as part of salinity control in the San Joaquin Valley and the Delta. The Board's failure to include selenium issues in Chapter 5 and Chapter 9 of the Draft SED continue the Board's record of unfortunate consistency on this issue. We respectfully request that the Board include this information in Chapters 5 and 9 of the SED.

The problem of salt loading in flows returning to the Delta via the San Joaquin River is compounded by the presence of selenium. Selenium is typically found as a very small component of total dissolved solids (TDS), a commonly used measure of salinity and salts. But the larger the salt load the larger the selenium load.

Selenium occurs naturally in mineral deposits like coal and oil, as well as other marine-derived sediments.[52] Wastes from agriculture, industry, mining, and gas and oil refineries can increase selenium contamination in estuaries and bays.

Selenium is necessary to the health of most vertebrate species and for human health when provided in small doses. Adequate amounts of selenium are found in a well-balanced human diet. But at just slightly elevated levels, selenium becomes actively poisonous. As concentrations rise further, selenium can cause embryonic defects, reproductive problems, and death in vertebrate animals.

As a chemical element, selenium is chemically similar to sulfur in how they both react with both mineral and organic compounds. Selenium can readily substitute for sulfur in salts (such as selenates for sulfates) as well as in certain amino acids (e.g., seleno-cysteine and seleno-methionine), the building blocks of proteins.[53] Selenium's ability to substitute chemically for sulfur in both salt chemistry and organic amino acids clears pathways to toxicity, increased gene mutation, and ecological damage.

At higher tissue concentrations, selenium can substitute for sulfur in amino acids, altering the structure of proteins in metabolic and reproductive systems of the body. When proteins in predator species mutate from excessive exposure to selenium, it can lead to sterility and suppression of the immune system "at critical development stages when rapid cell reproduction and morphogenic movement are occurring." Changes in the structure of many antibodies (such as from substitution of selenium atoms for sulfur atoms) can compromise the organism's immune defenses, making it more susceptible to disease.[54]

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[52] Presser, T.S., "Selenium Pollution," in *Encyclopedia of Environmental Science*, ed. D.E. Alexander and R.W. Fairbridge, Kluwer Academic Publishers, 1999, pp. 554-556. Available online at http://wwwrcamnl.wr.usgs.gov/Selenium/Library_articles/TSPresserEncyclo.pdf.

[53] Presser, *ibid.*; and Presser, T.S. and S.N. Luoma. 2006. *Forecasting Selenium Discharges to the San Francisco Bay-Delta Estuary: Ecological Effects of a Proposed San Luis Drain Extension*, US Geological Survey Professional Paper 1646, p. 40. Accessible online at http://pubs.usgs.gov/pp/p1646/.

[54] Presser, "Selenium Pollution," 1999, p. 555.

In the spring of 1983, federal wildlife biologists found that a majority of birds nesting at Kesterson National Wildlife Refuge had deformed embryos and chicks. Nearly two-thirds of Refuge birds had missing eyes and feet, protruding brains, and twisted beaks, legs and wings. The number of breeding birds able to reproduce collapsed. These birds had been poisoned and the reservoir at Kesterson became synonymous with "toxic disaster," a western Love Canal.

The direct culprit for these disfiguring effects on wildlife was selenium.[55] (Ohlendorf 1985; Saiki 1985; Sylvester 1985; Barnes 1985; Kilness and Simmons 1985) This contaminant was brought to Kesterson by agricultural drain water from a wastewater canal called the San Luis Drain, which was constructed by the US Bureau of Reclamation.

[55] Ohlendorf, H.M., "Aquatic Birds and Selenium in the San Joaquin Valley," pp. 14-23; Saiki, M.K. "Concentrations of Selenium in Aquatic Food-Chain Organisms and Fish Exposed to Agricultural Tile Drainage Water," pp. 25-32; Sylvester, M.A., "Results of U.S. Geological Survey Studies Pertaining to the Agricultural Drainage Problem of the Western San Joaquin Valley," pp. 34-40; Barnes, I., "Sources of Selenium," pp. 41-47; and Kilness, A.W. and J.L. Simmons, "Toxic Effects of Selenium on Wildlife Species and Other Organisms," pp. 52-59, all articles in *Selenium and Agricultural Drainage: Implications for San Francisco Bay and the California Environment.* Proceedings of the Second Selenium Symposium, March 23, 1985, Berkeley, California.

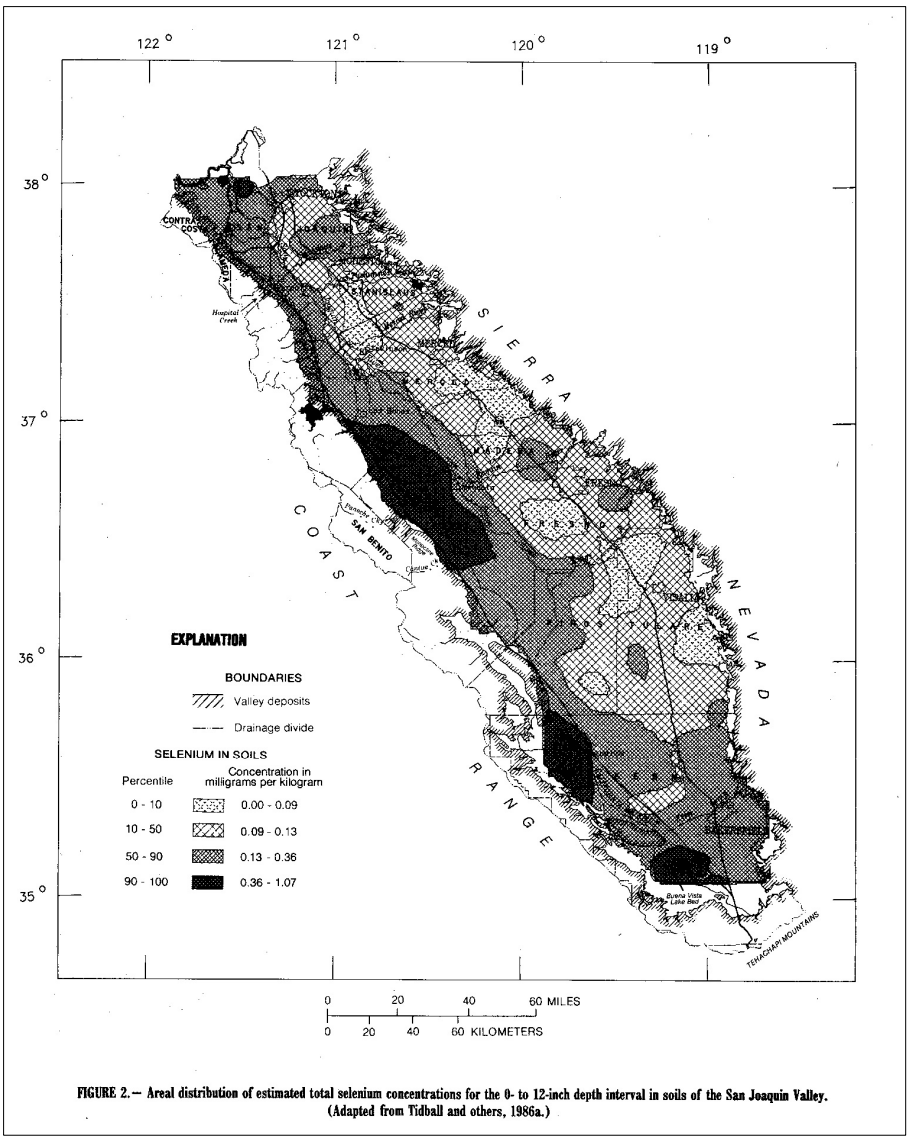

Figure 5: Selenium concentrations in San Joaquin Valley soils. The darkest areas contain the highest selenium concentration in soils. Source: Gilliom 1988.

The western San Joaquin Valley and its Coast Range foothills have naturally high levels of selenium in the rocks and soils.[56] Three areas of the western San Joaquin Valley have the highest soil selenium concentrations:

[56] Tidball, R.R., R.C. Severson, J.M McNeal, and S.A. Wilson. 1986. "Distribution of Selenium, Mercury, and Other Elements in Soils of the San Joaquin Valley and Parts of the San Luis Drain Service Area, California," in A.Q. Howard, ed., *Selenium and Agricultural Drainage: Implications for San Francisco Bay and the California Environment*, Proceedings of the Third Selenium Symposium, March 15, 1986, Berkeley, California, pages 71-82; and Gilliom, R.J., "Geologic Source of Selenium and Its Distribution in Soil," in Gilliom, R.J.. and others. 1989. *Preliminary Assessment of Sources, Distribution, and Mobility of Selenium in the San Joaquin Valley, California*, US Geological Survey Water-Resources Investigations Report 88-4186, Regional Aquifer System Analysis, prepared in cooperation with the San Joaquin Valley Drainage Program, pp. 7-11.

3. The alluvial fans near Panoche and Cantua creeks in the central western valley (near Gustine and Firebaugh; see Figure 5).
4. An area west of the town of Lost Hills.
5. The Buena Vista Lake Bed Area, west of Bakersfield.[57] (San Joaquin Valley Drainage Monitoring Program 2010)

The disaster at Kesterson National Wildlife Refuge was the earliest and most vivid example of the western San Joaquin Valley's toxic legacy due to selenium. It was caused by the west side growers' obtaining and applying a large supply of irrigation water from Delta imports to lands of the San Luis Unit. Presser and Luoma (2006) identify a unit of measure they refer to as the "kesterson." It is equivalent to 17,400 pounds of selenium, the load of selenium that is believed to have accumulated at Kesterson reservoir between 1981 and 1985, the period when the Westlands Water District's drain water was connected to the reservoir. This is the mass of selenium loading from agricultural drainage water to which scientists attribute the deformities and deaths affecting 64 percent of waterfowl there in 1983.

Other parts of the San Joaquin Valley are also naturally contaminated with salts, selenium, and high levels of other toxic elements like boron, arsenic, and molybdenum (Figure 5; San Joaquin Valley Drainage Program 1990: 58-63). Because of the extent of the geologic deposits and rocks containing selenium in the western San Joaquin Valley, it is important to recognize that at time scales relevant to society, "there are, for all practical purposes, unlimited reservoirs of selenium and salt stored within the aquifers and soils of the valley and upslope in the Coast Ranges." (Presser and Schwarzbach 2008: 2) The selenium reservoir will be with Californians for a very long time to come.[58]

Presser and Luoma's projections of selenium discharges over time are shown in Table 5. Their scenarios are as follows:

6. Existing discharges from the Grassland subarea (the northern part) through extension of the San Luis Drain to the Delta.[59]

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[57] California Department of Water Resources. 2010. *San Joaquin Valley Drainage Monitoring Program, 2003-2005 District Report*, December. 132 pages, including appendices. Accessible online at http://www.water.ca.gov/pubs/drainage/2003-2005_drainage_monitoring_report__san_joaquin_valley/sjv_dmr_2003-2005_final.webfile.pdf.

[58] Presser and Luoma (2006) quantify this reservoir by conceiving the reservoir of selenium as a stream of yearly time-step flows that can be modeled using reasonable assumptions about drainage projections, selenium concentrations and loadings from recognized plans and studies. San Joaquin Valley Drainage Program. 1990. *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley*. September, 183 pages. (Also known as the "Rainbow Report.") Accessible online at http://esrp.csustan.edu/projects/lrdp/documents/rainbowreport.pdf; United States Bureau of Reclamation. 2005a. Draft Environmental Impact Statement on the San Luis Drainage Feature Re-Evaluation, Mid-Pacific Region, Sacramento, California, May, 1,591 pages. Accessible online at http://www.usbr.gov/mp/sccao/sld/docs/index.html; California Regional Water Quality Control Board, Central Valley Region. 2000. *Selenium TMDL for Grasslands Marshes*. Staff Report, April. 13 pages. Accessible online at http://www.swrcb.ca.gov/rwqcb5/water_issues/tmdl/central_valley_projects/grasslands_se/grasslands_se_tmdl.pdf.

[59] "It seems unlikely that demand [for use of the San Luis Drain] would remain at this level once an out-of-valley conveyance was available. Increasing acreages of saline soils, rising ground water tables, and the availability of a conveyance facility are likely to generate strong pressures from other areas to use the facility." (Presser and Luoma, *Forecasting Selenium Discharges*, 2006, *op. cit.*, p. 31)

7. Westlands Water District subarea-only use of a San Luis Drain extension to the Delta or San Joaquin River.
8. Grassland subarea plus Westlands subarea, both carried to the Bay-Delta.[60]
9. Drainage is collected valley-wide from all five subareas (Northern; Grassland, Westlands; Tulare, and Kern subareas).[61]
10. Two other scenarios that include all potential problem lands estimated for the year 2000. The first shows the range of selenium loads expected if drainage management follows the 1990 Rainbow Report of the San Joaquin Valley Drainage Program (1990).[62] The second of the two forecasts lists load targets of the Total Mean Monthly (TMML) management plans for discharge to the San Joaquin River from the Grassland subarea, which ramp down over time.

Table 5 Projections of Selenium Loads from the Western San Joaquin Valley for Different Drainage Scenarios

[A kesterson (kst) is defined here as 17,400 lbs selenium, the cumulative load that caused ecological damage when released to Kesterson National Wildlife Refuge, California) (Presser and Piper, 1998)].

Scenario (subarea(s) discharging to a proposed San Luis Drain extension)	Selenium load (lbs/year)	Selenium load (kestersons/ year)	Cumulative 5-year selenium load (kestersons)
Grassland (based on current data)	6,960 – 15,500	0.4 – 0.89	2.0 – 4.45
Westlands (based on 50 – 150 µg selenium in drainage and 60,000 acre-feet)	8,000 – 24,500	0.46 – 1.41	2.3 – 7.05
Grassland and Westlands (from above)	14,960 – 40,000	0.86 – 2.30	4.3 – 11.5
Valleywide Drain (current conditions and Westlands from above)	16,490 – 42,785	0.95 – 2.46	4.75 – 12.3
Valleywide Drain (all potential problem lands with management of drainage quantity and quality)	19,584 – 42,704	1.12 – 2.45	5.6 – 12.2
Valleywide Drain (all potential problem lands with minimum management of quality and quantity)	42,704 – 128,112	2.45 – 7.36	12.2 – 36.8
Total Maximum Daily or Monthly Load Model management (load *targeted* for environment safeguards, Grassland subarea or drainage basin)	1,394 – 6,547	0.08 – 0.38	0.4 – 1.9

Source: Presser and Luoma 2006: Table 8, 33.

Using load targets (Table 5's bottom scenario) as the basis for the future stream of selenium drainage results in the lowest loading (about 1,400 to 6,500 pounds per year, or 0.08 to .38 "kestersons" per year) selenium discharges could be heavily regulated. By comparison, encouraging drainage of selenium and salts to the Bay-Delta either via a San Luis Drain extension or use of the San Joaquin River would result in a far larger range of nearly 15,000 to 42,800 pounds per year (or about 0.86 to 7.36 "kestersons" per year).

Presser and Luoma also examine scenarios in which constant concentrations of selenium in drainage flows (either in the San Luis Drain or in the San Joaquin River) are maintained. In Table 6, these projections show that at high flows selenium loads may differ significantly depending on the concentration maintained either in the river or the drain. At the current

[60] "This seems a likely outcome if a conveyance is constructed." *Ibid.*
[61] "This would require extensions of the San Luis Drain into Kern and Tulare subareas, in addition to an extension to the Bay-Delta." *Ibid.*, pp. 31-32.
[62] The Rainbow Report, *op. cit.*

Total Mean Monthly Load (TMML) level for the lower San Joaquin River (California Regional Water Quality Control Board 2000) of 5 micrograms per liter (µg/L) can yield large loads in high flows (up to 40,800 pounds during a 3 million acre-feet wet year) or small loads in low flows (or nearly 3,000 pounds during low flow in the San Joaquin River or capacity flow of the San Luis Drain).[63]

Table 6 Selenium Loads Conveyed to the Bay-Delta Under Different Flow Conditions by Maintaining Constant Concentration in Either San Joaquin River or San Luis Drain

[Flow conditions: high flow (3.0 million acre-feet/year); low flow (1.1 million acre-feet/year); and annual flow assumed for a proposed San Luis Drain extension at maximum capacity or a small San Joaquin River input in a dry year (approximately 220,000 acre-feet/year)].

Selenium concentration in river or drain extension (µg/L)	Selenium load (lbs/year)		
	3.0 million acre-feet/year	1.1 million acre-feet/year	216,810 acre-feet/year (300 ft^3/s)
0.1	816	299	60
1.0	8,160	2,990	598
2.0	16,320	5,980	1,197
5.0	40,800	14,960	2,992
50	–	–	29,920
150	–	–	89,760
300	–	–	179,520

Source: Presser and Luoma 2006: Table 9, 33.

Table 6 also shows that relaxing selenium concentration assumptions in the drainage flows to the Bay-Delta for purposes of carrying larger loads in the San Luis Drain from 50 to 300 µg/L can enable the Drain to carry much more selenium out of the San Joaquin Valley to the Delta (from nearly 30,000 pounds pear year to nearly 180,000 pounds per year, thereby easing the buildup of stored selenium in western San Joaquin Valley soils and groundwater (the "reservoir" alluded to earlier). Yet these cumulating loads would likely be highly toxic, especially in dry and drought years, of which more are expected as California's climate changes. Expressed in kestersons, these load projections by Presser and Luoma convert to *1.7 to 10.3 kestersons per year* in the San Luis Drain under relaxed assumptions of selenium concentration.

[63] California Regional Water Quality Control Board, Central Valley Region. 2001a. *Total Maximum Daily Load for Selenium in the Lower San Joaquin River*, August, 32 pages. Accessible online at http://www.swrcb.ca.gov/rwqcb5/water_issues/tmdl/central_valley_projects/san_joaquin_se/se_tmdl_rpt.pdf.

Selenium Behavior Across Aquatic Environments

Selenium concentrates naturally in the depositional environments of estuaries and marshes. Hydrologic conditions provide important reasons for this. Selenium dissolved in water represents only a small proportion of exposures.[64] Selenium can undergo "partitioning" reactions in the water column that determine whether selenium remains dissolved or enters what chemists refer to as its "particulate phase."[65]

Selenium in the water column of a flowing river can become problematic when flows slow down due to changing geomorphology of the stream channel, or at conclusion of a runoff event.[66] Incorporated into detritus or suspended sediments, selenium may then get deposited to the bed of the quiet water body. Incorporated into bacteria or phytoplankton, selenium gains immediate entry into an aquatic food web when these organisms are consumed by their immediate predators (such as zooplankton and other open water or bottom-dwelling consumers).

Presser and Luoma catalog a range of hydrologic environments and selenium's partitioning behavior, summarized in Table 7.[67] The relative calm of water in marshes, wetlands and estuaries facilitate this partitioning process by which selenium finds its way from the water column, aquatic organisms and animals connected by predation to aquatic food webs. Once consumed by prey organisms, predators can then bioaccumulate selenium at varying rates that depend on the assimilative efficiencies of prey in their diet choices.

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[64] Presser and Luoma, *Forecasting Selenium Discharges*, *op. cit.*; Luoma, S.N. and T.S. Presser. 2009. Emerging Opportunities in Management of Selenium Contamination. *Environmental Science and Technology* 43(22): 8483-8487; Roditi, H.A., and N.S. Fisher. 1999. Rates and Routes of trace elements uptake in zebra mussels. *Limnology and Oceanography* 44(7): 1730-1749; and Alquezar, R., S.J. Markich; and J.R. Twining. 2008. Comparative accumulation of ^{109}Cd and ^{75}Se from water and food by an estuarine fish (*Tetractenos glaber*). *Journal of Environmental Radioactivity* 99(1): 167-180.

[65] Presser and Luoma, *Forecasting Selenium Discharges*, *op. cit.,* p. 41; Presser, T.S. and S.N. Luoma, 2010a. A Methodology for Ecosystem-Scale Modeling of Selenium, *Integrated Environmental Assessment and Management* 6(4): 685-710. Accessible online at http://www.epa.gov/region9/water/ctr/selenium-modeling_full.pdf; and Presser, T.S. and S.N. Luoma, 2010b. *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California*, US Geological Survey Administrative Report, December, 46 pages. Accessible online, with attachments, charts and appendices, at http://www.epa.gov/region9/water/ctr/.

[66] Presser and Luoma, *Forecasting Selenium Discharges*, *op. cit.,* p. 6.

[67] Presser, T.S. and S.N. Luoma, 2010. *A Methodology for Ecosystem-Scale Modeling of Selenium, op. cit.*, p. 703.

Table 7 Examples of Ecosystem and Hydrologic Environment-Specific Selenium Criteria in Tissue and in Water Column

Hydrologic Environment	*Selenium Partitioning Factor (K_d)*	*Target Selenium Concentration in Tissue (µg/g, dry wt)*	*Hypothetical Selenium Concentration in Water Column (µg/L)*	*Protected Fish or Birds in Hydrologic Environment*
Mainstream River	150	5 (fish tissue)	10.8 to 34	Bluegill; Trout
Backwater	350	5 (fish tissue)	4.6 to 14.4	Bluegill; Trout; Bass
Reservoir	1,800	5 (fish tissue)	0.89 to 1.7	Blackfish; Redear
Estuary	3,000	5 (fish tissue)	0.24 to 1.2	Starry Flounder; White Sturgeon
Estuary	3,000	8 (bird tissue)	0.24	Scaup
Wetland	900	8 (bird tissue)	1.8	Grebe
Stream	350	8 (bird tissue)	4.5	Dipper
Saline Lake or Pond	1,500	8 (bird tissue)	0.70 to 1.8	Blacknecked Stilt

Source: Presser and Luoma (2010a: Figure 6, 703); California Water Impact Network.

Once consumed, selenium can quickly build up in the tissues of their predators, the fish, birds, and even humans higher up in aquatic food webs. Beckon and Maurer (2008) surveyed potential for selenium effects on a variety of fish and wildlife species in the San Joaquin River Basin and the San Joaquin Valley.[68] They found that:

11. The **San Joaquin Kit Fox** is "potentially at risk from dietary intake" of selenium by virtue of consuming small rodents (voles, mice, shrews) that may frequent evaporation ponds and selenium reuse areas (where selenium and salt-tolerant crops are grown to remove selenium from drain water).

12. **Kangaroo rats** in the San Joaquin Valley are potentially at risk from consuming seeds enriched with selenium in their diets. If so, Beckon finds kangaroo rats are "likely to exceed thresholds for adverse effects" from consuming such seeds.

[68] Beckon, W.N. and T.C. Maurer. 2008. *Potential Effects of Selenium Contamination on Federally-Listed Species Resulting from Delivery of Federal Water to the San Luis Unit*, prepared for U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Environmental Contaminants Division, for the US Bureau of Reclamation under Agreement #05AA210003, March, 46 pages. Accessible online at http://wwwrcamnl.wr.usgs.gov/Selenium/Library_articles/Beckon_and_Maurer_Effects_of_Se_on_Listed_Species_SLD_2008.pdf.

13. **Giant Garter Snakes** are potentially at risk, though that risk is unknown because this snake is rare and endangered.

14. **Blunt-Nosed Lizards** are also considered by Beckon to be at risk from feeding on aquatic insects in the vicinity of agricultural drainage ditches, evaporation ponds, reuse areas, and retired seleniferous (selenium-contaminated) lands. Beckon states that reuse areas may pose the greatest selenium-related risks for this lizard.

15. **California Least Terns** have been seen at selenium-treating evaporation ponds in the San Joaquin Valley, but have as yet shown no toxic effects from exposure. However, Beckon observes that "if California least terms learn to eat brine shrimp and other invertebrates in evaporation ponds" then their exposure to selenium could dramatically increase.

16. **Chinook Salmon** are among the most sensitive fish and wildlife to selenium exposure. In particular, Beckon warns there is substantial ongoing risk to juvenile salmon. For fall-run juvenile Chinook salmon, their migration commences with late winter and spring snowmelt flows along the major tributaries of the San Joaquin River (Stanislaus, Tuolumne, and Merced rivers). In low flow years on the San Joaquin River, this can mean, however, that otherwise compliant selenium concentrations in the river may prove toxic to young salmon beginning their migration. Beckon and Maurer estimate that up to 20 percent of all juvenile salmon at a tissue concentration of 2.45 µg/g dry weight reaching the San Joaquin River from the Merced River die in low flow years. Becker warns that San Joaquin River Restoration Program efforts to reintroduce fall-run Chinook salmon must address the potential for selenium poisoning of reintroduced salmon between Sack Dam and reaches of the River downstream of Mud Slough (north, which releases Grassland Bypass Project drainage flows that have passed through the San Luis Drain).[69]

[69] *Ibid*., Figure 9.

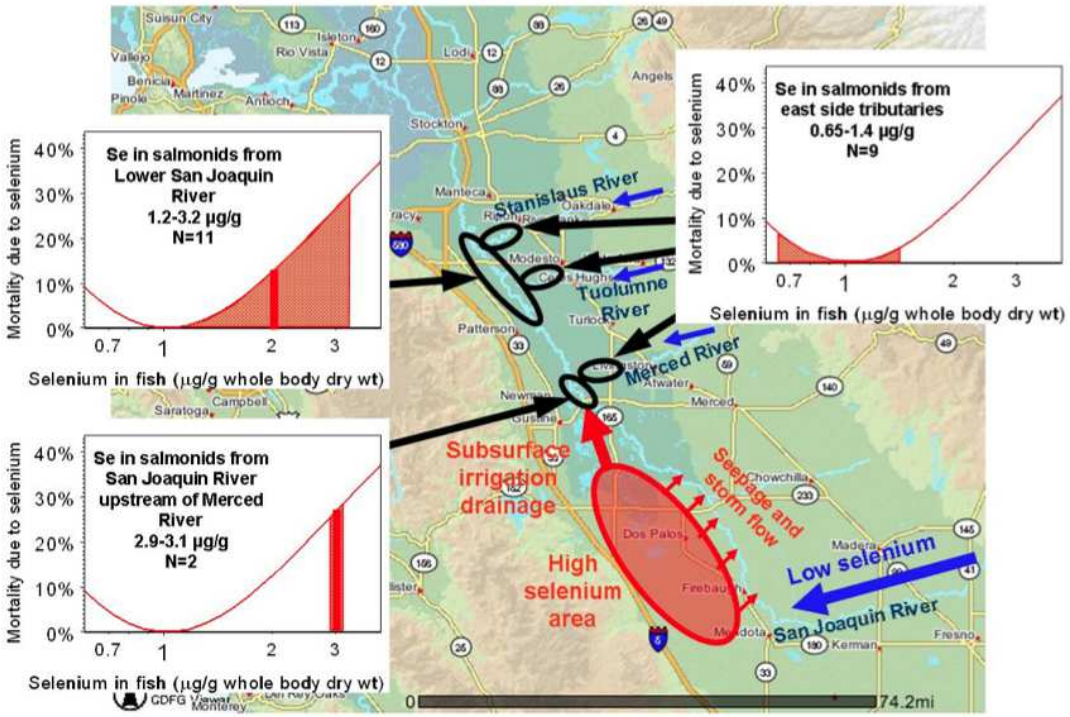


Figure 9. Risk of mortality to juvenile Chinook salmon based on selenium measured in the salmon (Saiki, *et al.* 1991) and the toxicity data shown in Figure 8 (presented here as mortality). Solid red bars represent the geometric mean selenium concentration in sampled fish at each location or cluster of locations. The stippled red areas span the ranges of concentrations in fish at the respective locations.

17. **Steelhead (Rainbow) Trout** are also believed by Beckon and Maurer to be at risk from selenium exposure, which could confound efforts to restore this fish to the upper San Joaquin River as well.

18. **White Sturgeon**, another migratory fish eats a major portion of its diet from bottom-dwelling (benthic) organisms, such as clams, which predominate in their diet. Beckon expresses hope that the exposure of white sturgeon to selenium will diminish as the State Water Resources Control Board's Total Monthly Mean Load regulations for selenium are implemented.

19. **Sacramento Splittail**, of which some 7 million individuals were killed after being entrained by state and federal pumps in the Delta during 2011, face important risks of selenium exposure. They reside mainly in slow-water estuarine habitat and rely on the Asian clam and other mollusks as about one-third of their diet. Beckon expresses hope that the exposure of Sacramento splittail to selenium will diminish as the State Water Resources Control Board's Total Monthly Mean Load regulations for selenium are implemented.

Beckon and Maurer included the Delta smelt in their survey of selenium exposure to listed species. In the case of Delta smelt, there is disagreement in the literature about the role selenium exposure may play in the decline of Delta smelt abundance in the last decade or

so.[70] Beckon and Maurer characterize the risk of selenium exposure by Delta smelt to be low. Delta smelt adults reach a maximum of about 4.7 inches in length.[71] They feed on zooplankton, primarily which is not a significant selenium partitioning pathway into Delta food webs, but Delta smelt also consume aquatic insect larvae when available.[72] Moreover, their spawning takes place in April and May in slow-water environments (e.g., side channels and sloughs) of the upper Delta and the lower Sacramento River in periods of low tidal activity. Beckon and Maurer report that Delta smelt larvae are "ecologically similar to larval and juvenile striped bass" in that they are not motile, but instead float in the water column where feeding occurs through random particle interactions.[73] (Bennett 2005: 18) Beckon and Maurer further note that Delta smelt obtained from the area of Chipps Island during the springs of 1993 (a wet year) and 1994 (a dry year, the seventh out of the previous eight) had whole body selenium concentrations of 1.5 µg/g dw (n=41, range from 0.7 to 2.3 µg/g dw; Beckon and Maurer 2008: 32), which are substantially lower than concentrations found in clams in the same region.

Delta smelt are known to prefer low salinity environments of from 2 to 7 parts per thousand salinity, such as is found in Suisun Bay and the northern and central Delta (McGinnis 2006). In drier years, the low salinity zone of the Delta estuary shrinks, however, and consequently Delta smelt habitat shrinks accordingly. Delta smelt eggs are spawned, fertilized, and attach initially during the April and May spawning season to the bottoms of slow-water hydrologic environments (e.g., backwaters in Table 7) prior to developing into larvae that then float in the water column in open water. These stages of Delta smelt life history take place in intimate proximity to hydrologic locations that are typical of selenium chemical speciation and partitioning, especially in lower flow regimes. Beckon states that Delta smelt spawning sites are now found largely in the north Delta channels associated with "the selenium-normal Sacramento River." However, Beckon appears to base his assessment of Delta smelt risk on a 1996 US Fish and Wildlife Delta smelt recovery plan, stating that Delta smelt "are nearly absent from the south-Delta channels associated with the selenium-contaminated San Joaquin River." This assessment appears to ignore at least two consecutive years (2000 and 2001) in which thousands of Delta smelt were killed at the state and federal project's pumping plants in the south Delta during the winter.[74] Beckon does not report on what if any selenium sensitivity studies have been done on Delta smelt in the field or in laboratory conditions.

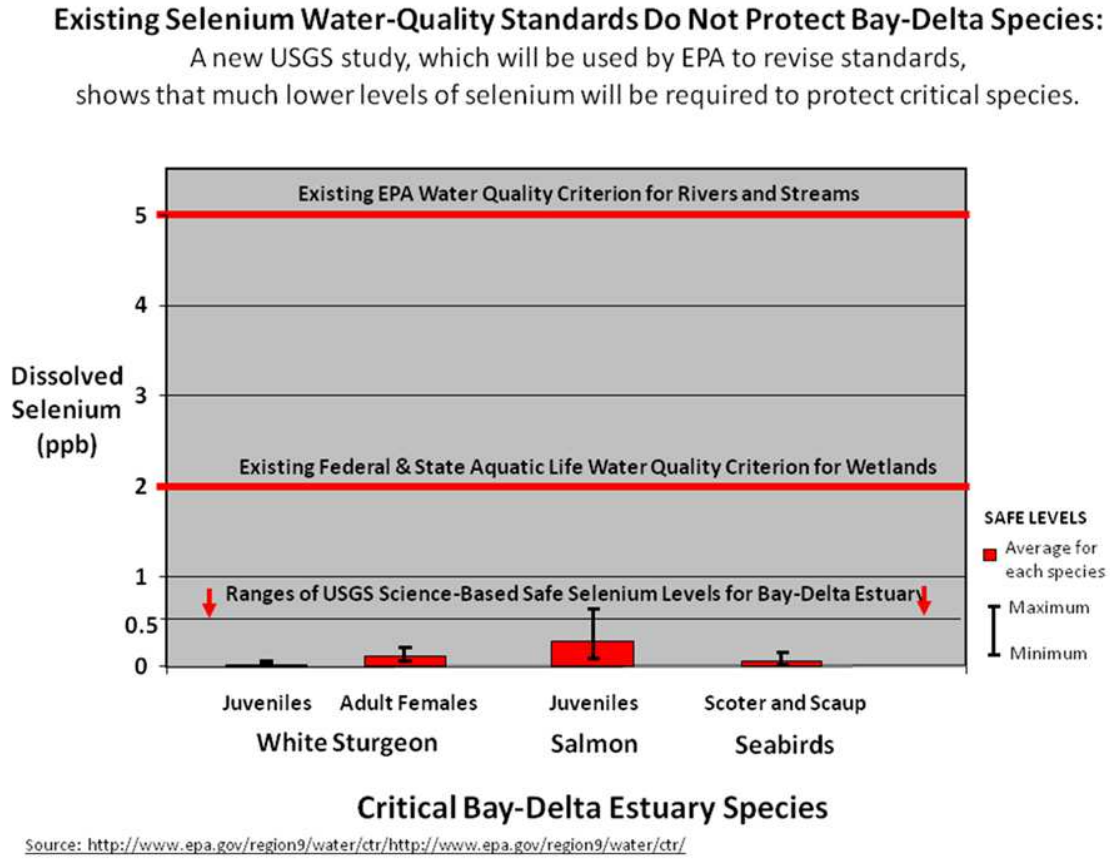
Presser and Luoma (2010b) and Beckon and Maurer both consider the Delta smelt to be at risk of selenium exposure in the Bay-Delta estuary. Presser and Luoma cite as reasons for its at-risk classification that its overall threatened status as an endemic Delta fish species, and the fact that it feeds on insect larvae that may take up selenium. They agree with Beckon that it does not feed in a clam-based food web since zooplankton are the more

[70] *Ibid.*, p. 31.
[71] *Ibid.*, p. 31.
[72] McGinnis, S.M., *Field Guide to Freshwater Fishes of California*, revised edition, California Natural History Series No. 77, Berkeley, CA: University of California Press, 2006, p. 197.
[73] Bennett, W.A. 2005. Critical Assessment of the Delta Smelt Population in the San Francisco Estuary, California. *San Francisco Estuary and Watershed Science* 3(2), Article 1, September, p. 18. Bennett has observed directly that in the water column Delta smelt larvae "swim continuously, and feeding success requires practically bumping into prey items rather than a coordinated attack behavior."
[74] Swanson, C. 2001. *The First Annual State of the Environmental Water Account Report*. The Bay Institute of San Francisco, September, 39 pages; and Swanson, C. 2002. *The Second Annual State of the Environmental Water Account Report*. The Bay Institute of San Francisco, October, 33 pages.

important component of Delta smelt diets. They write, "the sensitivity of delta smelt to selenium is unknown; population numbers are alarmingly low, so this species is particularly vulnerable to any adverse effect."[75]

Presser and Luoma (2006) earlier concluded from their selenium loading projections that white sturgeon (an Endangered Species Act-listed species) and greater and lesser scaup, surf and black scoters are at risk of significantly elevated selenium exposure given these selenium loading projections.[76] White sturgeon is a migratory fish, while the scaups and scoters are migratory estuary-based water birds that dive to prey on clams and other bottom-dwelling organisms.

Presser and Luoma continue to develop a modeling methodology by which regulators may reasonably set protective water column selenium concentrations that are appropriate to the ecosystems and hydrologic environments that need protection. They examine a broad spectrum of environments and identify partitioning factors (K_d) that characterize the relative rates of selenium partitioning (wherein selenium comes out of solution into particulate phase, available for bioaccumulation into food webs). Their broad characterizations of hydrologic environments and food webs is summarized in Table 7 (above).



[75] Presser, T.S. and S.N. Luoma, 2010b. *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California*, *op. cit.*, Table 4, p. 8, footnote 10.

[76] Presser and Luoma 2006: Table 33: 93; Presser and Luoma, 2010a; and Presser and Luoma, 2010b.

Their method links the detailed biogeochemistry of selenium in different environments to their food web relationships. Using these relationships, they expect to derive water column-based selenium criteria that link ecological relationships and hydrologic environments through which selenium moves.[77] Selenium has multiple routes through which it can expose fish and wildlife to its toxicity.

Policy choices are critical when applying Presser and Luoma's selenium model to the setting of protective selenium criteria. See Appendix D for a chronology of selenium regulation in the Bay Delta Estuary and its Central Valley watershed.

> Policy choices such as 1) the predator species [meant] to represent an ecosystem (e.g., toxicologically sensitive, ecologically vulnerable based on food web, resident or migratory, commercially or esthetically valuable) and 2) the food web [used] to represent an ecosystem (e.g., potentially restored food webs in addition to current food webs) also serve as important initial inputs into the development of protective scenarios for a site or watershed.[78]

These potential policy choices illustrate some of the many options for key species and ecosystems needing protection. There are many sensitive species for whom selenium exposures and possible food web pathways to selenium exposure have not been identified. Two key listed species in the Delta for which either no or limited data are available are the Delta smelt and Chinook salmon, discussed above. They deserve consideration by the State Water Resources Control Board and the US Environmental Protection Agency as sensitive listed species whose protection should be an important foundation on which selenium regulation should be revised in the San Joaquin River Basin and the Bay-Delta Estuary. The Bay-Delta Water Quality Control Plan has not yet had specific criteria pertaining to toxic contaminants. C-WIN believes the time is long past due for the State Water Resources Control Board to integrate the management of toxic contaminant threats such as selenium into its Bay-Delta estuary regulatory framework.

A great risk to the Delta's future health and quality are systemic changes that are likely to lengthen the residence time of waters passing through the Bay-Delta Estuary on their way to the Pacific Ocean, and in so doing increase risks of selenium poisoning and ecological damage in the Bay-Delta Estuary.[79] These risks originate with agricultural drainage accumulating in the San Joaquin River Basin due to irrigation of lands with soils impregnated with naturally occurring high selenium, salt, and other toxic contaminant concentrations and loads that must eventually be disposed of, else cultivation of western San Joaquin Valley lands will eventually go out of production.

There are three principal large-scale changes that each contribute to the prospect of increasing residence time in the Delta:

- Construction and operation of a peripheral canal or tunnel that would change the point of diversion for the south Delta pumping plants of the state and federal projects to the inflows of the Sacramento River at a north Delta diversion.
- Rising sea level in the Delta; and

[77] Presser and Luoma, *Methodology*, *op. cit.*, p. 704, 707.
[78] *Ibid.*, p. 707.
[79] Presser and Luoma 2006, 2010.

- Climate change affecting the volume, timing, and amount of inflows to the Bay-Delta Estuary from its major tributary watersheds, the Sacramento River Basin (including the Trinity River) and the San Joaquin River Basin

Under current hydrologic regimes, residence times of water in the south Delta and the North Bay can last from 16 days to three months in Suisun Bay during low flow, depending on levels of through-Delta discharge and mixing activity.[80] Removal of Sacramento River flows from the Delta will result in less overall fresh water reaching central Delta channels, such as through Georgiana Slough (or via the Delta Cross Channel, a Central Valley Project facility that serves the same purpose to get fresh water across the central Delta to the pumping plants in the south Delta). To compensate, far more water would have to flow into the Delta from the San Joaquin River, but this river on average has the capability of delivering only a fraction of Sacramento River flows under unimpaired conditions.

While San Joaquin flows need to be increased from its major tributaries to provide dilution flows (discussed above and in the Instream Flows chapter below), the San Joaquin can never fully replace Sacramento river flow volumes or timing. As a result, longer residence times should be expected for water containing selenium even in current selenium Total Mean Monthly Load (TMML)-compliant concentrations. The longer the residence time of flows from the San Joaquin River, the more opportunity there is for selenium to transfer chemically from its dissolved phase to particulate forms and become "bio-available." Once it becomes bio-available, selenium is readily accumulated by aquatic food webs in low- or no-flow areas of the Delta and Suisun Bay. If San Joaquin River Restoration Program activities restoring floodplain and riparian habitat where slow-water environments are created for rearing juvenile salmon and steelhead and Sacramento splittail, these environments may also become sites for growing selenium exposure and its damaging ecological effects. It will be vital to keep flows moving to avoid selenium toxicity exposures in the lower San Joaquin River and south and central Delta regions.

Mud Slough (north) on the west side, the lower San Joaquin River, and Suisun Bay are hydrologically connected. Rising selenium levels threaten many species, including salmon, white sturgeon, green sturgeon, and migratory birds that feed on bottom-dwelling organisms like clams and worms burrowing through sediments where selenium collects. Selenium concentrations in subsurface drain water in the San Joaquin River Basin exceed US Environmental Protection Agency aquatic selenium criterion for rivers and streams by 13 to 20 times (depending on whether the arithmetic or geometric mean is compared); by 32 to 50 times the aquatic criterion for westlands in California, and 130 to 200 times the level recommended as non-toxic in animal tissues by the US Geological Survey in recent research.[81] This is the reservoir of selenium toxicity that builds up. Selenium regulation needs to catch up with this reality.

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[80] Presser and Luoma, 2006, p. 17; Presser and Luoma, Methodology, p. 707; and Smith, L.H. 1987. *A Review of Circulation and Mixing Studies of San Francisco Bay, California*. US Geological Survey Open-File Report 87-534, 38 pages.

[81] Presser and Luoma, *Methodology*; Presser and Luoma, *Modeling*; and California Department of Water Resources. 2010. *San Joaquin Valley Drainage Monitoring Program, 2003-2005 District Report*, December. 132 pages, including appendices. Accessible online at http://www.water.ca.gov/pubs/drainage/2003-2005_drainage_monitoring_report__san_joaquin_valley/sjv_dmr_2003-2005_final.webfile.pdf.

Sea level rise also poses toxic challenges to the Delta's future. With the water in Delta channels at present sea level, direct concerns focus on additional hydrostatic pressures that rising sea levels will place on Delta levees. For this discussion, however, sea level rise is likely to result in two other aspects of hydraulic pressures upstream of the Delta:

(a) Larger and deeper (hence heavier) volumes of tidally influenced sea water reaching the Delta is expected to slow the rate at which subsurface flows into the Delta from both the Sacramento and San Joaquin River Basins can drain into the Delta.
(b) Larger volumes of tidally influenced sea water in the Delta will also slow the rate at which surface inflows to the Delta from major tributary watersheds will reach the Delta. (This potential effect could be compounded if the Sacramento River is diverted in the North Delta for direct delivery to the south Delta pumps.[82])

Slowing the escape of subsurface flows from the tributary valleys may result in slowed subsurface flow in both valleys, which could contribute to rising water table elevations. If groundwater elevations get to close to root zones, agricultural production can be disrupted. In areas where groundwater tables may be relatively deep, however, having them rise could be a benefit to some groundwater pumpers.

But in the San Joaquin River Basin, west side groundwater elevations are already very close to the surface, as discussed above. Having them rise further, with their saline and selenium-tainted water quality could be detrimental to irrigated cultivation in this part of the Basin.

This potential impact of climate change in the San Joaquin River Basin and the Delta would be further compounded by the trend, now seen in reduced snowpack and spring snowmelt, and increased rainfall and runoff. While extreme events like flooding and droughts may occur with greater frequency in the future in California, it is also anticipated that overall water supplies will decrease. In that event, residence time of waters in the Delta can be expected to increase as well with its implications of toxic damage in slow-water environments of the lower reaches of the San Joaquin River Basin and the Bay-Delta Estuary.

Regulatory Setting Omissions

Public Trust obligations of the State Water Resources Control Board are omitted.

It is not yet time to balance the public trust. The State Board should be setting water quality objectives that protect beneficial uses, period.

By setting its proposed San Joaquin River flow objectives at a percentage of unimpaired flow that maintains or closely approximates the status quo of actual flows in the river—flow levels that neither protect fish and wildlife beneficial uses in the river nor in the Delta—the Board fails to disclose in either its proposed Bay-Delta Plan amendment and its Draft SED that it has used an inchoate methodology to balance public trust beneficial uses to arrive at its flow proposal, or it has instead proposed a flow objective that ignores its obligation to

[82] Hanson, R., C. Faunt, M. Dettinger, and F. Munoz-Arriola. 2012. *Climate Data for CVHM [Central Valley Hydrologic Model]*, presentation delivered January 24, 2012, at US Bureau of Reclamation Offices, Sacramento, California, slide 42. Accessible online at http://ca.water.usgs.gov/projects/cvhm/cvhmWorkshop.html.

protect public trust beneficial uses of fish and wildlife in order to facilitate a transfer of flows from San Joaquin River tributaries (where agricultural beneficial uses would forego diversions) to route those foregone supplies to the South Delta export pumps of the state and federal water projects.

Governments have a permanent fiduciary responsibility and obligation to protect the public trust.[83] In *National Audubon Society v. Superior Court*, the California Supreme Court held that "the public trust is more than an affirmation of state power to use public property for public purposes. It is an affirmation of the duty of the state to protect the people's common heritage of streams, lakes, marshlands and tidelands, surrendering that right of protection only in rare cases when abandonment of that right is consistent with the purposes of the trust."[84] The act of appropriating water is an acquisition of a property right from the waters of the state, an act that is therefore subject to regulation under the state's public trust responsibilities.

The State Water Resources Control Board has invoked its public trust responsibilities in regulating the waters of California and acknowledges that the public trust is one of its ongoing regulatory responsibilities. Its most publicly prominent instance came in Water Rights Decision 1631 (D-1631) in 1994.[85] In D-1631, the Board balanced the needs of the City of Los Angeles for water supply from the tributaries of Mono Lake with the lake's own needs for water to sustain its ecosystem. It required Los Angeles to make releases from each of its tributaries that would sustain riparian ecosystems and help restore fish populations to the tributaries by prescribing lake level targets in a specified time period. The Board has also adopted regulations governing how it treats the public trust in matters of the appropriation of water in California.[86]

D-1631, however, was not a water quality control plan. It was a water right decision that followed on litigation over what terms and conditions should be imposed on the water right licenses of the City of Los Angeles by the State Water Resources Control Board. The Board's role in *planning* designating beneficial uses and identifying water quality objectives to protect them under the state and federal water quality control laws was not part of that decision. But it is in this instance.

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[83] Wrote Justice Racanelli in 1986: "In the new light of *National Audubon*, the Board unquestionably possessed legal authority under the public trust doctrine to exercise supervision over appropriators in order to protect fish and wildlife. That important role was not conditioned on a recital of authority. It *exists* as a matter of law." California Supreme Court, *National Audubon Society, et al., v. The Superior Court of Alpine County and Department of Water and Power of the City of Los Angeles*, et al. S.F. 24368. Filed February 17, 1983. Cited as 33 Cal.3d 419, (189 Cal.Rptr. 346, cert. denied, 464 U.S. 977), p. 441. Accessible online at http://www.monobasinresearch.org/images/legal/nassupct.htm.

[84] *Ibid.*

[85] State Water Resources Control Board, *Mono Lake Basin Water Right Decision 1631: Decision and Order Amending Water Right Licenses to Establish Fishery Protection Flows in Streams Tributary to Mono Lake and to Protect Public Trust Resources at Mono Lake and in the Mono Lake Basin*, September 28, 1994, 212 pages. Accessible online at http://www.swrcb.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1631.pdf.

[86] State Water Resources Control Board, *California Code of Regulations, Title 23 Waters, Division 3 State Water Resources Control Board and Regional Water Quality Control Boards* (Sections pertaining to water rights), January 2011, 168 pages. See Article 14, Standard Permit Terms and Conditions. Accessible online at http://www.swrcb.ca.gov/laws_regulations/docs/wrregs.pdf.

The California Legislature consolidated the State of California's water rights and water quality control responsibilities in the State Water Resources Control Board in 1967. Since that time, the Board has considerable authority to grapple with these questions and arrive at answers and solutions from them. The Board has authority to:

2. Plan for water quality control.
3. Receive, condition, and approve new water rights applications as permits.
4. Regulate and license water rights permits specifying the point of diversion, diversion flows, place of use, and purpose of use for water.
5. Investigate pre-1914 and riparian water rights to determine whether such claims to divert and use water are legal, including follow-up enforcement against illegal uses when determined (discussed below).
6. Investigate and enforce the state's prohibition of waste and unreasonable use and wasteful and unreasonable method of diversion of water under the California Constitution, Article X, Section 2.
7. Protect the public trust. As an agency of the state, the Board is charged with ensuring the state of California carries out its fiduciary responsibility to protect air, running water, the sea, and the seashore, "these things that are common to all," as stated originally in Roman law (the Institutes of Justinian).

California's constitution promises water rights only up to what is a reasonable use. No one has a right in California to use water unreasonably, not even the federal government.[87] The Public Trust Doctrine provides that no one has a vested right to appropriate water in a manner harmful to the interests protected by the public trust.[88] And the dictionary definition of usufructuary rights, of which both riparian and appropriative water rights are examples, indicates that a fundamental principle of usufruct is that it connotes only a right to *use* a resource like water, not to waste or use it unreasonably. The State Water Resources Control Board will be deciding whether and how California's abundant legal authorities apply to the Bay-Delta Estuary's Central Valley watershed, assuming it does not abuse its administrative discretion in so doing.

In mid-2009, the State Water Resources Control Board updated its review of the Water Quality Control Plan which its Water Right Decision 1641 (D-1641) implements. The Board took the position that to change its water quality and flow criteria it needed more scientific information about flows reasonably needed to protect fish and wildlife beneficial uses.[89] Its impetus to consider making changes at that time included pronounced fisheries declines among both open water resident and migratory fish, and the still-unfolding impacts of climate change and its impacts on the Bay-Delta estuarine system.[90] The California

[87] California Constitution, Article X, Section 2.
[88] *National Audubon Society, op. cit.*
[89] State Water Resources Control Board, *Periodic Review of the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, Adopted by Resolution 2009-0065, August 4, 2009, p. 17. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/index.shtml.
[90] *Ibid.*, p. 9.

Department of Fish and Game sought to build a salmon survival model to assist the Board's need for additional information.[91]

Later in 2009, the California Legislature directed the State Water Resources Control Board to prepare a report on Delta flow criteria that would "develop new flow criteria for the Delta ecosystem necessary to protect public trust resources" and in so doing "use the best available scientific information." The Legislature directed the Board to gather the information as part of an "informational proceeding" rather than through an evidentiary hearing. And the Legislature charged the Board with including volume, quality and timing of water necessary for the Delta ecosystem under different conditions.[92]

The Board produced its Delta flow criteria report after taking detailed testimony on the best available science for key fish species and ecosystems. The report identified a set of broad flow regimes for upstream tributaries providing inflow to the Bay-Delta Estuary that fish need to survive and recover. They represent the Board's consideration of the best available fishery and hydrologic science it considered during 2010 addressing the question: what flows do fish need? The Board confirms this when it stated in a footnote, "...the flow criteria developed in this proceeding are intended to halt population decline and increase populations of certain species," and acknowledged that, "Recent Delta flows are insufficient to support native Delta fishes for today's habitats….Flow and physical habitat interact in many ways, but they are not interchangeable."[93]

The Board states that the flow criteria "must be considered" in context:

a. The flow criteria do not consider any balancing of public trust resource protection with public interest needs for water.
b. The State Water Board does not intend that the criteria should supersede requirements for health and safety such as the need to manage water for flood control.
c. There is sufficient scientific information to support increased flows to protect public trust resources; ***while there is uncertainty regarding specific numeric criteria, scientific certainty is not the standard for agency decision making.***[94]

The Board's flow determinations are:

1) 75 percent of unimpaired Delta outflow from January through June.
2) 75 percent of unimpaired Sacramento River inflow from November through June.

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[91] California Department of Fish and Game. 2010. *Flows Needed in the Delta to Restore Anadromous Salmonid Passage from the San Joaquin River at Vernalis to Chipps Island, Central Region*, February, Prepared for the Informational Proceeding to Develop Flow Criteria for the Delta Ecosystem Necessary to Protect Public Trust Resources Before the State Water Resources Control Board, 38 pages. Accessible online at http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/exhibits/dfg/dfg_exh3.pdf.

[92] Water Code § 85086(c).

[93] State Water Resources Control Board, *Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem,* Prepared pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009, p. 5 and 120. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf. Approved unanimously by the Board in Resolution No. 2010-0039. Hereafter cited as "2010 Delta Flow Criteria Report."

[94] *Ibid.*, p. 4.

3) 60 percent of unimpaired San Joaquin River inflow from February through June.
4) Increased fall Delta outflow in wet and above normal years.
5) Fall pulse flows on the Sacramento and San Joaquin Rivers to stimulate migrating fish.
6) Flow criteria in the Delta interior to help protect fish from mortality in the central and southern Delta caused by operations of the state and federal water export pumps.

In essence, these flow determinations represent the Board's answer to the question, "what flows do fish need in the Central Valley watershed and the Bay-Delta Estuary?" The Board's flow determinations also answer the question of what level of flow protects the most sensitive beneficial uses in the Delta, as we have described in Section II of this letter. The State Water Resources Control Board's 2010 Delta flow criteria report acknowledged that protective Delta outflows start with protective tributary inflows to the Delta. The Board's Delta inflow criteria rely on a percentage of unimpaired flow measure, which enables the flow criteria on the Sacramento and San Joaquin rivers to more closely mimic their natural hydrographs than now occurs.

For the San Joaquin River, the State Water Resources Control Board approved its determination that 60 percent of unimpaired flow from February through June for the river basin would protect juvenile Chinook salmon during their peak emigration period. For the Sacramento River, the Board adopted the criterion of 75 percent of unimpaired flow from November through June. (This is because numerous runs of migratory salmon use the Sacramento River Basin for more of the year.) These constrained periods would also benefit the rearing period of juvenile salmon in the basin's major tributaries upstream. The Board also adopted in that report (2010) a fall season Delta inflow criterion calling for an average flow of 3,600 cubic feet per second for 10 days sometime during late October.

Nearly all scientists testifying to the Board in March 2010 agreed that mimicking the natural hydrograph (in shape if not in magnitude and volume of flow) is necessary to improve conditions for native fish species, and to counter invasive species in the Delta. Existing Board water quality and flow objectives intended to protect fish and wildlife beneficial uses in the south Delta are not working, as shown in abundant evidence presented to the Board at its hearings for the Delta Flow Criteria report. The Board includes much of that data in its report.[95]

In August 2010, the State Water Board approved these currently nonbinding Delta inflow determinations for the Sacramento and San Joaquin rivers.[96] The State Water Resources Control Board observed that using such flow criteria would mean that "to achieve the attributes of a natural hydrograph, the criteria are advanced as a percentage of unimpaired flow on a 14-day average, *to be achieved on a proportional basis from the tributaries to the San Joaquin River.*"[97] (State Water Resources Control Board, 2010: 120, emphasis added) The Board makes an important point that mimicking natural hydrograph and improving prospects for species recovery depends on achieving proportional flow allocations from all the major tributaries. Proportional tributary contributions would be needed to implement the Board's broader Delta inflow criteria. The Board will need to answer key questions

[95] *Ibid*., pp. 41-98.
[96] *Ibid.*, pp. 114-123.
[97] *Ibid.*, p. 120.

including: what should those proportions be, how should responsibility for them be assigned, and who will be responsible for providing them? And: when will the upper San Joaquin River be included by the Board in making these determinations?[98]

A question for the Board is how to do proportional flows *legally.* Proportional tributary contributions from Delta inflow are not new. In 1992, the California Department of Fish and Game proposed a method to identify tributary contributions to Delta inflows based on the pro rata share of unimpaired runoff each tributary generates to the Delta, as identified in the California Department of Water Resource's Bulletin 120 each year.[99] Other allocation methods could be devised as well, such as one based on reservoir storage on these same tributaries. The State Water Board in its Draft Water Right Decision 1630 presented such a method, but which, like the proposal now under consideration, excluded contributions from the San Joaquin River above Mendota Pool.[100]

Proportional tributary contributions needed to fulfill Delta inflow determinations from the major tributaries of the Sacramento and San Joaquin River Basins will require changes to the water rights of major water users in these Basins. The State Water Resources Control Board has authority over water rights to reallocate water usage and ensure compliance with the Board's Delta inflow objectives. The Board received testimony from EWC member organizations California Water Impact Network, California Sportfishing Protection Alliance, and AquAlliance providing a method that incorporates all demands for water in the watershed of the Bay-Delta Estuary by capturing full natural (unimpaired) flow, flows needed for nonconsumptive instream uses, and flows available for consumptive uses (nearly all of which are based in water rights claims).[101] That water availability analysis complies with Justice Racanelli's legal standard for attaining a "global perspective" in determining demands of water by all beneficial uses without omitting the other water users (holding water rights) that Racanelli wanted included by the Board. The Board should make clear in the Bay-Delta Plan that the implications of such a water availability analysis be addressed in the Bay-Delta Plan's implementation program.[102]

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[98] Right now, the Board excludes the upper San Joaquin River from its Bay-Delta Estuary planning deliberations. C-WIN evaluates the Board's stance in Appendix B of Stroshane, *Testimony on Water Availability analysis, op. cit.*

[99] California Department of Fish and Game. 1992. *Summary and Recommendations for the Department of Fish and Game's Testimony on the Tributaries to the Sacramento-San Joaquin Estuary*, presented to the State Water Resources Control Board, Interim Water Rights Actions Phase, Bay-Delta Estuary Proceedings, WRINT-DFG Exhibit No. 29, 8 pages.

[100] State Water Resources Control Board. 1992. *Draft Water Right Decision 1630: San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, December, 121 pages, Tables IV and V.

[101] Stroshane,T., *Testimony on Water Availability Analysis for Trinity, Sacramento, and San Joaquin River Basins Tributary to the Bay-Delta Estuary*, Submitted by the California Water Impact Network on behalf of California Sportfishing Protection Alliance, and AquAlliance on October 26, 2012, for Workshop #3: Analytic Tools for Evaluating Water Supply, Hydrodynamic, and Hydropower Effects of the Bay-Delta Plan. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/comments111312/tim_stroshane.pdf..

[102] Assuming that the State Water Board adopts the 75 percent unimpaired flow determination for the upstream tributaries of the Sacramento River Basin, the 60 percent of unimpaired flow determination for the San Joaquin River Basin, and that the water rights priority system is applied, it becomes evident that several significant water rights claimants that are junior in priority contribute dramatically to the problem of paper water: They have been promised water far in excess of flow conditions available to them in most years.

Appendix D.1 of Mr. Stroshane's testimony for C-WIN (submitted October 26, 2012 to the State Board for the Bay-Delta Plan comprehensive review) is an example of what Justice Racanelli stated the Board should provide in its water quality planning for the Bay-Delta Estuary.[103]

By adopting its public trust Delta inflow and outflow determinations as flow objectives in the Bay-Delta Plan for each major tributary, and applying water rights priorities—in that order—the State Water Resources Control Board can use its authority to eliminate paper water (propertied beneficial uses of water that do not have a basis in water quality law) in the Bay-Delta Estuary's Central Valley watershed. This is because beneficial uses and water quality objectives *define* reasonable use and protection of the public trust simultaneously, in practical and legally compliant terms. The California Constitution reminds us that no one in California has a right to use or divert water wastefully or unreasonably. The state's public trust responsibility requires protection of the waters of the state for the benefit of all beneficial users, not just water rights holders. The federal Clean Water Act requires that the protections adopted must be for those beneficial uses that are the most sensitive to impairment from whatever cause. The state's water quality control planning obligation is to carry out this responsibility. It also helps the state meet its public trust obligations as well. The doctrine of prior appropriation requires that senior water right holders be served before junior water right holders. The water quality control planning process and the water rights priority system on the major tributaries of the Sacramento and San Joaquin River Basins should be used as tools for eliminating paper water—that is, for quieting water titles, and ending trespasses and boundary disputes that impair public trust resources—to uses that conflict with legitimately designated beneficial uses.

The Board has omitted nearly all reference to the 2010 Delta Flow Criteria Report and its informational proceeding. It is omitted from the Board's Draft SED timeline appearing in Sections ES4 and Table 1-1 as well. In neither Appendix K, containing the proposed San Joaquin flow and South Delta salinity objectives, nor Chapter 19 of the Draft SED (addressing "Antidegradation Policy Analysis), nor the rest of the Draft SED, has the State Board conducted an analysis of how it takes account of, let alone balances, the public trust and antidegradation policy, as it is obligated to do. The State Board abuses its discretion by neglecting this obligation. We respectfully request that the Board decline to certify the Draft SED and the proposed San Joaquin River flow and South Delta salinity objectives until these rationales behind its inchoate decision-making are disclosed.

The Board fails to disclose the vital role of federal Clean Water Act policies and regulations with which the State Water Resources Control Board must comply.

The Board fails to disclose federal Clean Water Act requirements in its regulatory setting, leaving readers with the impression that Porter-Cologne Water Quality Control Act requirements dominate the regulatory requirements for which the Board plans and with which it must comply. Such an implication would be incorrect about the legal framework within which the State Water Board must act. The proposed plan amendments and the Draft SED fail to disclose that the Board must consider new water quality objectives that protect the most sensitive beneficial uses in the Bay-Delta Estuary under the federal Clean Water

[103] Appendix D.1 in Stroshane, *Testimony on Water Availability Analysis*, *op. cit.*

Act and its implementing regulations administered by the US Environmental Protection Agency.

The primary purpose of water quality control planning under the federal Clean Water Act is to prepare or develop comprehensive programs for preventing, reducing, or eliminating the pollution of the navigable water and ground waters and improving the sanitary condition of surface and underground waters. The Act continues:

> In the development of such comprehensive programs *due regard shall be given to the improvements which are necessary to conserve such waters for the protection and propagation of fish and aquatic life and wildlife*, recreational purposes, and the withdrawal of such waters for public water supply, agricultural, industrial, and other purposes.[104]

Congress clearly intends through the Clean Water Act that water quality control plans are to be used to *improve* water quality, not merely maintain it. Congress's declaration of goals and policy for the Act call for restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. It states goals for eliminating discharge of pollutants; protecting and propagating fish, shellfish, and wildlife; prohibit discharge of toxic pollutants; and to recognize, preserve, and protect the primary responsibilities and rights of states to prevent, reduce, and eliminate pollution, plan the restoration, preservation, and enhancement of land and water resources. Research priorities funded under the Act are intended to foster prevention, reduction and elimination of pollution in the waters of the United States. These goals intend neither *stasis* nor *degradation;* they intend *change in the direction of making water quality better.*

The heart of water quality control under these laws is first the designation of the beneficial uses to be protected, and second the setting of standards, criteria, and objectives that provide reasonable protection for those beneficial uses. This vital principle of water quality control law is omitted from the regulatory setting. From this omission flows a cascade of planning failures by the Board, making this a deeply flawed process.

From this Draft SED, it appears the Board does not intend to use its water quality control powers to materially improve water quality in the South Delta and the lower San Joaquin River. Similarly, the Board proposes a new set of flow objectives for San Joaquin River inflow to the Delta that offers no significant change in flows while providing for no significant change in south Delta exports to state and federal water contractors by the California Department of Water Resources and the US Bureau of Reclamation. The Board goes to great lengths to avoid dealing with the Delta's well-documented ecological collapse.

The State Water Resources Control Board is accountable to the US Environmental Protection Agency under the federal Clean Water Act. The Board is obligated by the Clean Water Act to operate a "continuing planning process." Each time the State Board approves a new plan, the federal Clean Water Act requires that the EPA Administrator "shall from time to time review each State's approved planning process for the purpose of insuring that such planning process is at all times consistent with" the legal standards of the Clean Water

[104] 33 USC 1252. Emphasis added.

Act.[105] The EPA Administrator is empowered by the Clean Water Act to disapprove any water quality objectives approved by the State Board which in the Administrator's view are inconsistent with Clean Water Act requirements. The Administrator may promulgate compliant water quality standards instead within a specified time period.[106] The USEPA still maintains a placeholder regulation for "California" in its Clean Water Act regulations.[107]

The State Water Resources Control Board is also authorized to implement Clean Water Act requirements for water quality control policy and enforce water quality objectives through the Porter-Cologne Water Quality Control Act. This information is vital for readers to understand exactly what is involved in the Board's decisions concerning San Joaquin River flow and South Delta salinity objective changes. Why did the State Water Board omit these vital legal requirements from the above regulatory setting sections of the Draft SED?

The Board fails to disclose in its regulatory setting (especially Sections 1.5 and in Chapter 5) that there are important steps it must follow to designate beneficial uses and establish water quality objectives to protect them.

There are three key elements in water quality planning law: the designated beneficial uses, water quality standards or objectives, and compliance with antidegradation policy. Whenever the State Board revises or adopts a new standard, the Board must submit it to the EPA Administrator for review. Such standards are to consist of "designated uses" (which the California Porter-Cologne Water Quality Control Act calls "beneficial uses") and "water quality criteria" (which the Porter-Cologne Water Quality Control Act calls "water quality objectives") that represent the level of protection for the beneficial use.

> Such standards shall be such as to protect the public health or welfare, *enhance* the quality of water and serve the purposes of this chapter. Such standards shall be established taking into consideration their use and value for public water supplies, *propagation* of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and also taking into consideration their use and value for navigation.[108]

The purposes of the Clean Water Act, which this section incorporates, include:

b. Restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters;
c. Protecting and propagating fish, shellfish, and wildlife
d. Providing for recreation

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[105] 33 U.S.C. 1313(e)(2). Moreover, this section states, "The Administrator shall not approve any State permit program under subchapter IV of this chapter for any State which does not have an approved continuing planning process under this section."

[106] 33 U.S.C. 1313(a)(2).

[107] 40 CFR 131.37, accessible online at http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=d5e7e1e03ae07b72fb89e47ac2e6b5b9&rgn=div8&view=text&node=40:23.0.1.1.18.4.16.7&idno=40.

[108] 33 U.S.C. 1313 (c)(2)(A). Emphasis added. "Enhance" means to "intensify, increase, or further improve the quality, value, or extent of" something. One meaning of "propagate" is to "cause (something) to increase in number or amount." "Restore" can mean to "return (someone or something) to a former condition, place, or position." In general, the plain language of Clean Water Act policies on protection of beneficial uses is not merely intended to maintain water quality but to increase or improve water quality as well as to return water quality to former conditions of chemical, physical, and biological integrity..

e. Prohibiting discharge of toxic pollutants
f. Protecting the right of states to prevent, reduce, and eliminate pollution
g. Planning for development and use (including restoration, preservation, and enhancement) of land and water resources
h. Preventing, reducing and eliminating pollution through research and financial aid.[109]

Under the Porter-Cologne Water Quality Control Act, beneficial uses to be "*protected against quality degradation*" may include domestic, municipal, agricultural and industrial supplies; power generation, recreation, aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.[110] The Act identifies the definition of beneficial uses simultaneous with the need to protect the uses from quality degradation. Under this Act, "water quality objectives" are defined to mean the "limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area."[111] Porter-Cologne recognizes "that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses." But before doing so, the Board must take account of several factors, the relevant parts here including:

- Factors to be considered...in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:
- Past, present, and probable future beneficial uses of water.
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
- Economic considerations.
- The need for developing housing within the region.
- The need to develop and use recycled water.[112]

The State Water Resources Control Board has since 1991 designated 17 specific beneficial uses of water in its Bay-Delta Estuary water quality control plans.[113] These beneficial uses have not changed during this period. Thus, the Bay-Delta Estuary and its watershed contain waters with multiple beneficial uses by the State Board. EPA Clean Water Act regulations require that water quality criteria (or in California's term, "water quality objectives") must be based on sound scientific rationale and must contain sufficient parameters or constituents. Such objectives shall protect the most sensitive beneficial use in areas where there are multiple uses.[114]

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[109] 33 U.S.C. 1251(a) and (b).
[110] California Water Code §13050(f). Emphasis added.
[111] California Water Code §13050(h).
[112] California Water Code §13241.
[113] These beneficial uses include: municipal and domestic supply, industrial service supply, industrial process supply, agricultural supply, groundwater recharge, navigation, contact and non-contact water recreation, shellfish harvesting, commercial and sport fishing, warm fresh water habitat, cold fresh water habitat, migration of aquatic organisms, spawning, reproduction and/or early development of fish, estuarine habitat, wildlife habitat, and rare, threatened or endangered species' habitats.
[114] 40 CFR 131.11(a).

Existing South Delta Salinity Objectives

The Board has since 1978 treated salinity as a nonpoint source pollutant that potentially harms agricultural beneficial uses in the western and southern Delta. Since 1978, the Board's South Delta salinity objectives regulate salinity concentrations at Vernalis on the lower San Joaquin River and at the interior South Delta monitoring stations at Tracy Boulevard Bridge at Old River, Old River near Middle River, and Brandt Bridge on the San Joaquin River (downstream of the head of Old River). These interior South Delta objectives currently range from 0.7 Electrical Conductivity (EC) during the irrigation season (April 1 through August 31) to 1.0 EC from September 1 through March 31. Enforcement has long been lax. It was not until the State Water Resources Control Board issued Water Rights Decision 1641 (D-1641) in March 2000 that it assigned responsibility to the Department of Water Resources and the US Bureau of Reclamation for attaining these salinity objectives.

The existing South Delta salinity objectives are intended to protect South Delta agricultural beneficial uses, which includes protection of the water rights of South Delta agricultural water users. The current objectives protect these water rights by providing that level of salinity (as measured in terms of electrical conductivity) that meets the quality requirements of the beneficial uses served by those rights. To relax these objectives would be a conscious State Water Resources Control Board choice to impair agricultural beneficial uses and injure water rights of these beneficial users in the South Delta. This proposed action would violate the federal Clean Water Act's antidegradation policy and the Board's own 1968 resolution protecting against antidegradation of the state's waters.

In the 1978 Bay-Delta Water Quality Control Plan, the State Water Board established water quality objectives of 500 milligrams per liter (mg/L) at Vernalis, and 0.7 EC (maximum 30-day running average of mean daily EC in mmhos) during the irrigation from April 1 through August 31, and 1.0 EC from September 1 through March 31.[115] At that time, the Board wrote,

> An implementable solution for the southern Delta has eluded the best efforts of responsible public agencies for well over twenty years. *Prior to 1944 water quality in the southern Delta was suitable for agricultural uses. Upstream depletions and water quality degradation of the San Joaquin River and its tributaries have greatly reduced the flows and quality available for protection of the southern Delta.*
>
> ...Implementation of these standards could be achieved through the Board's broad enforcement authority. As previously indicated, all of the water right permits for the San Joaquin River Basin upstream of the Delta include a paramount provision that appropriations under these Board entitlements are subject to prior vested rights.

The California Third District Appellate Court in 1986 criticized the Board for protecting water rights rather than beneficial uses when making its water quality decisions. But nowhere in the Board's findings in either Chapter V or VI of the 1978 plan did the Board take note of or consider setting its South Delta salinity objectives with reference to agricultural beneficial uses *in the export service areas of the federal Central Valley Project and the State Water Project*. (The Board acknowledged that these uses of water existed in

[115] State Water Resources Control Board, *Water Quality Control Plan, Sacramento-San Joaquin Delta and Suisun Marsh*, August 1978,Table VI-1, p. VI-29. The interior South Delta salinity objectives have been applied by the Board ever since 1978. The Vernalis salinity objective was changed to match the interior South Delta objectives in the 1991 Bay-Delta Water Quality Control Plan. Emphasis added.

the planning area, but did not take those uses of water as an object for setting the South Delta salinity objectives.) At the time, the State Water Board set the water quality objective to protect agricultural beneficial uses using the least tolerant, and therefore most sensitive agricultural uses. The interior South Delta salinity objectives were set with respect to the salt tolerance of beans in the summer irrigation season (0.7 EC) and alfalfa in the winter irrigation season (1.0 EC).[116] (No entity was made responsible for compliance at that time, however.)

In the 1995 Bay-Delta Water Quality Control Plan, the State Water Board stated for agricultural beneficial uses:

> The water quality objectives in Table 2 are included *for the reasonable protection of the beneficial use, AGR, from the effects of salinity intrusion and agricultural drainage in the western, interior, and southern Delta.* With the exception of the effective date of the salinity objectives for the southern Delta stations on Old River, *these objectives are unchanged from the 1991 Bay-Delta Plan*.[117]

These water quality objectives were again left unchanged in the 2006 Bay-Delta Plan.

> The beneficial uses to be protected were established in the 1978 Delta Plan and the 1991 Bay-Delta Plan. Since all of the beneficial uses exist and *there were no requests for changes in the beneficial uses, these uses are carried over in this plan from earlier plans, including the 1995 Plan.*[118]

Over the last 35 years, water exportation from the Delta has not been a designated beneficial use and under the Board's water quality control plans receives no explicit consideration for protection as a beneficial use in any of these water quality control plans. As shown by the Board's own consistent record of designating and maintaining South Delta agricultural beneficial uses and salinity objectives together, the question arises: On what basis does the Board propose relaxing south Delta salinity objectives?

Not only are there no Delta export beneficial uses in the record of the last four Bay-Delta water quality control plans, but in D-1641 the Board placed responsibility for meeting South Delta salinity objectives to protect South Delta agricultural beneficial uses on the shoulders of the US Bureau of Reclamation and the California Department of Water

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[116] According to the 1978 Bay-Delta Water Quality Control Plan, page VI-18: "The drainage and high water table problems in portions of the southern Delta limit the type of crops which can be grown. *For instance, beans were grown on about 20,000 acres in the southern Delta during the early 1930s. Field beans are now grown on only about 2,400 acres in the southern Delta. A reason advanced for this decline is the poorer water quality presently available to the southern Delta.* Most of the beans now grown in this area are black-eyed beans, because they are more salt tolerant. Even these salt tolerant beans are grown generally in areas receiving Delta-Mendota Canal water due to its better quality." Emphasis added.

[117] *Water Quality Control Plan for Salinity, San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 95-1WR, May 1995, p, 12 and Table 2, p. 17. Emphasis added.

[118] *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, December 13, 2006, p. 8, and Table 2, p. 13. Emphasis added. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/docs/2006_plan_final.pdf.

Resources, the exporters themselves.[119] The Board did so recognizing that the major source of salinity in the San Joaquin River to the South Delta was a result of agricultural drainage generated by naturally salinized lands of the western San Joaquin valley which were irrigated with water exported by the Central Valley Project from the Delta.

Antidegradation Policy—Failure to Protect Agricultural Beneficial Uses in the South Delta From Unjustified Degradation of Salinity Conditions, and Failure to Provide an Antidegradation Analysis at all.

National water quality policy since 1972 obligates the states, including California, to improve water quality, whatever its current condition, and since 1987 requires satisfaction of antidegradation requirements that EPA established in Clean Water Act regulations.[120] US EPA established a regulatory framework for antidegradation policy that requires states to develop antidegradation policies. The heart of EPA antidegradation criteria include: Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

Lowering of water quality may only be tolerated in instances where it "is necessary to accommodate important economic or social development in the area in which the waters are located...after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning processes." The Board can only proceed with lowering water quality objectives where it provides and sustains a clearly supported and convincing argument about the economic and social development in the area. Since the Board merely describes the antidegradation policies that apply to its proposed actions evaluated in the Draft SED, and does not provide any such economic or social analysis in that antidegradation chapter, the Board cannot proceed with lowering either the water quality of the South Delta or the objective intended to protect agricultural beneficial uses there.

Moreover, the state must still assure water quality adequate to protect existing agricultural uses fully even if it proceeds with relaxing the South Delta salinity objectives. Further, the state shall assure that there shall be achieved the "highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control."[121]

Antidegradation analysis under federal policy must assure that "existing instream water uses and the level of water quality necessary to protect the existing uses" is "maintained and protected."[122] In addition, the Draft SED for the San Joaquin River flow and South Delta

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[119] State Water Resources Control Board. 2000. *Revised Water Right Decision 1641: In the Matter of Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; A Petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and A Petition to Change Places of Use and Purposes of Use of the Central Valley Project*, December 29, 1999, revised in accordance with Order WR 2000-02, March 15, 193 pages. Accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf

[120] 33 U.S.C. 1313 (d)(4)(B).

[121] 40 CFR Part 131.12(a)(1) and (2).

[122] 40 CFR 131.12(a)(1).

salinity objectives states that "the project area's water bodies are classified as Tier 2 water bodies as per the Federal Antidegradation Policy."[123] This *only* allows consideration of lowering water quality "where it is necessary to accommodate important economic or social development *in the area in which the waters are located.*" From the standpoint of South Delta agricultural beneficial uses to be protected, there should have been *no* consideration of changing the existing interior South Delta salinity objectives. There was no legal reason to.

The State Water Resources Control Board's own "Statement of Policy with Respect to Maintaining High Quality of Waters in California" states:

> Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."[124]

Our analysis in this letter demonstrates that the State Water Board has never designated as a beneficial use for purposes of Delta water quality planning the export areas served by the federal Central Valley Project and the State Water Project. These areas, therefore, are not to be considered as areas of "important economic or social development" in relation to the "area where the waters are located." In this instance, that area is the South Delta; the South Delta does not extend to include the San Luis Unit or Delta-Mendota Canal service area of the Central Valley Project, or any service area served by the State Water Project's California Aqueduct. In this light, under federal Clean Water Act antidegradation policy the State Water Board abuses its discretion by undertaking a planning process to lower the salinity objectives in the South Delta area, and we respectfully request that the Board not approve the proposed salinity objectives it has developed through this deeply flawed process.

Antidegradation Policy—Application to San Joaquin River Flow Objectives

US EPA Region 1, consistent with *PUD No. 1 of Jefferson County v. Washington Department of Ecology*, 511 U.S. 700 (1994), has found that a state's antidegradation program "must obviously address water withdrawals" as well as discharges.[125][1] California's antidegradation policy (Resolution 68-16, Oct. 1968) contemplates the policy's application to water rights permits, reading in part:

> WHEREAS the California Legislature has declared that it is the policy of the State that *the granting of permits and licenses for unappropriated water* and the disposal of wastes into the waters of the State *shall be so regulated as to achieve*

[123] 2012 Draft SED, p. 19-2.
[124] State Water Resources Control Board, Resolution No. 68-16 (Oct. 28, 1968), Part 1. Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/laws_regs_policies/rs68-016.pdf.
[125] Letter from John DeVillars, US EPA Region 1, to Timothy Keeney, Rhode Island Department of Environmental Management (June 25, 1996), p. 3 (available upon request).

highest water quality consistent with maximum benefit to the people of the State….[126]

Antidegradation analysis of water withdrawals has particular importance in California given a recent decision of the Third Appellate Court. In the *Asociacion de Gente Unida* decision, the Court found that "[t]he antidegradation policy measures the baseline water quality as that existing in 1968 and defines high quality waters as the *best quality achieved since that date."*[127] It further finds that any actions to lower water quality below that level trigger the antidegradation policy, unless those levels are consistent with state-adopted water quality objectives.[128] By this definition, the proposed actions trigger preparation of an adequate antidegradation analysis, which must include findings to support the above requirements if lowering of water quality is to be legally allowed. Water quality lowering almost invariably accompanies water diversions, in the form of changes in flow-related parameters such as dissolved oxygen, temperature, sediment, bacteria, and other pollutants.

As summarized by US EPA, all three water quality law components—designated uses, criteria to protect the designated uses, and the state's antidegradation requirements—are "relevant and vital tools to protect and restore healthy hydrology."[129] California must consider hydrology impacts in its antidegradation analysis, and perform the assessments necessary to justify any concomitant degradation consistent with state and federal antidegradation policies.

[126] State Water Board Resolution No. 68-16, *op. cit*., note 73 above.
[127] *Asociacion de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Board* (Cal. App. 3d, Nov. 6, 2012), No. C066410, p. 22. Emphasis added.
[128] *Ibid*., pp. 21-22.
[129] Letter from James Giattina, US EPA Region 4 to Lance LeFleur, Alabama Department of Environmental Management, "Alabama Water Agencies Working Group: EPA Region 4 Stakeholder Comments," p. 9 (Nov. 19, 2012) (available upon request).

Regulatory Setting Omissions—Selenium Regulation

Because of the absence of substantive environmental setting descriptions involving selenium discharge and toxicity, there is also inadequate treatment in the Draft SED of the Board's regulation of selenium since its toxicity and prevalence became widely known in the 1980s. We respectfully request that the Board include this setting information in chapters 5 and 9 of the Draft SED pertaining to water quality and groundwater.

The Grasslands Bypass Project was started in 1996 as a means of preventing discharge of selenium-contaminated subsurface agricultural drainage water into wildlife refuges and wetlands in the Grasslands Basin, tributary to the San Joaquin River. The Grassland Bypass Project is operated by the Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. The drainage water is "bypassed" around the refuges, wetlands and Salt Slough, and is conveyed into a segment of the San Luis Drain where it discharges to Mud Slough (north), a tributary of the San Joaquin River a few miles from the former Kesterson evaporation ponds. (See Figure A-3.)

The Grasslands Drainage Area is primarily in the northerly area of the San Luis Unit, but also includes lands within the Delta Mendota Canals Unit of the CVP as well as a portion of the San Joaquin River Exchange Contractors. Figure A-2 shows the geographic location of the Grassland Drainage Area in relation to the service areas of the local water providers.

> The GDA is located on the western side of the San Joaquin River roughly between Los Banos to the north and Mendota to the south. The GDA consists of Charleston Drainage District, Pacheco Water District, Panoche Drainage District, a portion of the Central California Irrigation District (CCID) known as Camp 13 drainage area, Firebaugh Canal Water District, Broadview Water District (acquired by Westlands Water District following retirement from irrigation), and Widren Water District. The In- Valley drainage reuse area, called the San Joaquin River Water Quality Improvement Project (SJRIP), is owned and operated by Panoche Drainage District.[130]

[130] San Luis & Delta Mendota Water Authority and United States Bureau of Reclamation. 2009. *Final Environmental Impact Statement/Environmental Impact Report on Grassland Bypass Project, Appendix E.2: Selenium Ecological Risk Assessment*, 12 pages.

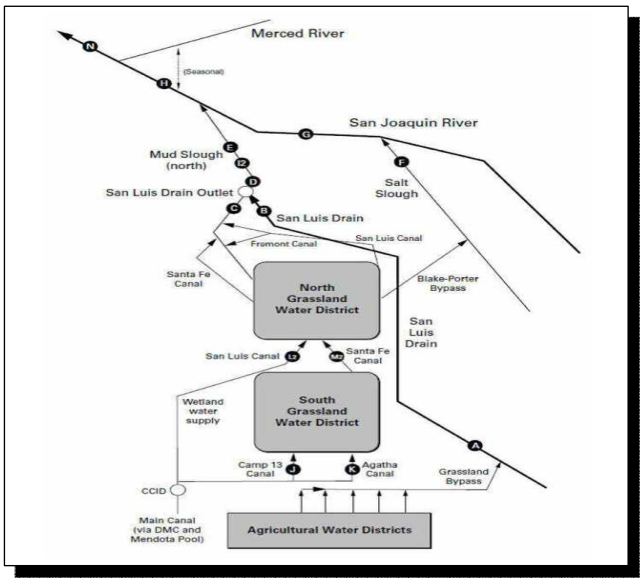

Figure A-3: Schematic Map of the Grassland Bypass Project. Source: US Bureau of Reclamation.

The principal features of the Grasslands Bypass Project are drainage collection and drainage reduction. A portion of the federally owned San Luis Drain is the conveyance structure to discharge the drainage to areas outside of the Grassland Bypass Project service area at Mud Slough (north; see Figure A-3). Grassland Bypass Project proponents claim that the reductions in drainage volume, selenium, salt and boron are a direct result of source control (lining ditches, reducing seepage, irrigation system improvements, etc.), groundwater management, dust control using drainage water, and reuse at the San Joaquin River Improvement Project. Land retirement must also play a role (see below)

The Grassland Bypass Project is facilitated by a Use Agreement signed by Reclamation and the San Luis Delta Mendota Water Authority on behalf of the Grassland Drainers to establish conditions for use of a portion of the San Luis Drain to discharge selenium and other pollutants from the Grassland Drainage Area. The first Use Agreement was signed in 1996 and was renewed and amended in 2009. The Use Agreement includes monitoring provisions, penalties for selenium discharges in excess of Waste Discharge Requirements and limitations on the volume of drainage water that can be conveyed in the San Luis Drain.

While the Grassland Bypass Project has improved water quality in Salt Slough, the wildlife refuges and wetlands, the Project discharges pollutants directly into Mud Slough and the San Joaquin River, thereby increasing pollution there. It has sustained the productivity of 97,000 acres of irrigated acres, mostly in the northerly area of the San Luis Unit at the expense of water quality in Mud Slough and the San Joaquin River. The Grassland drainers do not have the same problems with high salty groundwater that the Westlands irrigators have because they are able to export their salty drainage water via Mud Slough and the San Joaquin River. The Grassland Bypass Project is the de facto San Luis Drain, emptying pollution into Mud Slough and the San Joaquin River. Salt, selenium and boron are the major sources of pollution from the Grassland Bypass Project, but nutrients and other pollutants are also discharged. Excessive nutrients from Mud and Salt Sloughs have been linked to dissolved oxygen water quality problems in the San Joaquin River deepwater ship

channel.[131]

The selenium control program described in the Central Valley Regional Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) includes a prohibition of discharge of agricultural subsurface agricultural drainage unless the discharge is regulated by Waste Discharge Requirements or water quality objectives for selenium are met. Selenium water quality objectives are 5 µg/L (4 day mean) for the San Joaquin River and 2 µg/L (4 day mean) for Salt Slough and wetland water supply channels identified in the Basin Plan. The Basin Plan amendment in 1996 included a compliance time schedule establishing October 1, 2010, as the effective date of the prohibition of discharges for Mud Slough (north) and the San Joaquin River above the mouth of the Merced River. Waste Discharge Requirements were issued by the Central Valley Regional Board allowing selenium discharges in excess of the Basin Plan selenium objective and larger than the allowable monthly and annual selenium loads at Vernalis contained in the San Joaquin River TMDL until October 1, 2010.[132] The Waste Discharge Requirements includes monthly monitoring for molybdenum and nutrients (nitrate, ammonia, total Kjedahl nitrogen, total phosphate, and orthophosphate) as well as weekly analyses of salinity, selenium, boron, and other parameters, and chronic toxicity testing. The Waste Discharge Requirements also outline a program to monitor storm water releases from the Grassland Drainage Area into the Grassland wetland supply channels should they occur.

State Board Also Delays Selenium Protections

The 1996 Grassland Bypass Project Basin Plan Amendment and waste discharge requirements were originally approved by the Central Valley Regional Board to establish an end to seleniferous discharges into Mud Slough North by October 1, 2010. The intent was to have zero selenium discharges by that time as a result of treatment through source control and reuse, with reverse osmosis and biotreatment for the remaining volume of drainage. However, by 2007 it became apparent that there was no "Best Practicable Treatment and Control" option to treat the selenium pollution, so the Grassland Drainers and Reclamation requested and received a time extension in 2010 from the Central Valley Regional Water Quality Control Board and the State Water Resources Control Board to delay implementation of selenium water quality objectives in the San Joaquin River and Mud Slough North until December 31, 2019. An unenforceable "performance goal" of 15 µg/L monthly mean has been established for December 31, 2015 by the CVRWQCB.[133] (California

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[131] Lee, G.F. and A. Jones-Lee. 2003. *Synthesis and Discussion of Findings on the Causes and Factors Influencing Low DO in the San Joaquin River Deep Water Ship Channel near Stockton, CA: Including 2002 Data*, March, 284 pages. Accessible online at http://www.gfredlee.com/SynthesisRpt3-21-03.pdf.

[132] California Regional Water Quality Control Board, Central Valley Region. 2001a. *Total Maximum Daily Load for Selenium in the Lower San Joaquin River*, August, 32 pages. Accessible online at http://www.swrcb.ca.gov/rwqcb5/water_issues/tmdl/central_valley_projects/san_joaquin_se/se_tmdl_rpt.pdf; and California Regional Water Quality Control Board, Central Valley Region. 2001b. *Waste Discharge Requirements Order No. 5-01-234 for San Luis & Delta Mendota Water Authority and United States Department of the Interior, Bureau of Reclamation, Grassland Bypass Channel Project (Phase II), Fresno and Merced Counties*, September 21, 29 pages. Accessible online at http://www.swrcb.ca.gov/rwqcb5/board_decisions/adopted_orders/fresno/5-01-234.pdf.

[133] California Regional Water Quality Control Board, Central Valley Region. 2010b. *Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to Address Selenium*

Regional Water Quality Control Board 2010) The U.S. Environmental Protection Agency declined to approve or disapprove of the Basin Plan Amendment, claiming that it was not subject to federal jurisdiction.[134]

The two main reasons given for the delay are the lack of effective drainage treatment options and lack of funding. Reclamation and the San Luis Delta Mendota Water Authority had originally anticipated that effective drainage treatment technology could be identified prior to 2010, but it did not occur. Several technologies were tested but results have not been positive, with no clear Best Practicable Treatment and Control option identified. Prior to full-scale implementation, treatment technology must still be tested and validated. Over $100 million in state, federal and private monies have been spent on the Grassland Bypass Project.[135] (Water Education Foundation n.d.) The Grassland Drainers were spending a $25 million grant award when the State Department of Finance issued Budget Letter 08-33 stopping payment of awarded grant funds and forcing the Grassland Drainers to stop work. The "halt work" order came when the project had completed a series of local source control projects and the SJRIP drainage reuse area had been constructed, but before treatment technology could be identified, constructed, tested and used.

The rationale for the Central Valley Regional Board's action to extend the compliance date for the 5 µg/L (4 day mean) selenium water quality objective can be summed up in the following paragraphs from its Resolution R5-2010-0046 approving the Basin Plan amendment:

> 8. In a 13 December 2006 letter to the US Bureau of Reclamation, the GAF [Grassland Area Farmers] informed the Bureau and Central Valley Water Board staff that the GBP [Grassland Bypass Project] would be unable to eliminate all surface water discharges of agricultural subsurface drainage by 30 October 2010 without increased risks of loss of soil productivity; accelerated loss of beneficial use of groundwater due to salinization; a significant decrease in farm profitability stemming from a rising water table if irrigation continues; or low or no returns if fields are dryland farmed or fallowed. Rising groundwater would also increase groundwater seepage to surface water channels and open ditches, potentially increasing selenium in channels now protected by the monitoring and management of the regional drainage program. Continued farm productivity and profitability is necessary to fund ongoing regional drainage management in this area; and continued wildlife protection is consistent with state, federal, local and GBP priorities.
>
> 9. The GBP [Grassland Bypass Project] operators anticipate that the project area will be able to achieve full control of agricultural subsurface drainage if an additional nine years, three months beyond the existing compliance date is granted." (California Regional Water Quality Control Board 2010a, 2010b)

The Central Valley Regional Board Final Staff Report for the Basin Plan Amendment also

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Control in the San Joaquin River Basin, Final Staff Report, May, 61 pages. Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/grassland_bypass/sac_sj_basins_salinity_staffrpt.pdf.

[134] Strauss, A. 2011. *Letter to Tom Howard, Executive Director, State Water Resources Control Board*, Director, Water Division, US Environmental Protection Agency, Region IX, San Francisco, 3 pages. Accessible online at http://www.c-win.org/webfm_send/227.

[135] Water Education Foundation. n.d. Westside Resource Conservation District, maps of selenium and salinity impacted soils. 5 pages. Accessible online at http://www.watereducation.org/userfiles/WestsideResourceConservationDistrict.pdf.

justified the requested delay as follows:

> The compliance time schedule currently in the Basin Plan includes compliance dates prior to 2010 for other channels and other reaches of the River. The Grassland Area Farmers (GAF), the subset of local agencies within the Authority participating in the GBP, have met the interim milestones of the selenium control program, complying with the prohibition of discharge or meeting the selenium objective in the channels where these requirements are now in effect (see Figures 3, 4 and 6 in Section 1 of this report). Given this history, it is reasonable to expect that if the Board approves the requested time extension by adopting the proposed amendment, the GAF will develop full drainage management capacity in the project area. In this context, "full drainage management capacity" means that, consistent with the Grassland Bypass Project's dual goals of water quality and environmental protection and maintaining the viability of farming in the area, the dischargers are able to control all agricultural subsurface drainage generated in the drainage area without discharge. The Grassland Area Farmers expect to achieve this by further development of the source control measures and drainage reuse strategies in current use and by treating drainage to remove selenium and/or salt. Expanded source control and reuse alone could potentially increase the Project's drainage management capacity sufficiently to achieve water quality and environmental goals, but at a cost. If the Board adopts the proposed amendments, dischargers will need to weigh those costs and determine whether drainage treatment is truly feasible for this area; and report their decision to the Board in 2013."

Currently, the Bureau of Reclamation is funding a selenium demonstration treatment plant in the Panoche Drainage District. The project, estimated to cost $37 million[136] (United States District Court, Eastern District 2011), will treat 200 gallons per minute constantly for 18 months (470 AF). At that treatment rate, the cost of treating agricultural drainage only for selenium (excluding salt and boron treatment) is $78,723 per acre-foot, not counting transportation and disposal of the processed solid waste to a hazardous waste facility. Even at that cost, the potential for economic feasibility is at best low. A 2010 Report by CH2M Hill for the North American Metals Council determined the following:

> While these physical, chemical and biological treatment technologies have the potential to remove selenium, there are very few technologies that have successfully and/or consistently removed selenium in water to less than 5 µg/L at any scale. There are still fewer technologies that have been demonstrated at full-scale to remove selenium to less than 5 µg/L, or have been in full-scale operation for sufficient time to determine the long-term feasibility of the selenium removal technology. There are no technologies that have been demonstrated at full-scale to cost-effectively remove selenium to less than 5 µg/L for waters associated with every one of the industry sectors."[137]

The Grassland Bypass Project has resulted in a reduction of the volume of drainage water and pollutants as follows for Water Years 1997 through 2010:

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[136] United States District Court for the Eastern District of California. 2011. *Supplemental Declaration of Donald R. Glaser re: Revised Control Schedule in the case of Firebaugh Canal Water District and Central California Irrigation District v. United States of America et al*. Case 1:88-cv-00634-LJO-DLB Document 921-1, filed November 4, 7 pages. Accessible online at http://www.c-win.org/webfm_send/226.

[137] CH2M Hill. 2010. *Review of Available Technologies for the Removal of Selenium from Water*, prepared by Tom Sandy, P.E., and Cindy DiSante, P.E. for North American Metals Council. Accessible online at http://www.namc.org/docs/00062756.PDF.

B. Discharge volume (Acre-Feet) reduced by 64% (39,856 AF to 14,529 AF)

C. Selenium load reduced by 77% (7,096 lbs. to 1,601 lbs.)

D. Salt load reduced by 61% (172,608 tons to 67,661 tons)

E. Boron load reduced by 58% (753,000 lbs. to 315,000 lbs.)[138]

These improvements are achieved at enormous cost relative to the economic activity it is intended to support: agriculture. The U.S. Geological Survey, in its 2008 "Technical Analysis of In-Valley Drainage Management Strategies for the Western San Joaquin Valley, California" stated in regard to the possibilities for treatment of drainage water that:

> The treatment sequence of reuse, reverse osmosis, selenium bio-treatment, and enhanced solar evaporation is unprecedented and untested at the scale needed to meet plan requirements."[139] (Presser and Schwarzbach 2008)

Purpose and Formulation of Plan Amendments and the Analysis of Alternatives is Inadequate

The following narrative discussing Plan amendment problems from the Draft SED and its appendices are based on review of the following sections of the Draft SED:

1. Executive Summary, Section 5 "Alternatives", especially Sections ES5.1 through ES5.4
2. Executive Summary, Section 8, "Preferred Alternative," especially Sections ES8.1 and ES8.2.
3. Chapter 3, Section 3.2, "Purposes and Goals"

Purpose and Formulation of the Plan Amendments ignore Delta Reform Act requirements that govern State Water Resources Control Board actions in the Delta Estuary and its watershed.

The policies and requirements of the Delta Reform Act of 2009 apply to the State Water Resources Control Board, except where it is otherwise stated.

The Delta Reform Act acknowledged in 2009 that "The Sacramento-San Joaquin Delta watershed and California's water infrastructure are in crisis and existing Delta policies are

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[138] McGahan, J.C. 2010. *Waste Discharge Requirement Order No. 5-01-234, Long-Term Drainage Management Plan*, Drainage Coordinator, Grassland Area Farmers and San Luis Delta-Mendota Water Authority, letter to Rudy Schnagl, Central Valley Regional Water Quality Control Board, December 29, 16 pages. Accessible online at http://www.waterboards.ca.gov/centralvalley/water_issues/grassland_bypass/2010_longterm_drainage_plan.pdf.

[139] 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/.

not sustainable. Resolving the crisis requires fundamental reorganization of the state's management of Delta watershed resources."[140]

The Draft SED and its Appendix K fail to acknowledge that this crisis originates with past State Board water quality policies and objectives. Originating with adoption by the State Water Board of the 1995 Bay-Delta Water Quality Control Plan (and the proposed objectives of the 1994 Bay-Delta Accord) CalFED's "No Net Loss to Exports" policy is what led to the Delta Reform Act's passage in the first place, through the partial implementation of D-1641, modified by the San Joaquin River Agreement and its failed Vernalis Adaptive Management Plan.

The Delta Reform Act of 2009 has at its core the assignment of "coequal goals":

> "Coequal goals" means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.[141]

The Draft SED makes clear that the Board wishes to use its deeply flawed, segmented process for amending the 2006 Bay-Delta Plan to merely tweak inflows from major tributaries of the San Joaquin River and divert what additional fresh flows that reach the South Delta from these tributaries to state and federal export pumps.

The Board is effectively requiring reduced tributary diversions by senior water right holders so that the extra flows may reach the South Delta where they would be diverted at state and federal pumps. This also violates the Delta Reform Act of 2009 because the Appendix K flow objective threatens to impair the prior water rights of major service providers on the major San Joaquin River tributaries.[142] The US Bureau of Reclamation's water rights on the Stanislaus River are junior to these rights. The Bureau's rights to the upper San Joaquin River, which the Board has unjustifiably excluded from its Plan Area, date only as early as 1915, and at that point is only a small portion of the Bureau's total water rights claims to the river.

Through its proposed San Joaquin River flow objectives, the Board is effectively aiding and abetting a water heist benefitting CVP and SWP contractors at the expense of senior water rights holders on the Stanislaus, Tuolumne, Merced and San Joaquin rivers. This outcome is contrary to the doctrine of prior appropriation and wholly inconsistent with the Delta Reform Act requirement to reduce reliance on the Delta as a source of water supply:

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[140] California Water Code §85001(a).
[141] California Water Code §85054.
[142] California Water Code §85031 (a): "This division does not diminish, impair, or otherwise affect in any manner whatsoever any area of origin, watershed of origin, county of origin, or any other water rights protections, *including, but not limited to, rights to water appropriated prior to December 19, 1914, provided under the law*." According to pre-1914 water rights records compiled by C-WIN and submitted to the State Water Resources Control Board, there are at least 16.125 million acre-feet of riparian and pre-1914 water rights claims (the vast majority of which are pre-1914 claims) made upon an annual average unimpaired flow in the San Joaquin River Basin of 6.18 million acre-feet. See Tim Stroshane, *Testimony on Water Availability Analysis, op. cit.*

> The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.[143]

The Delta Reform Act of 2009 reaffirms existing water rights doctrines and environmental laws that implement the public trust doctrine.[144]

The State Water Resources Control Board shies away from its duty to use the water quality control planning process under sway of the public trust doctrine to revise its Bay-Delta Estuary basin plan to comply with the spirit and letter of the Delta Reform Act.

The State Water Resources Control Board fails to integrate the plan amendments with the "whole of an action" in formulating overall revisions of the Bay-Delta Plan.

The California Environmental Quality Act defines a "project" to mean "an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and which is" undertaken by any public agency, supported through monetary or contractual arrangements from one or more public agencies, or involves issuance to a person of a lease, permit, license, certificate or other such entitlement by one or more public agencies.[145] The CEQA Guidelines further define a "project" to mean the "whole of an action" that would cause direct or reasonably foreseeable indirect physical environmental changes.[146]

CEQA case law has resulted in the definition of "project" receiving a broad interpretation in order to maximize environmental protection. Plans or programs are typically schemes in which multiple actions are coordinated or facilitated within a framework of policies that govern the sequence or series of those actions. In performing CEQA analysis of a plan or program, then, agencies should not "piecemeal" or "segment" a project by splitting it into two or more segments.[147] CEQA prohibits piece mealing because to segment a project can submerge the cumulative impact of individual environmental impacts. In *Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal. 3d 376, 396 [253 Cal. Rptr. 426] the court declared that environmental reviews must "include an analysis of the environmental effects of future expansion or other action if: (1) it is a reasonably foreseeable *consequence of the initial project*; and (2) future expansion or action

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[143] California Water Code § 85021.
[144] California Water Code §85031 and §85032. In addition, §85057.5(c) states, as part of the definition of "covered action": "Nothing in the application of this section shall be interpreted to authorize the abrogation of any vested right whether created by statute or by common law."
[145] California Environmental Quality Act, §21065.
[146] CEQA Guidelines, §15378.
[147] "This approach ensures 'that environmental considerations not become submerged by chopping a large project into many little ones, each with a potential impact on the environment, which cumulatively may have disastrous consequences." *Burbank-Glendale-Pasadena Airport Authority v. Hensler* (2d Dist. 1991) 233 Cal. App. 3d 577, 592 [284 Cal Rptr. 498], cited in Michael Remy, Tina A. Thomas, James G. Moore, and Whitman F. Manley, *Guide To CEQA*, 11th ed., Point Arena, CA: Solano Press Books, 2007, p. 89. Hereafter cited as Remy, et al, *Guide to CEQA.*

will be significant in that it will likely change the scope or nature of the initial project or its environmental effects."

CEQA case law has also evolved an "independent utility" test for assessing the piece mealing issue. (*Del Mar Terrace Conservancy, Inc. v. City Council of the City of San Diego* (1992) 10 Cal. App. 4th 712 [12 Cal. Rptr. 2d 785] Under this test, an environmental review may focus solely on one project that is arguably part of a larger scheme when that project has "independent utility" that justifies its separate processing and approval.

The State Water Board segmented review under CEQA of the San Joaquin River flow and South Delta salinity objectives from the rest of its activities updating the 2006 Bay Delta Water Quality Control Plan. Specifically, the Board refers in descriptions of its planning process to Phase I being the revision of the flow and salinity objectives, while Phase II is the "comprehensive review" of the 2006 Bay-Delta Plan. The Board has also issued two separate notices of preparation (NOPs) for each segment of its planning process. The first NOP, dated February 13, 2009, stated:

> The State Water Resources Control Board (State Water Board or Board) will be the lead agency and will prepare environmental documentation for the potential update and changes to implementation of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) (Bay-Delta Plan). The Bay-Delta Plan identifies beneficial uses of the Bay-Delta, water quality objectives for the reasonable protection of those beneficial uses, and a program of implementation for achieving the water quality objectives. The proposed Project includes both: 1) the review and update of water quality objectives, including flow objectives, and the program of implementation in the Bay-Delta Plan; and 2) changes to water rights and water quality regulation consistent with the program of implementation. Accordingly, the environmental documentation will identify and evaluate the significant environmental impacts associated with potential changes to the Bay-Delta Plan and potential changes to water rights and other measures implementing the plan that may be needed to ensure the reasonable protection of beneficial uses in the Bay-Delta watershed. Through the environmental review process, the Board will identify possible ways to minimize the significant effects and describe a range of reasonable alternatives to the potential changes to the Bay-Delta Plan and its implementation through water rights and other measures.[148]

The February 2009 notice from the Board stated the Project Title as "Update and Implementation of the Water Quality Control Plan for the San Francisco Bay / Sacramento-San Joaquin Delta Estuary." Its stated project location is "the Bay-Delta watershed and its upstream tributaries and any reservoirs for which water may be used to meet the water quality objectives, including upstream reservoirs and San Luis Reservoir. The area of potential environmental effects encompasses most of the State," including the Bay-Delta watershed, the Trinity River watershed from which water is imported to the Bay-Delta watershed, and areas receiving water exported from the Bay-Delta watershed.[149]

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[148] State Water Resources Control Board, *Notice of Preparation and of Scoping Meeting for Environmental Documentation for the Update and Implementation of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: Southern Delta Salinity and San Joaquin River Flows*, 13 February 2009, p. 2. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/index.shtml.

[149] *Ibid.*, p. 3.

Two years later, the Board issued a second NOP, dated April 1, 2011.[150] This NOP was intended to first clarify the scope of the "Board's current review of the southern Delta salinity and San Joaquin River flow objectives and the program of implementation for those objectives" through the Bay-Delta Plan and substitute environmental documentation under CEQA. Second, this NOP provided opportunity for public comment on the clarified scope. The clarified scope reiterated the Board's focus on water quality objectives for the south Delta salinity and San Joaquin River flow. The Board also stated its intention to change its monitoring and special studies program in the 2006 Bay-Delta Plan. This second notice stated that the Board "is not currently considering any other changes to the Bay-Delta Plan or any specific changes to water rights and other requirements implementing the Bay-Delta Plan."[151] It stated the Project Title as "Update to the Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Estuary: Water Quality Objectives for the Protection of Southern Delta Agricultural Beneficial Uses; San Joaquin River Flow Objectives for the Protection of Fish and Wildlife Beneficial Uses; and the Program of Implementation for Those Objectives." Its project location map indicates that this project scope had two project areas: the South Delta, which appears to coincide with the service area of the South Delta Water Agency (and including the interior South Delta salinity compliance monitoring sites), and the major tributaries of the lower San Joaquin River: the Merced, Tuolumne, and Stanislaus rivers, together with the lower San Joaquin River itself.

In between these two notices, the State Legislature passed Water Code Section 85086 as part of the Delta Reform Act of 2009 (passed in November 2009). Section 85086(c)(1) required of the State Water Resources Control Board that:

> For the purpose of informing planning decisions for the Delta Plan and the Bay Delta Conservation Plan [BDCP], the board shall, pursuant to its public trust obligations, develop new flow criteria for the Delta ecosystem necessary to protect public trust resources. In carrying out this section, the board shall review existing water quality objectives and use the best available scientific information. The flow criteria for the Delta ecosystem shall include the volume, quality, and timing of water necessary for the Delta ecosystem under different conditions. The flow criteria shall be developed in a public process by the board within nine months of the enactment of this division. The public process shall be in the form of an informational proceeding...and shall provide an opportunity for all interested persons to participate. The flow criteria shall not be considered predecisional with regard to any subsequent board consideration of a permit, including any permit in connection with a final BDCP.

The State Water Board completed this task and made several determinations identifying flow criteria that would protect public trust resources (about which more below), and approved these determinations on August 3, 2010.[152] The report approved by the Board is significant for having determined several flow criteria for both the Sacramento and San Joaquin River as well as for Delta outflow. It identified a number of other criteria for which additional research would be needed to support. The report treated flow criteria for protecting public trust resources as an integrated set of actions that would be needed. The criteria represented in the best sense the "whole of an action" that the Board could take that would protect public trust resources. Moreover, the Delta Reform Act, quoted above, states that the purpose of these criteria is to "inform planning decisions for the Bay Delta Plan…"

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[150] State Water Resources Control Board, *Revised Notice of Preparation and Notice of Additional Scoping Meeting*, 1 April 2011.
[151] *Ibid*., p. 3.
[152] Delta Flow Criteria Report, *op. cit.*, note 36 above.

Completing its formal segmentation of the "Project" of updating the Bay-Delta Plan, the Board issued a third NOP for the Bay-Delta Plan's Comprehensive Review in January 2012.[153] This notice states the Project Title simply as "Update of the Water Quality Control Plan for the San Francisco Bay / Sacramento-San Joaquin Delta Estuary: Comprehensive Review." This notice clearly states that "The State Water Board is not soliciting information regarding these [the San Joaquin River flow and South Delta salinity objective] potential amendments and related SED at this time. Instead, this aspect of the proposed Project involves the comprehensive review of the other elements of the Bay-Delta Plan and potential changes to protect beneficial uses in the Bay-Delta." The notice indicates that the Board includes among these "other elements" and "potential changes" those items recommended in the Board staff's 2009 review of the 2006 Bay-Delta Plan, including Delta outflow objectives, export/inflow objectives, Delta Cross Channel closure objectives, Suisun Marsh objectives, reverse flow objectives for Old and Middle Rivers, potential new floodplain habitat flow objectives, changes to the monitoring and special studies program, and potential changes to the implementation program.[154] The Board also announced it would consider information submitted through the NOP's scoping process, from the Bay Delta Conservation Plan (BDCP), and the 2010 Delta Flow Criteria Report. The NOP's project location not only includes the Bay-Delta Estuary watershed, but Suisun Marsh, and the waters of San Francisco Bay, in addition to the other locational elements included in the original 2009 NOP.

What started in 2009 as an apparently unified project (the update and revision of the 2006 Bay-Delta Plan) has thus been artificially bifurcated by the Board by 2011 where San Joaquin River and South Delta issues and water quality objectives (what the Board calls "Phase I") are considered separately from the rest of the elements included in the Bay Delta Plan scope (what the Board calls "Phase II comprehensive review").

The Board offers no explanation as to *why* it has segmented consideration of South Delta salinity and San Joaquin River flow objectives from the rest of "comprehensive review" of the Bay-Delta Plan and its other water quality objectives, except that there were "compliance problems" discussed above in this letter. But not even this reason is given in the NOPs. This is true not only of the NOPs but the Board's silence on this question carries over into the Draft SED for Phase I. The Board merely states that in its 2008 *Strategic Work Plan for Activities in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* it "committed to begin the process to review and potentially amend the SJR flow and southern Delta salinity objectives and associated program of implementation included in the 2006 Bay-Delta Plan."[155] The Board continued this unexplained commitment to review the flow and salinity objectives in its 2009 staff report on the Periodic Review of the 2006 Bay-Delta Plan, characterizing them as "emerging issues," a term that has no significance in water quality control law.

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[153] State Water Resources Control Board, *Supplemental Notice of Preparation and Notice of Scoping Meeting for Environmental Documentation for the Update and Implementation of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: Comprehensive Review*, issued 24 January 2012. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/environmental_review/docs/notice_baydeltaplancompreview.pdf..

[154] *Ibid.*, p. 3.

[155] Draft SED, p. 1-4.

This contrasts sharply with past Board practice updating Bay-Delta Estuary water quality control plans. Dating back to at least 1978, the Board has included review of Sacramento River and San Joaquin River water quality objectives in a unified way, as essential elements in the "whole of an action" undertaken as development of the Bay-Delta water quality control plan.[156] And as shown in the 2010 Delta Flow Criteria report, the Board has recently considered the two river basins together and simultaneously in the midst of the process it runs to update the Bay-Delta Plan.

The State Water Board's decision to evaluate revision of the San Joaquin River flow and South Delta salinity objectives separately from the rest of its review and update of the 2006 Bay-Delta Water Quality Control Plan constitutes piece mealing of its project description, the revision of all the elements of the Bay-Delta Plan. Piece mealing, or segmenting of "the whole of an action" is prohibited under the California Environmental Quality Act. The Board itself fails to acknowledge this piece mealing problem, yet it has acknowledged that the administrative records for the two separate "phases"—which the Board operates in overlapping fashion since 2011—will be considered together for each Phase. Our organizations support this decision by the Board because it is logical. But the Board has scheduled a sequential timing of approval first for the flow and salinity objectives of Phase I, followed later by Board approval of the rest of the Bay-Delta Plan's "comprehensive review."

By the same logic, however, the State Water Board should be considering Phase I and Phase II as an integrated whole and for several reasons. First, the hydrodynamics of the Delta are not readily segmented, but connected and continuous, even if there are gradients of salinity or other biophysical factors typical of estuaries. Sacramento and San Joaquin River inflows meet in the central and south Delta river channels, and are intermingled with tidal flows as well which come in from the west via Carquinez Strait and Suisun Bay. Second, in terms of water quality, robust inflows from the San Joaquin River contribute to freshening of waters reaching the central Delta as well as Old River channels from which state and federal project pumps near Tracy draw water for exports. Third, ecologically, Sacramento and San Joaquin River inflows together help govern the timing and magnitude of salmon recruitment from the ocean and salmon smolt outmigration, as well as the degree to which open water conditions provide critical habitat for both salmon and resident species like steelhead, longfin smelt, Delta smelt, and striped bass. In terms of hydraulics, water quality, and ecology, these rivers must be considered together in evaluating environmental effects on the Bay-Delta Estuary, as they always have.

The Draft SED finds that the revised San Joaquin River flow and South Delta salinity objectives will not affect state and federal exports and will have no change to Delta outflows or the size of X2. These findings are made without reference to water quality objectives for

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[156] See State Water Resources Control Board, *Water Quality Control Plan, Sacramento-San Joaquin Delta and Suisun Marsh*, August 1978,Table VI-1, p. VI-29; *Water Quality Control Plan for Salinity, San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 91-15WR, May 1991, Table 1-1; *Water Quality Control Plan for Salinity, San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 95-1WR, May 1995, Table 1; and *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, December 13, 2006, Tables 1 through 3. In each of these tables it is evident that the Board considers and treats through regulation the flow and salinity objectives from both the Sacramento and San Joaquin Rivers simultaneously and together and not in a segmented fashion.

Sacramento River inflows, changes to export/inflow ratios, Delta Cross Channel closure objectives, Suisun Marsh objectives, Old and Middle River reverse flow objectives, or other changes to water quality objectives that are reasonably foreseeable from Phase II proceedings to date, and the 2010 Delta flow criteria proceedings. It is reasonably foreseeable that changes to any or all of these objectives could affect or undermine the conclusory results of this Draft SED. And the Draft SED fails to acknowledge this reality by excluding the rest of these reasonably foreseeable water quality elements from its analysis. The environmental effects of changes to these other elements of the comprehensive review of the Bay-Delta Plan (i.e., Phase II) altered and therefore undermine the anticipated water quality, aquatic and terrestrial resource effects of the Draft SED now under review.

Finally, there is no "independent utility" claim that can be reasonably sustained by the State Water Board on behalf of the proposed Phase I water quality objectives because it already acknowledges in its NOPs that: 1) the proposed Project in 2009 is declared to be the "update and implementation of the Water Quality Control Plan" for the Bay-Delta Estuary; 2) there remains connections between Phase I and Phase II that are inextricable because the proposed draft language of the flow and salinity objectives in Phase I are intended by the State Water Board for eventual inclusion in the updated Bay-Delta Plan; and 3) by issuing the NOP for the comprehensive review, the State Water Board intends to reintegrate the segmented pieces, though it is unclear how or when.

The State Water Resources Control Board fails to follow Clean Water Act requirements to develop water quality objectives that protect designated beneficial uses.

Existing and Proposed Flow Objectives

The State Water Resources Control Board re-adopted water quality objectives in the 2006 Bay-Delta Plan that it claims provide reasonable protection for fish and wildlife beneficial uses. The Board fails to identify which of these beneficial uses are the "most sensitive" whose protection would determine what water quality objective would be chosen. The Board held to this finding despite the fact that by 2005, the same water quality objectives contained in D-1641 had failed to protect a spectrum of pelagic fish and aquatic species in the Delta Estuary whose abundances had begun declining rapidly in 2000, the very year that those same water quality objectives were implemented through Water Rights Decision 1641 and the Vernalis Adaptive Management Plan. The Board stated in 2006 that:

> Information available in 1995 indicated that, unlike water quality objectives for parameters such as dissolved oxygen, temperature, and toxic chemicals, which have threshold levels beyond which adverse impacts to the beneficial uses occur, there were no defined threshold conditions that could be used to set objectives for flows and project operations. Instead, available information indicated that a continuum of protection exists. Based on that information, higher flows and lower exports provided greater protection for the bulk of estuarine resources up to the limit of unimpaired conditions. *Therefore, these objectives were set based on a subjective determination of the reasonable needs of all the consumptive and nonconsumptive demands on the waters of the Estuary.* After completion of the POD [Pelagic Organism Decline] studies, the State

> Board will review the study results and may consider amending this Plan to improve water quality protections for fish and wildlife in the Estuary.[157]

The Board does not elaborate on the nature of the "subjective determination of the reasonable needs of all the consumptive and nonconsumptive demands on the waters of the Estuary." This is precisely where it should have provided the analysis Justice Racanelli called for in the 1986 Appellate Court decision. Readers are left to presume, however, that in 2006, as in 1995, the Board avoided doing a water availability analysis.

The Board also does not tease out which of the 2006 Table 3 water quality objectives are intended to protect which specific beneficial uses. Some, like Suisun Marsh salinity objectives, are far more related to Sacramento River inflow than San Joaquin River inflow. Others, however, like the dissolved oxygen, salmon protection, Delta outflow, San Joaquin River salinity (between Jersey Point and Prisoners Point), the San Joaquin River flow at Vernalis, and export limits receive important contributions from actual San Joaquin River flows.

Other objectives besides San Joaquin River flow objectives are affected by the latter. Existing San Joaquin River flow objectives are tied to Delta outflow objectives through footnotes that link both to the sizing of fresher open water habitat critical to estuarine beneficial uses (EST) and rare, threatened or endangered species (RARE). The very construction of the Delta outflow and San Joaquin River flow objectives are inextricable because they regulate the hydraulic connectivity that is essential to protecting both estuarine habitat and species and RARE beneficial uses, which include listed species like longfin smelt, Delta smelt, and Chinook salmon.

Delta outflow is an example of hydraulic connection between Table 3 objectives, part salinity and part flow objective. During the month of January, the flow objective of 4500 cfs for Delta outflow may be increased to 6000 cfs if the Eight River Index for December is greater than 800, 000 acre-feet.[158] From February through June, the minimum daily outflow is 7,100 cfs (calculated as a 3-day average). If either the daily average or 14-day running average electrical conductivity (EC) at the confluence of the Sacramento and San Joaquin rivers is less than or equal to 2.64 mmhos/cm, the requirement is also met.

Other thresholds apply depending on the status of the Eight River Index (an aggregation of all major upstream river inflows to the Delta culminating in the Sacramento or San Joaquin river systems) and salinity in the confluence of the two main rivers.[159] Moreover, the current Delta outflow is affected explicitly by the San Joaquin River flow objective requiring spring season pulse flows out of the San Joaquin River to provide spring outmigration "flushing flows" for salmon smolts as well as October attraction pulse flows.[160]

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[157] "The water quality objectives in Table 3 provide reasonable protection of fish and wildlife beneficial uses in the Bay-Delta Estuary including EST, COLD, WARM, MIGR, SPWN, WILD, and RARE. Protection of these fish and wildlife beneficial uses also provides protection for the beneficial uses of SHELL, COMM, and NAV." State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, December 13, 2006, p. 11. Emphasis added.
[158] *Ibid*., Table 3, footnote 10, p. 15, 16.
[159] *Ibid*., Table 3, footnote 11, p. 15, 16.
[160] *Ibid.*, Table 3, footnotes 15 and 16, p. 15, 16.

Flow objectives on the San Joaquin for the rest of the February through June period are increased when X2 is required to be at or west of Chipps Island for the Delta outflow objective between February and June.[161] This alone is evidence that the proposed San Joaquin River flow must be reintegrated into the comprehensive review of the Bay-Delta Plan (what is now called Phase II). And it is also evidence of why Appendix K plan amendments should actually be treated in the Draft SED as part of the whole Bay-Delta Plan. This river's hydraulic connectivity through the Delta is integral to the current regulatory scheme the Board employs in broadly protecting beneficial uses with water quality objectives in the Bay-Delta Estuary. Again, the Board fails to justify segmenting proposed new flow objectives from the actions called for in the rest of Phase II of this process.

In actuality, the Board is formulating the plan amendment to continue the status quo of poor ecological conditions in the south Delta. The Board apparently wishes only to adjust *how* it regulates San Joaquin River flow at Vernalis. The Board seeks to maintain existing conditions that fail to protect the pelagic and migratory beneficial uses of fish and wildlife, rather than improve or increase the protection for these beneficial uses. Figure 3 is from Appendix C to the Draft SED.[162] For observed and unimpaired flows at Vernalis, there is great similarity between the record of observed flow between 1984 and 2009 (represented by reddish-brown triangles) and the record of 40 percent of unimpaired flow for the 1923-2009 period (represented by short dark blue-dashed lines). Observed flows for the 1984-2009 period are, in about 62 percent of years, somewhat lower than the curve showing 40 percent of unimpaired flow and roughly approximate the proposed flow objective of 35 percent of unimpaired flow. This exceedance curve thus illustrates that for about 60 percent of the time, the proposed San Joaquin River flow objective at 35 percent of unimpaired flow will be approximately the same as that of existing flow conditions for the San Joaquin River at Vernalis. (In the 38 percent or so of historic wetter years in the observed flow record at Vernalis, the effects of climate change may result in fewer of these, since the very "stationarity" of relying on historic flow records to indicate future flow outcomes are called into question under changing climatic conditions.)

The Board *has* done much of the analysis needed to set flow objectives that will protect fish beneficial uses that are the most sensitive: the rare, endangered and threatened species of longfin smelt, Delta smelt, and Chinook salmon. But none of it appears in the Draft SED or in Appendix K, the plan amendment.

Yet, the proposed water quality objective to govern San Joaquin River flow for fish and wildlife beneficial uses calls only for a narrative "value" from February through June in all water years.[163] It proposes to "maintain flow conditions from the San Joaquin River Watershed to the Delta at Vernalis...sufficient to support and maintain the natural production of viable native San Joaquin River watershed fish populations." These vague flow conditions "that contribute toward maintaining viable native migratory San Joaquin River fish populations" include flows that mimic natural hydrographs to which fish species are adapted, and the relative magnitude, duration, timing and spatial extent of flows "as they would naturally occur." Indicators of viability would include abundance, spatial extent or distribution, genetic and life history diversity, migratory pathways, and productivity.

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[161] *Ibid*., Table 3, footnote 14, p. 15, 16.
[162] Draft SED, p. 2-13.
[163] See Appendix K, Draft SED, page 1 of 11.

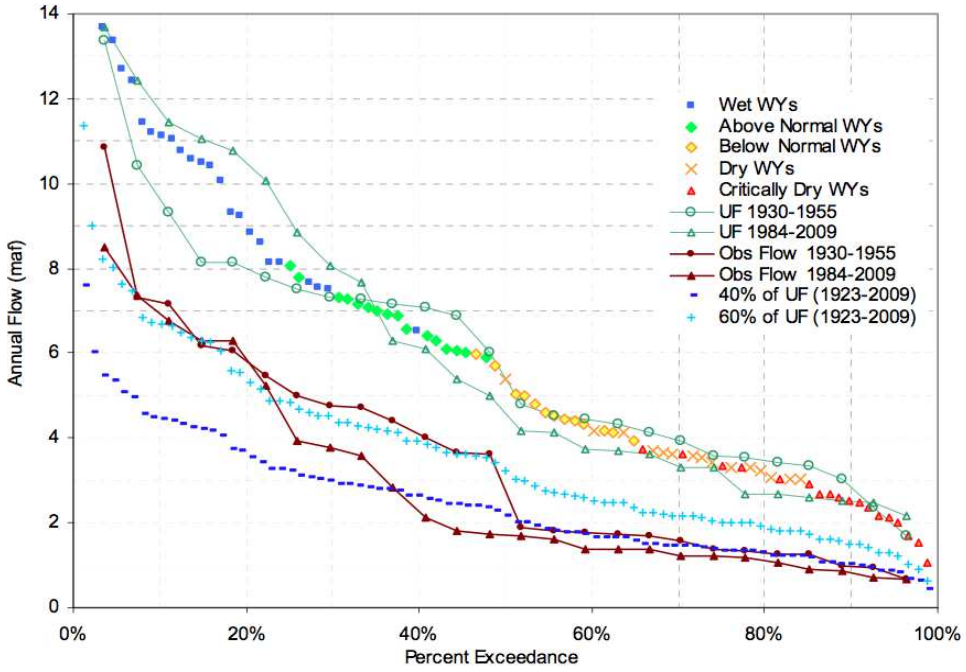

Figure 2.5. Exceedance Curves of Observed and Unimpaired Flow Hydrology in the San Joaquin River at Vernalis

These are important flow conditions to maintain in the San Joaquin River in the abstract, but they come at the expense, it appears, of the State Board eliminating the comparatively concrete goal of doubling salmon populations established in state Fish and Game Code and the federal Central Valley Project Improvement Act.[164] What is the State Water Board's rationale for extending and diversifying the measuring sticks for San Joaquin River inflow objective at Vernalis, while abandoning the salmon doubling goal that remains state and federal law and policy in California?[165] How does the State Board justify its proposed San Joaquin River flow objective in relation to EPA Clean Water Act regulations that call for the water quality objective to protect the most sensitive beneficial uses in the Delta Estuary? Has the Board done the requisite continuing planning process to analyze and make the necessary findings that its proposed San Joaquin River flow objective would meet this legal standard (i.e., 35 percent of unimpaired flow), that is "sufficient to support and maintain the natural production of viable native San Joaquin River watershed fish populations migrating through the Delta"? Saying that the objective is *intended* to protect ALL fish in the San Joaquin River system to Vernalis still fails to identify the objective that would protect the most sensitive fish beneficial use in the system and regulate to that objective as called for by EPA Clean Water Act regulations. The Board has failed to analyze its proposed flow

[164] The US Fish and Wildlife Service has developed numeric goals as required by the Central Valley Project Improvement Act, passed by Congress in 1992. Anadromous fish data accessible online at http://www.fws.gov/stockton/afrp/.

[165] Central Valley Project Improvement Act of 1992, Section 3406(b)(1), accessible online at http://www.fws.gov/stockton/afrp/title34.cfm; and California Fish and Game Code Section 6902(a).

objective to that standard, or has produced competing analyses and has not disclosed why one may be more correct than the other.[166]

RARE and MIGR—Salmon Beneficial Uses

The State Water Resources Control Board did in fact study the question "what flows do fish need?" as directed by the State Legislature under the Delta Reform Act of 2009. At that time, the Board determined, after considering the science, life histories, and population trends of both migratory and pelagic (resident) fish species in the Bay-Delta estuary, that these fish could recover their populations if flow objectives were set at 60 percent of unimpaired flow in the San Joaquin River Basin.[167]

Fortunately, the Board provided scientifically sound analysis of this matter in its 2010 Delta Flow Criteria Report. In that report, the Board determined that public trust resource protection on the San Joaquin River would be attained through application of three criteria:

- At Vernalis: 60 percent of 14-day average unimpaired flow
- At Vernalis: 10-day minimum pulse flow of 3,600 cubic feet per second in late October (e.g., October 15 to 26)
- At Vernalis: 2006 Bay-Delta Plan October flows.

The basis for these determinations rested on the Board's findings that they would, first, increase juvenile Chinook salmon outmigration survival and abundance and provide conditions that will generally produce positive population growth in most years and achieve the doubling goal in more than half of years; second, provide minimum adult Chinook salmon attraction flows to decrease straying, increase dissolved oxygen concentrations in the San Joaquin River main stem through the Stockton Deep Water Ship Channel, reduce temperatures, and improve olfactory homing fidelity; and third, provide adult Chinook salmon attraction flows.[168] *These findings, while made with direct application to San Joaquin River flows, depend implicitly yet essentially on San Joaquin River flows continuing throughout the Delta to become part of Delta outflow.* The Board clearly indicates that salmon are the most sensitive species for which it developed public trust-protective flow criteria in 2010. All three justifications for its San Joaquin River inflow criteria are rooted in the sensitivities of salmon populations to changes in and timing of flow through the Bay-Delta Estuary. The Board qualifies its 2010 flow criteria for the San Joaquin River by stating that "these flow criteria do not consider any balancing of public trust resource protection with public interest needs for water."[169]

The Board has concluded it wishes to use this proposed objective to "maintain flow conditions from the San Joaquin River watershed to the Delta at Vernalis."[170] The Board says only of its proposed narrative flow objective: "Thus, the State has determined that 35 percent of unimpaired flow is required from February through June from each of the Merced, Tuolumne, and Stanislaus Rivers on a 14-day running average, unless otherwise

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[166] That is, one analysis is contained the Draft SED in Chapter 20 and Appendix C, while the other, more thorough and complete analysis is provided in the 2010 Delta Flow Criteria Report.
[167] 2010 Delta Flow Criteria Report.
[168] 2010 Delta Flow Criteria Report, p. 133, Table 22.
[169] *Ibid.*
[170] Appendix K, *op. cit..*

approved by the State Water Board through the adaptive management framework described below." It is silent about the fate of fish populations beyond Vernalis that migrate to and through the Delta as part of their life histories that involve the San Joaquin River. The Board fails to provide an analysis to justify its determination that indicates *how* and why it chose to reduce its flow determination for the San Joaquin at Vernalis from 60 percent of unimpaired flow in 2010 to 35 percent now. This 35 percent of unimpaired flow objective is not even stated in the amended Table 3 objective in Appendix K of the Draft SED. The Board fails even to state *whether or that it used a method to balance the public trust resources* in whose name the Board made this determination, let alone explain what that method was.

RARE and EST—Longfin smelt and Delta smelt

Not only has the Board failed to complete its task of properly analyzing whether its proposed flow objectives will improve the chances of migratory salmon in the San Joaquin River basin, but it has failed to undertake and complete the same task with respect to estuarine habitat and listed pelagic resident species like longfin smelt and Delta smelt.

In effect, the State Water Board has treated the San Joaquin River flow objective revision as simply an isolated river reach that by logical deduction from the Draft SED connects hydrodynamically only to the South Delta export pumps. As noted above, the Board's current regulatory scheme assumes some level of hydraulic connectivity that goes unused in its proposed attempt to justify the new San Joaquin River flow objective. The Board's analysis for the proposed San Joaquin River flow objective should have been done in the context of its relationship to other estuary-related water quality objectives like Delta outflow, export limits and the like—in other words, in the context of a full comprehensive review of all water quality objectives of the Bay-Delta water quality control plan.

Oddly, the Board *did* do an analysis for listed pelagic resident fish species in its 2010 Delta Flow Criteria Report. It has ignored its recent work for this flow objective analysis, but it would apply logically to flow objectives to protect the EST, MIGR, SPAWN, and RARE beneficial uses of the Bay-Delta. Table 2 of the Delta Flow Criteria Report summarizes "species of importance" (or "most sensitive fish beneficial uses") from analyses prepared by the California Department of Fish and Game, the relevant life stage, the "mechanism" (a mix of both beneficial uses and water quality objectives), and the "time when flows are most important." Relevant to revising the San Joaquin River flow objectives, Table 2 notes that:

2. San Joaquin River Chinook salmon smolts out migrate between March and June
3. San Joaquin River Chinook salmon eggs and fry are vulnerable to temperature, dissolved oxygen conditions, and predation in the vicinity of the temporary barriers and other state and federal water facilities between October and March.
4. Longfin smelt eggs need fresh to brackish water habitat between December and April.
5. Longfin smelt larvae need fresh to brackish water habitat between December and May.
6. Delta smelt larvae and pre-adults need flows for transport and habitat needs between March and November.[171]

Bearing in mind that Sacramento and San Joaquin River inflows are key components of Delta outflow, the State Water Resources Control Board "determined" for Delta outflow that

[171] 2010 Final Delta Flow Criteria Report, Table 2, p. 45-46.

> *...as a Category A criterion, that 75% of 14-day average unimpaired flow is needed during the January through June time period to promote increased abundance and improved productivity for longfin smelt and other desirable estuarine species*. It is important to note that this criterion is not a precise number; rather it reflects the general timing and magnitude of flows needed to protect public trust resources in the Delta ecosystem. However, this criterion could serve as the basis from which future analysis and adaptive management could proceed.[172]

"Other desirable estuarine species" includes Delta smelt which was included in the Board's review of "important species." The Board defines a "Category A criterion" as one that is "supported by more robust scientific information." The emphasized passage indicates that the Board has in fact identified an estuarine flow objective that would meet federal Clean Water Act legal standards for establishing an objective that is consistent with the Act's purposes. It qualifies as a flow objective for Delta outflow; by definition of the Interagency Ecological Program's "Dayflow" database of Delta flow indicators, it must have a San Joaquin River inflow objective set that will help meet the Delta outflow objective.[173] While the State Water Board has not analyzed whether its 2010 San Joaquin River inflow criterion of 60 percent of unimpaired flow would be a sufficient objective to meet the 75 percent of unimpaired flow objective for Delta outflow, it is certainly true that 60 percent of unimpaired flow is greater than 35 percent of unimpaired flow, and it would therefore have a better likelihood of not only facilitating the increase of native estuarine species populations (i.e., estuarine beneficial uses) but also complying with federal Clean Water Act regulations governing protection of beneficial uses through setting and enforcing water quality objectives.

The State Water Resources Control Board fails to formulate its proposed plan amendments and their alternatives to attain compliance with both state and federal antidegradation policies.

Why Revise the South Delta Salinity Objectives?

Because the Board wishes the problem of salty San Joaquin River flows would go away. It proposes to change Table 2 to show 1.0 EC applied as a salinity objective year-round for the southern Delta, while in the proposed Program of Implementation, the Board anticipates "maintaining current protective salinity levels" in the southern Delta by continuing to condition the Bureau's water rights permits at 0.7 EC. It has not explained the reason for this.So, the Bureau further complicates a possible antidegradation analysis and judicial review by implementing a more restrictive water quality objective against only the Bureau in its water rights permits.[174]

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[172] *Ibid*., p. 99. Emphasis added.
[173] According to Dayflow program documentation, Delta outflow (QOUT) is the sum of total Delta inflow, Delta precipitation runoff estimates, Delta gross channel depletions (i.e., consumptive use), Delta exports, and total flooded island and island storage diversions. Total Delta inflow consists of Sacramento River inflow plus Eastern Delta inflow and Yolo Bypass inflow. Eastern Delta inflow is the sum of inflows of the San Joaquin, Cosumnes, Mokelumne, and miscellaneous small creek flows. Accessible online at http://www.water.ca.gov/dayflow/documentation/.
[174] Draft SED, Appendix K, p. 2 of 5.

This two-way approach to southern Delta salinity objectives in Appendix K is illegal. The Board was already informed by Justice Robie in 2006 that the water quality objectives adopted in basin plans, like the Bay-Delta Plan, must be implemented.[175] We recommend that the Board revise the proposed southern Delta salinity objective to be consistent with the current objectives in the 2006 Plan. Apart from its legality it can help the Board avoid preparing an antidegradation analysis it cannot conceivably justify.

In 2005, the Department and the Bureau informed the State Water Resources Control Board they would not be able to comply with the salinity objectives in the South Delta. The Board in 2006 issued a Cease and Desist Order against the Bureau and the Department for violating the objectives almost as soon as they became responsible for meeting them. The Board adopted a Cease and Desist Order in 2006, giving the Department and the Bureau until July 1, 2009, to comply or face additional enforcement actions.

The State Water Resources Control Board allows the Bureau and the Department to divide the responsibilities of complying with these salinity objectives. The Department has three main facilities in or directly affecting the San Joaquin River Basin: the San Luis Reservoir, the California Aqueduct's northern reach, and the Banks Pumping Plant, which exports Delta water through the Basin via the Aqueduct's northern reach (ultimately to some water contractors along the way and to the San Luis Reservoir for later export out of the Basin). Consequently, the Department's activities directly concerning the San Joaquin River occur mainly in the Delta where it operates Banks Pumping Plant. In the Delta itself, the Department attempts to manage the hydrodynamics of Delta flow and salinity conditions, some of which are caused by Banks Pumping Plant.

Water levels in neighboring channels that are used by Delta farmers to divert water to irrigate their fields. (If water levels are too low, their pumps may not connect and they cannot divert.) Many of these farmers are water right holders whose rights are either paramount (that is, riparian) or senior (that is have earlier appropriation dates) to those of the Department for Banks Pumping Plant and must not be harmed.

Finally, the Department has obligations to minimize impacts to fish and wildlife from its diversions and their effects on neighboring channels.

When the salinity objective violations at interior South Delta monitoring stations were reported to the State Water Resources Control Board, the Department of Water Resources and the Bureau of Reclamation were completing planning and environmental documents for a "South Delta Improvement Program" which would, among other things, install permanent operable tidal barriers intended to influence hydrodynamics and interior South Delta salinity conditions. Through operation of the barriers, it was hoped that salinity, water level, and fish passage issues could be addressed.

[175] *State Water Resources Control Board Cases*, 136 Cal.App.4th 674 (2006). See section on the Vernalis Pulse Flow Objective. Justice Robie writes that Water Code Section 13247 provides that "state offices, departments, and boards, in carrying out activities which may affect water quality, *shall* comply with water quality control plans approved or adopted by the state board unless otherwise directed or authorized by statute…" Emphasis in original.

The Board issued draft Cease and Desist Order, held evidentiary hearings led by Board prosecution team, and adopted the Order in February 2006. The Order required, among other things, that:

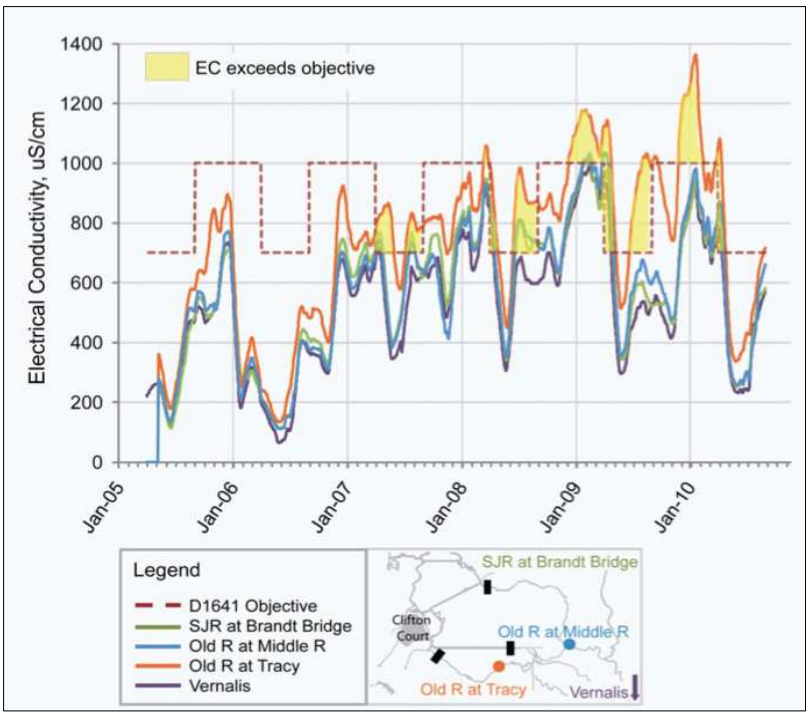
- The Department and the Bureau "obviate the threat of non-compliance with the 0.7 EC [electrical conductivity] interior southern Delta salinity objectives by July 1, 2009.
- The two agencies prepare within 60 days of issuing the Order a "detailed plan and schedule" for the Board that would obviate the threat of salinity violations by providing for "equivalent measures" that "will provide salinity control at the three compliance stations equivalent to the salinity control that would be achieved by permanent barriers."
- The two agencies were also to prepare "an operations plan that will reasonably protect southern Delta agriculture" for Board approval no later than January 1, 2009.
- Corrective actions may include "but are not limited to additional releases from upstream Central Valley Project facilities or south of the Delta State Water Project or Central Valley Project facilities, modification in the timing of releases from Project facilities, reduction in exports, recirculation of water through the San Joaquin River, purchases or exchanges of water under transfers from other entities, modified operation of temporary barriers, reductions in highly saline drainage from upstream sources, or alternative supplies to Delta farmers (including overland supplies)."[176]

Even the State Board's Cease and Desist Order prosecution team could not help noticing the absurd delays by the Department and the Bureau in achieving compliance with south Delta salinity objectives:

> Considering that the objectives were first adopted in the water quality control plan in 1978 [in D-1485], and there is evidence that salinity is a factor in limiting crop yields for southern Delta agriculture, the State Water Board will not extend the date for removing the threat of non-compliance beyond July 1, 2009.[177]

[176] State Water Resources Control Board, *Order WR 2006-0006: In the Matter of Draft Cease and Desist Order Nos. 262.31-16 and 262.31-17 Against the Department of Water Resources and the United States Bureau of Reclamation Under their Water Right Permits and License*, adopted February 15, 2006, pp. 29, 30. Accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/2006/wro2006_0006.pdf.

[177] *Ibid.*, p. 27.



As with the water quality control plans before it, this Cease and Desist Order recognizes that the rationale for the South Delta salinity objectives is rooted in the protection of South Delta agricultural beneficial uses, not those of the western and southern San Joaquin Valley.

Despite the array of "corrective actions" the Board suggested in the Cease and Desist Order to the Department and the Bureau, the two water agencies fixed on the permanent operable barriers of the South Delta Improvement Program serve as their solution to their salinity control problems near the export pumps. The Department informed the State Board in February 2007 that its consultation process with US Fish and Wildlife Service and National Marine Fisheries Service was delayed due to the fishery agencies' concerns about the interrelatedness of the South Delta Improvement Program and the long-term operation of the CVP and SWP. Ultimately, neither the Bureau nor the Department would lift a finger for any other "corrective action" available to them to try to address south Delta salinity objective compliance. Figure 4 records the extent of violations the two water agencies allowed to occur during dry years.

In the 2006 Bay-Delta Water Quality Control Plan, the Board announced that among its "Measures Requiring a Combination of State Water Board Authorities and Actions by Other Agencies" it would conduct a workshop in January 2007

> to commence proceedings to receive information and conduct detailed discussions regarding the southern Delta salinity objectives, the causes of salinity in the southern Delta, measures to implement salinity objectives for southern Delta agriculture, and other factors.[178]

[178] 2006 Bay-Delta Plan, p. 29.

The Board did not offer to explain in the Bay-Delta Plan that year the necessity to "commence proceedings" on the South Delta salinity objectives through the mechanism of the 2007 workshop. In the same Plan, the Board wrote, "The water quality objectives in Table 2 [those for agricultural beneficial uses] provide reasonable protection of the beneficial use AGR, from the effects of salinity intrusion and agricultural drainage in the western, interior, and southern Delta," so there appears no obvious reason from that Plan itself of the need to revise the South Delta salinity objective.

At the January 2007 workshop, representatives of both the South Delta Water Agency and the Central Delta Water Agency participating in the Board's public workshops in 2007 that addressed south Delta salinity objectives submitted letters and expert testimony indicating that revisions to these objectives were neither necessary nor desired by their agencies or their constituents. In fact, these agencies state they were deeply concerned that the State Board would relax the south Delta salinity objectives.[179] The logical explanation, however, for the Board's January 2007 workshop was to give the Department and the Bureau an opportunity to undermine the existing South Delta salinity objectives.

The following year, the Board completed a Strategic Work Plan for the Bay-Delta Estuary. Through it, the Board announced its intent to undertake an "activity" "to ensure that the South Delta salinity objective is "protective of the specified beneficial uses and that the objectives are appropriately implemented." The Board justified the activity this way:

> **Impetus**: The southern Delta salinity and San Joaquin River flow objectives and the implementation of those objectives *may not be appropriate*. Revised objectives and implementation may benefit beneficial uses including: San Joaquin Basin salmonids, pelagic organisms and other species; and may improve San Joaquin River water quality (salinity, DO, and other constituents). In addition, the State Water Board committed to review these issues in the 2006 Bay-Delta Plan. Further, *both issues constitute an ongoing compliance problem.* Lastly, the State Water Board must address the expiration of the VAMP scheduled for the end of 2011 and other issues associated with the VAMP.[180]

"Appropriateness" of a water quality objective is not the legal standard by which water quality objectives are to be evaluated. Given that the Board announces with this Draft SED its intent to relax South Delta salinity objectives, it is difficult to see how this "activity" would result in improvement to San Joaquin River water quality, let alone improvements in the Delta. By "compliance problem" the Board appears to mean that it dislikes having to

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[179] Letter of Dante Nomellini, Central Delta Water Agency, to Gita Kapahi, Special Projects Unit, State Water Resources Control Board, January 5, 2007. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/sds_srjf/sds/docs/cdwa010507_ah.pdf.; Testimony of Alex Hildebrand, South Delta Water Agency, to the State Water REsources Control Board, January 16, 2007, accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/sds_srjf/sds/docs/sdwa010507_ah.pdf.; and other submittals from Central and South Delta water agencies accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/sds_srjf/sds/index.shtml..

[180] State Water Resources Control Board, *Strategic Workplan for Activities in the San Francisco Bay/Saccramento-San Joaquin Delta Estuary*, July 2008, p. 62. Emphasis added. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/strategic_plan/docs/baydelta_workplan_final.pdf..

enforce salinity objectives on the Bureau and the Department for their project operations in the South Delta, perhaps in part because the violations are nearly continuous at times. Under ordinary circumstances, it is the Bureau and the Department that have compliance problems. The Board has failed to explain why, as the enforcer of water quality objectives, it believes itself to have the "compliance problem." Would the Board please explain this rationale?

By June 2009, less than 30 days before deadlines in the 2006 Cease and Desist Order were to lapse, the Department on behalf of the Bureau announced to the State Water Board that the agencies were about to violate interior south Delta salinity objectives once again, and requested that the Board hold hearings to modify the Order. The Board hastily convened an evidentiary hearing to modify the Cease and Desist Order. (EWC members the California Water Impact Network and the California Sportfishing Protection Alliance participated as protestants in the Cease and Desist Order proceeding in the summer of 2009.) The Board moved to delay enforcement of the Order by five more years. As part of compliance with a modified Cease and Desist Order that the Board issued in January 2010, the State Board required the Department and the Bureau to "study the feasibility of controlling salinity by implementing measures other than the temporary barriers project, recirculation of water through the San Joaquin River, or construction of permanent operable gates."[181] Low-head pumping at the temporary barriers was to be studied by the Department, and dilution flows from the San Joaquin River Basin was to be studied by the Bureau.

The Department of Water Resources' South Delta Low Head Pumping Study. The Department agreed to study "low head pumping" as a method for controlling salinity at key compliance monitoring stations in the South Delta (shown in the inset to Figure 4). The Bureau evaluated dilution flow needs and the potential for achieving interior South Delta salinity objectives. The goal for the study was to determine what flows and at which locations low head pumping would significantly reduce or eliminate the salinity objective violations by the Department and the Bureau. Water years 2007, 2008 and 2009 were dry or critically dry years, and so as time went on, fresh water flows with low salinity became harder to come by, and exceedances piled up. These "low head pumps" would in theory shunt high quality Sacramento River water upstream (eastward) around the temporary rock barriers with culverts through them that the Department installs each year in key interior Delta channels. It was hoped that low head pumping might improve the Department and the Bureau's compliance record on salinity objectives with little cost of high quality fresh water from upstream sources.

The Department's study results indicate that low head pumping could increase the dilution effects on salinity in south Delta channels by shifting higher quality Sacramento River water upstream of the barriers where the compliance points are. However, their effects appear to

[181] State Water Resources Control Board. 2010a. *Order WR 2010-0002: In the Matter of Cease and Desist Order WR 2006-0006 against the Department of Water Resources and the United States Bureau of Reclamation in Connection with Water Right Permits and License for the State Water Project and Central Valley Project, Order Modifying Order WR 2006-0006*, Condition 7. Accessible online at http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/2010/wro2010_0002.pdf.

be small at best, even at pumping rates of from 500 to 1,000 cubic feet per second.[182] *The most important factor in South Delta salinity, the Department acknowledged, was the sources of water reaching each south Delta compliance monitoring site.* From modeling results, the Department found that 83 to 93 percent of the salty water reaching the interior South Delta compliance monitoring sites originated from the San Joaquin River. While low head pumping at one location could move large proportions of Sacramento River water upstream of the barriers and improve water quality there, salinity concentrations at other (non-pumped) compliance points saw little or no improvement; the salty flows of the San Joaquin River continued to predominate in the South Delta. Even joint low head pumping at both Old and Middle River sites would not result in significant reductions in the likelihood of continued salinity violations by the Bureau and the Department. After trying almost 60 different modeling scenarios, the Department concluded that, while low head pumping can reduce salinities on the upstream side of the Delta's temporary barriers near salinity compliance points, this approach's ability to reduce salinity objective violations was minimal, and posed high costs for fish screens. Cost estimates also had very high ranges of uncertainty in the absence of more definite engineering designs.[183]

The Bureau's Dilution Flow Study. The Bureau of Reclamation's 2011 study for the State Water Resources Control Board addresses the ability of such upstream dilution flows to attain salinity control and compliance at the interior South Delta monitoring sites. Table 1 above that fresh water flows from the major east side tributaries to the San Joaquin River exhibit sharp declines in flow from unimpaired to observed conditions, ranging from 53 percent on the Stanislaus River to 90 percent on the Upper San Joaquin River.[184] Higher unimpaired fresh water flows would contribute larger volumes of low salinity water that would help to dilute salinity concentrations from west side and Valley Floor drainage sources.

The Bureau acknowledges in its dilution flow study that the best watersheds from which to get ideal dilution flows would have salinity conditions that are "60% or lower" than the salinity targets with which the Bureau wants to comply. In other words, the Bureau recognizes in the study's methodology that the lower the salinity and hence the better the water quality of the dilution flows to be used for compliance, the more likely the Bureau could use less water to achieve compliance with the State Board's salinity objectives.

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[182] California Department of Water Resources. 2011. *Low Head Pump Salinity Control Study: Prepared to meet requirements of the State Water Resources Control Board Water Rights Order WR 2010-0002, Condition A.7.* Bay-Delta Office, April, p. 25-31. Accessible online at: http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/docs/lhscs_rpt.pdf.

[183] California Department of Water Resources, *Low Head Pump Salinity Control Study*, prepared to meet requirements of the State of California State Water Resources Control Board, Water Rights Order WR 2010-0002, Condition A.7, April 2011, Tables III.3 through III.6 and Figures III.5 and III.6; cost data shown in Tables ES.1 and ES.2. Accessible online at: http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/docs/lhscs_rpt.pdf.

[184] State Water Resources Control Board, *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*. October 2011, Tables 2.9 through 2.14, 170 pages, including appendices. Accessible online at http://www.swrcb.ca.gov/water_issues/programs/peer_review/docs/sanjoaquin_river_flow/technical_report.pdf.

For its study, the Bureau assumed that the salinity of dilution flow would be 60 micro-mhos per centimeter of electrical conductivity, a very low salt concentration "representing eastside reservoir water quality."[185] (This salinity is equal to about 38.4 mg/L (milligrams per liter) of salt as Total Dissolved Solids.[186]) This would approximate the salinity of water originating from snowmelt in the High Sierra, either from the Stanislaus or the Upper San Joaquin Rivers, or both.

The Bureau found that the tributaries with the best water quality for dilution flows are the Stanislaus and the Tuolumne rivers. While the Merced River's flows are of better quality than the those of the Bureau's recirculation scenario (in which Delta water is imported into the Delta Mendota Canal, then released down eastbound "wasteways" to the San Joaquin River without being used for irrigation), its water quality is not as good as the Stanislaus and the Tuolumne and would therefore require greater volumes of water to achieve compliance. Of course, the Bureau, like the State Water Board, avoided the alternative of including dilution flows from Friant Dam to help address the "compliance problem" of the interior South Delta salinity objectives.

The Bureau found that using high quality water from an eastside reservoir (as yet unnamed), it would take about 100,000 to 200,000 acre-feet to comply with the most lenient of water quality objectives, and as much as 1.4 million acre-feet in dry years to meet "the most stringent" water quality objectives at Vernalis, which of course are years when such a supply of water is unlikely to be available.[187]

These two studies emanating from the modified Cease and Desist Order of 2010 confirm what the Board proves unwilling to do water quality planning for: that *western* San Joaquin Valley tributaries cause most of the underlying salinity problems that plague the South Delta, the Bureau and the Department of Water Resources. Like the high quality waters of the upper San Joaquin River, they are excluded from the Plan Area since the drainage from these western valley sloughs and creeks join the San Joaquin River just upstream of the confluence with the Merced River. The Board refuses to deal with the reality that irrigating those salty lands with water imported from the tidally-influenced Delta is an unreasonable use of water. But it is an important part of the setting for southern Delta salinity objectives since this saline drainage makes it especially difficult for the Bureau to use only reservoir releases from New Melones Reservoir to dilute the salty waters below Vernalis that affect the interior southern Delta channels and monitoring sites, especially in drier years.[188]

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[185] United States Bureau of Reclamation, *Special Study: Evaluation of Dilution Flow to Meet Interior South Delta Water Quality Objectives: To Meet Water Rights Order 2010-002 Requirement 7*, April 8, 2011, p. 39. Accessible online at http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/docs/spcl_stdy1.pdf for Main Report through Appendix C and http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/docs/spcl_stdy2.pdf for Appendices D through G.

[186] Conversion from micromhos per centimeter to total dissolved solids (expressed in mg/L) is based on criteria conversions provided in Bauder, T.A., R.M. Waskom, P.L. Sutherland, and J.G. Davis, "Irrigation Water Quality Criteria," Colorado State University Extension, "Salinity Hazard," 2011, Table 3, page 3. Accessible online at http://www.ext.colostate.edu/pubs/crops/00506.html..

[187] *Ibid.*, p. 40.

[188] Bureau of Reclamation, *Special Study*, op. cit., p. 46. Here the Board states its non-binding opinion that "using dilution flows to achieve full compliance with the South Delta objectives would likely require an unreasonable amount of water." The Bureau is only advocating here, and the Board should

Omitting the river depletions caused by diversions to Friant-Kern Canal and the saline drainage emissions to the San Joaquin River from the western San Joaquin Valley lands is achieved merely by defining them as outside the planning area. As expedient as that is, the Board has failed to disclose to the public that is what it is doing. We maintain that the Board's reliance on the present absence of salmon stocks upstream of the Merced River confluence is a red herring. The Board is thus improperly enabled to design plan amendments and alternatives analyses that are defined narrowly and endowed with purposes that utterly fail to address the larger salt and drainage issues of the lower San Joaquin River and the South Delta together, as part of the "whole of an action" sought in CEQA analysis.

Subirrigation, Hydraulic Connectivity, and Crop Tolerances in the Delta

The Board focuses its plan formulation for southern Delta salinity objectives narrowly on crop tolerance of existing crops grown on lands in the South Delta region. It does so at the expense of examining southern and central Delta agricultural practices into which crops are integrated, as a process of applying water not only to crops but to sustaining soils in a tidally-influenced environment. The Board has failed to use sound science to investigate subirrigation practices that enable Delta agriculture, infused with San Joaquin River inflows through the distributary system of Old, Middle and San Joaquin River main stem channels, to continue and to evaluate the salinity limits of applied water used to leach salts from Delta soils in winter. The Board's earlier, pre-1995 Bay-Delta water quality control plans recognized, and even complimented this agricultural practice.

The State Board revisited crop salt tolerances as a component of the objective-setting process. In 2010, the State Water Resources Control Board retained Dr. Glenn J. Hoffman, an expert on crop tolerance in agriculture, to evaluate the potential for changing or relaxing the South Delta salinity standard. The Board wished to see if the crop tolerances for South Delta crops could be adjusted based on recent research and modeling.

Dr. Hoffman recommended that "if the salt tolerance of bean is to be used to set the water quality standard for the South Delta, it is recommended that a field experiment be conducted to ensure that the salt tolerance is established for local conditions."[189] Hoffman also recommended that

> If the water quality standard is to be changed throughout the year then the salt tolerance of bean at different growth stages (time of year) needs to be determined. No published results were found on the effect of salinity on bean at different stages of growth. This type of experiment can best be conducted at the U.S. Salinity Laboratory at Riverside, CA where the experimental apparatus and previous experience on studying salt tolerance at different stages resides.[190]

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remind the Bureau that it, along with the California courts, is the arbiter of waste and unreasonable use and method of use of water.

[189] Dr. Glenn J. Hoffman, *Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta*, Final Report, January 5, 2010, for State Water Resources Control Board, Division of Water Rights, p. 102. Appendix E of Draft SED. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/docs/final_study_report.pdf,

[190] *Ibid.*

Other methods for modeling crop salt tolerance would be far more data-intensive than is now available, according to Dr. Hoffman. He also indicated that boron concentrations in surface water and in subsurface drain discharge is a possible concern for impairing bean production, and he recommended "that this concern be studied to determine if there needs to be a boron objective for the surface waters in the South Delta."[191]

Ultimately, however, Dr. Hoffman's study is framed too narrowly to be of justifiable use for revising or relaxing the South Delta salinity objective. First, Dr. Hoffman identified a number of alternate irrigation methods used in the Delta from a Department of Water Resources survey during 2007.[192]

Second, as the South Delta Water Agency made clear in its comments on Dr. Hoffman's report, his crop tolerance methodology used lab results rather than field measurements of leaching fractions. His report relies on *no data* from actual areas of the South Delta region where the most sensitive crops are grown. The methods he used to compensate for the absence of data are inadequate science for purposes of revising the South Delta salinity objectives and providing for an adequate or satisfactory antidegradation analysis.

Third, the study focuses strictly on the agricultural beneficial uses of the South Delta Water Agency service area, as depicted in the Hoffman report.[193] This is relevant because as a simple matter of hydraulic connectivity, the agricultural beneficial uses of the "southern Delta" were identified as a larger area encompassing not only the South Delta Water Agency but areas of the central, western and northern Delta areas in the 1978 Water Quality Control Plan. In other words, there is an obvious hydraulic connection between the San Joaquin River at Vernalis, and the quality of waters along Old and Middle Rivers and the main stem San Joaquin as it flows through Stockton, past Jersey Point, joining the Sacramento River, and into Suisun Bay. This hydraulic connection yields beneficial use protection downstream:

> The waters of the San Joaquin River flow into the Central Delta Water Agency and contribute to the water supply therein. Such water supply is used within the Central Delta Water Agency for agricultural, recreational, and domestic purposes as well as fish, wildlife, and general environmental purposes.[194]

The Board ignores conscious Delta farming practices that manage salt and sustain their lands' fertility. The extent reaches from the lower lands of the southern Delta to the south banks of the Sacramento River (as shown in the 1991 map below). The Department studied application of irrigation water and associated drainage in the Delta in the 1954 and 1955 prior to the State Water Project. It found that salt in Delta lowlands (a substantial portion of which occur in the South Delta) varied widely by month, with most of it accruing in Delta island soils during the irrigation season. By applying water to Delta island fields during

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[191] *Ibid.*
[192] *Ibid.,* pp. 34-41.
[193] *Ibid*., Figure 1.1, p. 2.
[194] Letter of Dante John Nomellini, Manager and Co-Counsel, Central Delta Water Agency, to Gita Kapahi, Chief, Bay-Delta/Special Projects Unit, Division of Water Rights, State Water Resources Control Board, January 5, 2007, p. 8. Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/sds_srjf/sds/docs/cdwa010507_ah.pdf.

winter months, however, farmers leached salts out of Delta soils. Department of Water Resources engineers concluded at the time that:

> The Delta Lowlands act as a salt reservoir, storing salts obtained largely from the channels during the summer, when water quality in such channels is most critical and returning such accumulated salts to the channels during the winter when water quality there is least important. Therefore agricultural practices in that area enhanced rather than degraded the good quality Sacramento River water enroute [*sic*]to the [Central Valley Project's] Tracy Pumping Plant.[195]

The Board's own 1978 Water Quality Control Plan comments on this irrigation practice. High groundwater table conditions in Delta lowlands coupled with the erodible and settling organic soils there

> Make subirrigation a desirable method of water application for crop production. Subirrigation is the delivery of water to plant roots by capillary action from the underlying saturated soil strata, and is the primary method of irrigation in the Delta organic soils. (RT Vol. XX, pp. 112-115) *As practiced in the Delta, subirrigation may be the most efficient irrigation process in California from the standpoint of net water consumption.* (RT Vol. XIII, pp. 107-108). *However, because of soil and crop management constraints, this form of irrigation must be tied to a winter leaching program to remove salts accumulated in the root zone.* (RT Vol. XII, p. 47).

The Board's 1991 Water Quality Control Plan for the Bay-Delta Estuary also mentions Delta organic soils and the practice of subirrigation to maintain them, stating that "subirrigation is an irrigation technique by which water is delivered to the crop root zone by horizontal flow through the soil from the spud ditches."[196] The Board adds in a footnote about winter ponding that:

> Winter ponding, currently in use in the Delta, is the practice of flooding large agricultural field areas for the purpose of controlling weeds, and reducing salt in the upper region of the soil profile. Other benefits are recreation, and possibly salt leaching.[197]

Dante Nomellini of Central Delta Water Agency confirmed to Tim Stroshane of the California Water Impact Network that subirrigation practices continue in their service area today.[198] Both the 1978 and 1991 Water Quality Control Plans present maps showing where subirrigation practice were applied. No such analysis of south and central Delta agricultural beneficial use irrigation practices appears in the State Water Board's 2006 Bay-Delta Plan or its appendices. Nor is it analyzed in Appendix K, nor anywhere else in the Draft SED.

The key agricultural beneficial uses that the Board should be planning to protect are not just crop salt tolerance but also the irrigation management practice that sustains agriculture in the rich organic soils of the lower South Delta Water Agency and most of the lands of the Central Delta Water Agency's service areas. This more holistic grasp of what comprised South Delta agricultural beneficial uses informed past Bay-Delta Plans prepare by the Board. Indeed it is the subirrigation and winter leaching practices that sustain irrigated

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[195] California Department of Water Resources, *Investigation of the Sacramento-San Joaquin Delta. Report No. 4, Quantity and Quality of Waters Applied to and Drained from the Delta Lowlands*, July 1956, p. 30.

[196] State Water Resources Control Board, *Water Quality Control Plan for San Francisco Bay/Sacramento-San Joaquin Delta Estuary Technical Appendix*, 91-16WR, May 1991, p. 4.0-5.

[197] *Ibid*.

[198] Nomellini to Stroshane, personal communication to Tim Stroshane, February 15, 2013.

cultivation there, less so specific crop choices and their associated salt tolerances. The Board has opted to study only crop salt tolerance since it launched this process in early 2009, and therefore fails to account for the full nature of the agricultural beneficial use that is to be protected by the South Delta salinity objectives.

Dr. Hoffman's report does not examine this practice of subirrigation by Delta farmers. More importantly, the State Water Resources Control Board's own proposal to relax South Delta salinity objectives would allow degradation of salinity loads and concentrations in Delta channels used on both the organic (lowland) and mineral (upland) soils of the Delta, and would interfere with the subirrigation and winter leaching practices that occur in the lowland (Central Delta Water Agency) areas, as well as increasing the need to leach salts out of soils in the South Delta Water Agency's service area as well. Such degradation of San Joaquin River salinity levels is entirely inconsistent with federal Clean Clean Water Act antidegradation policy and would be expected to fail even to maintain actual water quality for economically and socially important beneficial uses in the Delta.

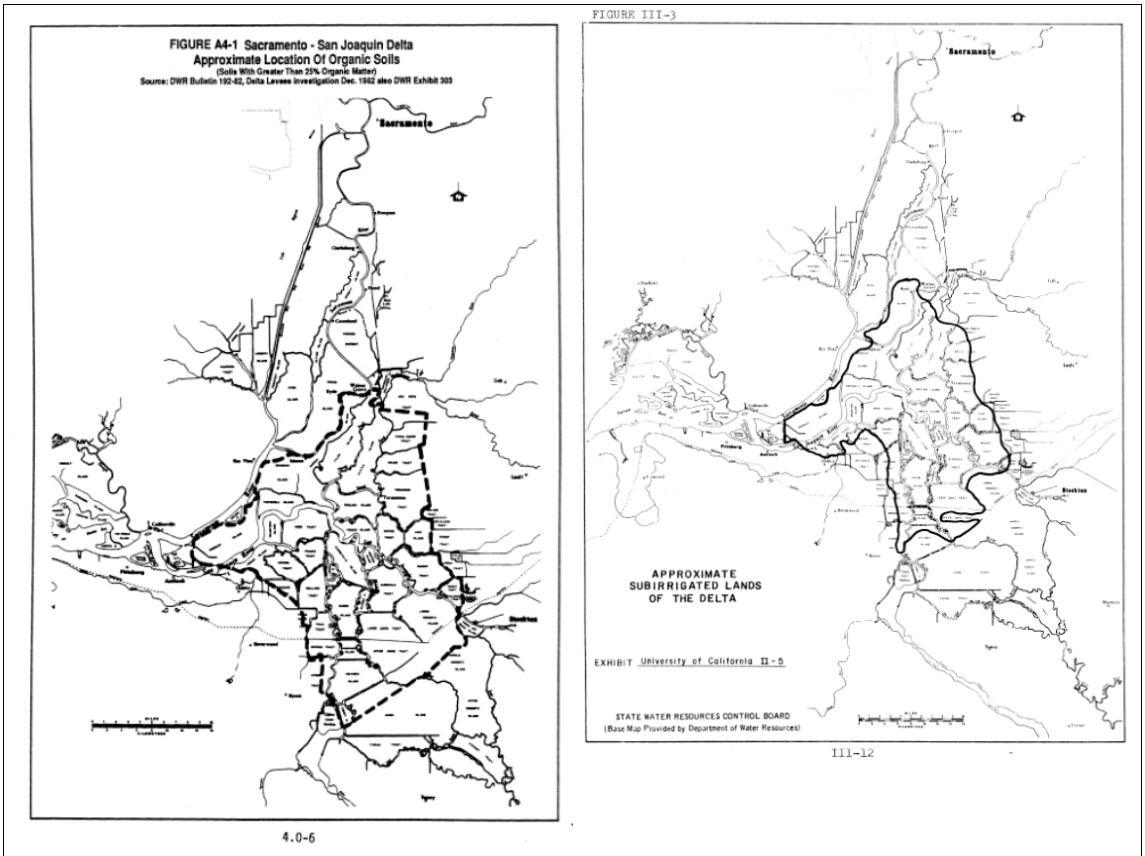


Figure 5: Maps of Delta areas employing subirrigation techniques. Map from 1991 Bay-Delta Plan at left; map from 1978 Bay-Delta Water Quality Control Plan at right.

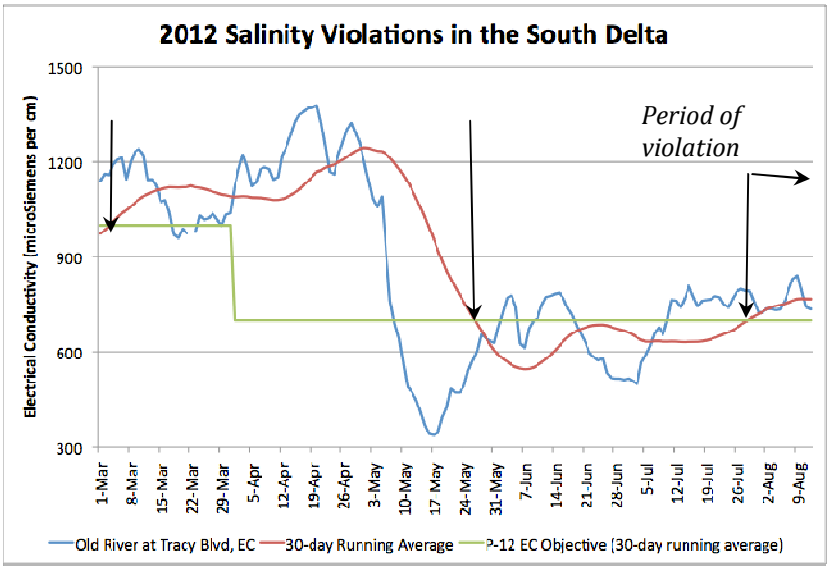
In mid-2009, the National Marine Fisheries Service in its just-issued biological opinion on the coordinated operations of the State Water Project and the Central Valley Project, rejected permanent operable barriers as essentially magnets for predators consuming

juvenile salmon and salmon smolts migrating to the ocean. Throughout the 2009 evidentiary hearing, the Department and the Bureau held to their belief that pursuing the permanent operable barriers remained their preferred course of action, and won from the State Water Board a modified Cease and Desist Order that postpones any enforcement action by the Board against them until at least 2014. There is no certainty at this time that National Marine Fisheries Service will alter its opinion of the permanent operable barriers. But by 2014, at least nine years will have elapsed during which the Department and the Bureau are and are not held responsible for complying with interior South Delta salinity objectives of the 1995 Bay-Delta Water Quality Control Plan, D-1641, and the subsequent 2006 Bay-Delta Water Quality Control Plan.

Salinity violations continue during 2012 in the South Delta. Figure 2 shows the trends in actual electrical conductivity at monitoring station P-12 (Old River at Tracy Boulevard), the calculated 30-day average of EC values at this location, and the salinity objective of 1000 microSiemens per centimeter (mS/cm) through March 31 and the 700 mS/cm from April 1 through August 31. The red curve in Figure 6 shows that the 30-day running average for electrical conductivity exceeded the P-12 EC objective for 84 consecutive days between March 4 and May 26, nearly three months of compromised water rights for South Delta diverters.

The Board excuses these violations in the Draft SED:

> Since the issuance of the [Cease and Desist Order], there have been many instances of exceedance of the EC objective in the southern Delta, in particular at the Old River near Tracy Road Bridge, Station P-12 [shown above]. Typically this exceedance occurs due to dry hydrologic conditions in the Sacramento River and SJR Basins and degradation occurring downstream of Vernalis.[199]



[199] Draft SED, p. 1-9.

The violations do tend to occur during "dry hydrologic conditions," but this should not be occasion for excusing them. Every spring in California inaugurates a six-to-eight month drought season typical of our state's Mediterranean climate. The Bureau and DWR plan for flood storage each year just in case of heavy runoff late in the rainy season, as required by the Army Corps of Engineers. They should be planning for releases from storage in the spring to meet those southern Delta salinity objectives as well. And the Board as the chief state water regulator should not be making excuses in such matters for the Bureau and the Department's inattention to complying with water quality law.

The State Board's serial failures to prevent salinity impacts on the South Delta predate enactment of the Clean Water Act by several decades.[200]

The State Water Resources Control Board's misplaced concern for the "compliance problem" of the South Delta leads it to propose reducing violations of the South Delta salinity objectives ***not*** by improving water quality there. Instead, the Board would relax the salinity objectives themselves so that the Bureau and the Department would not violate them so routinely.

The Board's proposed action violates the spirit and the letter of both its own antidegradation policy and that of the federal Clean Water Act. Relaxing the objective will reduce the incentive to the Bureau and the Department to comply with the standard by directly allowing them to provide less dilution flows to the south Delta. To use a football metaphor, the Board proposes to move the figurative "goalpost" closer so that the Bureau and the Department find it easier to score points (i.e., avoid salinity objective violations). The Board's proposed action is neither protective of agricultural beneficial uses in the south Delta, nor compliant with federal Clean Water Act antidegradation policy. We do support continuing the more restrictive April to August salinity objective for the South Delta on the Bureau; the Board should also continue this objective in the Bay-Delta Plan.

Legally speaking, the Board appears to be protecting a use that it has not designated as a beneficial use to protect, while degrading protections for a beneficial use that has had salinity objectives in place over 35 years and whose agricultural beneficial users are located in and downstream of the "south Delta" and who also reject the proposed changes to the salinity objective when given opportunities to express their views to the Board.

The Board's actions thus far distort and confuse the federal Clean Water Act's process for setting water quality objectives and should be halted immediately. We conclude that the State Water Resources Control Board abuses its discretion by undertaking to revise the South Delta salinity objectives rather than enforce existing objectives against the Department and the Bureau, and has failed to disclose the full significance of the Cease and Desist Order proceedings carried out by the Board in the regulatory setting of the Draft SED.

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[200] See especially Stroshane, *Testimony on Recent Salinity and Selenium Science and Modeling for the Bay-Delta Estuary*, *op. cit.*, Appendix A, "Drainage Salt and Selenium in the San Joaquin Valley"; and Appendix C, "Chronology of State Water Board Actions and Related Studies Concerning Salinity Control and Fish Protection." Accessible online at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/cmnt081712/tim_stroshane.pdf.

The Draft SED for the San Joaquin River flow and South Delta salinity objectives states that "the project area's water bodies are classified as Tier 2 water bodies as per the Federal Antidegradation Policy."[201] This allows consideration of lowering water quality "where it is necessary to accommodate important economic or social development *in the area in which the waters are located.*" But since the beneficial users in the area in which the waters are located (i.e., the South Delta) already indicate that they reject relaxation of the existing objectives, the need for such an analysis is moot.

We discuss a reasonable alternative to the Board's proposed southern Delta salinity objectives below.

The State Water Resources Control Board fails to analyze competing demands for water by all beneficial uses in the formulation of the plan amendments and their alternatives.

Appellate Justice Racanelli clarified the application of these legal standards to the Board's quasi-legislative task of completing a water quality control plan. Racanelli told the Board in 1986 that "the Board is directed to consider *not only* the availability of unappropriated water (§174) but also *all* competing demands for water in determining what is a reasonable level of water quality protection (§13000)." "[N]othing in the federal act or California's Porter-Cologne Act allows the Board to limit the scope of its basin planning function to such water quality standards as are enforceable under the Board's water rights authority."[202] Water rights yields are thus useful for identifying and potentially designating beneficial uses, but they should reflect the yields of all propertied beneficial uses for water in the watershed for which water quality control planning is occurring. Those yields do depend on water rights priorities. But that doesn't mean the Board ignores actual water demands in formulating its water quality objectives:

> …[T]he Board need only take the larger view of the water resources in arriving at a reasonable estimate of all water uses, an activity well within its water rights function to determine the availability of unappropriated water. [citation] We think a similar global perspective is essential to fulfill the Board's water quality planning obligations.[203]

Justice Racanelli also cited several sections of the California Water Code that obligate the State Water Resources Control Board to consider the public interest in its appropriation and water quality control planning decisions. The Board has omitted these Water Code Sections from its Regulatory setting discussions in the Draft SED and failed to apply them in formulating its proposed plan amendments. These Water Code sections also further clarify his direction to the Board to employ a "larger view" and "global perspective":

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[201] 2012 Draft SED, p. 19-2.

[202] *United States v. State Water Resources Control Board*, 182 Cal.App.3d 82. The problem in the 1978 Delta water cases was that the State Board had only taken account of federal Central Valley Project and State Water Project water rights in arriving at its Water Quality Control Plan objectives: "The implementation program [of the plan] was flawed by reason of the Board's failure in its water quality role to take suitable enforcement action against other users as well." Section II.A.

[203] *Ibid.*, Section I.A.

> The use of water for recreation and preservation and enhancement of fish and wildlife resources is a beneficial use of water. In determining the amount of water available for appropriation for other beneficial uses, *the board shall take into account, whenever it is in the public interest, the amounts of water required for recreation and the preservation and enhancement of fish and wildlife resources.*[204]
>
> In determining the amount of water available for appropriation, *the board shall take into account, whenever it is in the public interest, the amounts of water needed to remain in the source for protection of beneficial uses, including any uses specified to be protected in any relevant water quality control plan established pursuant to Division 7 (commencing with Section 13000) of this code.*[205]

If ever there was a time when the Board needs to determine the amount of water available for appropriation and to do so in the public interest, now is it. A compliant water quality control planning process should look like this: First, designate beneficial uses of water in the water body. Second, answer the question of what level of water quality is needed to protect those beneficial uses. To do this with regard to regulating flow, the Board must answer the question: What are the volumes of water needed in the water body that protect (and sustain) the beneficial uses and in so doing protect the public's interest in that beneficial use? Finally, the plan must contain an implementation program (not the actual implementation of the plan).

For water availability analysis in support of Justice Racanelli's "global perspective,"" the Board correctly attempts to apply a flow objective for the San Joaquin River that would mimic natural hydrograph conditions. However, its proposed flow objective at 35 percent of unimpaired flow is well below a protective flow level the Board identified in 2010 at 60 percent of unimpaired flow, and does so without explaining reasons for the reduction. This is vital because the Board did explain why it determined that 60 percent of unimpaired flow was a protective level of flow in its 2010 Delta Flow Criteria report.

The Board should instead have identified in the proposed Bay-Delta Plan amendment (i.e., Appendix K of the Draft SED) what the various water demands are for beneficial uses. Next, it should identify which of the beneficial uses are the most sensitive, so that it can comply with the federal Clean Water Act requirement that requires the most sensitive beneficial uses be protected. As we read Racanelli's decision, the Board may use a water availability analysis that quantifies overall natural (or unimpaired flow), followed by the increment of flow that is necessary to sustain (i.e., increase, propagate, enhance, benefit) the most sensitive nonconsumptive, instream beneficial uses of the Bay-Delta watershed (e.g., longfin smelt, Delta smelt, and salmon fish species), and then followed by the increment of flows that are available for riparian and appropriative consumptive use. This is the method that the California Water Impact Network applied in Phase II workshop testimony for the comprehensive review of the Bay-Delta Plan last fall.[206]

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[204] California Water Code §1243. Emphasis added.
[205] California Water Code Section §1243.5. Emphasis added.
[206] Stroshane T., *Testimony on Water Availability Analysis for Trinity, Sacramento, and San Joaquin River Basins Tributary to the Bay-Delta Estuary*, Submitted by the California Water Impact Network on behalf of California Sportfishing Protection Alliance, and AquAlliance on October 26, 2012, for Workshop #3: Analytic Tools for Evaluating Water Supply, Hydrodynamic, and Hydropower Effects of the Bay-Delta Plan. Accessible online at

The State Water Resources Control Board has failed to comply with this method at each step. First, the Board has not designated beneficial uses for which its proposed South Delta salinity objective are intended to protect. Second, the Board proposes San Joaquin River flow objectives that maintain the status quo, albeit through a new method of regulation. By doing so, the Board fails to comply with the federal Clean Water Act purposes of enhancing water quality and fish and wildlife populations wherever improvements are possible. Improvements are certainly possible. Third, the Board fails to include an analysis of water availability as Justice Racanelli reads applicable water quality control law to require and to take full account of competing demands for water from all beneficial uses in that context.

The State Water Resources Control Board failed to analyze reasonable and feasible alternatives to achieve the purpose of the Delta Reform Act that would increase Delta outflow and critical estuarine open water habitat, improve hydraulic connectivity of the San Joaquin River to the Bay-Delta Estuary, restore fish beneficial uses, and reduce salinity loading and concentrations to the interior southern Delta.

What if water now exported from the San Joaquin River Basin was brought back to flow into the Delta? The Central Valley Regional Water Quality Control Board explored this question briefly in 2006. If the City and County of San Francisco's exports of 250,000 acre-feet of Tuolumne River flows and 17,000 tons of salt were hypothetically reintroduced to the San Joaquin River, it would "have a large cumulative effect," according to the Central Valley Regional Board:

> Removal of this high quality, low salinity, water has a relatively large impact on water quality in the San Joaquin River. If this 250,000 acre-feet of water per year were added to the mean annual discharge for the San Joaquin River from 1985-to 1994, mean annual [electrical conductivity, a direct measure of the presence of salts in water] would have been reduced from 570 to 506 [microSiemens, a unit of electrical conductivity]. Similar results could be expected with flow augmentation from other high quality sources or reduced consumptive use of water in the Basin.[207]

The reduction in salinity concentration is significant: the Central Valley Regional Board finds it would result in an 11 percent average decrease in salinity from the addition of 250,000 acre-feet annually of high quality water during a hydrologic period in which 7 of 10 years were dry or critically dry (1985, 1986 and 1993 were the exceptions).

What if upper San Joaquin River flows could be returned to the San Joaquin River Basin, the Bay-Delta Estuary, and San Francisco Bay? Returning an average of over 800,000 acre-feet of Upper San Joaquin River flows that are exported under the Bureau's Friant Dam water

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http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/comments111312/tim_stroshane.pdf..

[207] California Regional Water Quality Control Board, 2006, *op. cit.*, p. 44-45. This example illustrates the effect of returning a large bloc of dilution flows on San Joaquin River salinity conditions; we do not advocate this specific action for the City and County of San Francisco's Tuolumne River supplies at this time.

rights via the Friant-Kern Canal would also reduce salinity concentrations from imports substantially. Assuming a linear extrapolation of the electrical conductivity relationship the Regional Board identifies above (that is, for every 250,000 acre-feet of fresh water returned to the river, an 11 percent decrease in salinity would result), a cumulative 46 percent reduction in average annual salinity concentration would result from returning about 800,000 acre-feet of Upper San Joaquin River water from Friant Dam to the Delta from this extrapolation, a decrease from 570 to about 307 microSiemens of salinity. *Such an action would reduce salinity by nearly one-half in the San Joaquin River.* It would increase Delta outflow and estuarine habitat volume while pushing a much greater share of San Joaquin River flows past the export pumps to Chipps Island, thereby helping both Delta agricultural beneficial uses. And migratory fish survival would likely rise as well.

In addition to such water quality improvements from returning unimpaired flows from the Upper San Joaquin River to the Delta, other gains in salinity reduction would occur from retiring saline irrigated lands in the western San Joaquin Valley and ending Delta imports of salty water there.

The EWC believes the review of alternatives in this Draft SED and the formulation of the State Board's Bay-Delta Plan amendment are wholly inadequate. The Board has avoided reasonable and feasible alternatives for improving salinity and flow conditions in the San Joaquin River and the South Delta by defining a plan area that avoids important sources of both fresh high quality water and large concentrations and loads of salinity. By defining these sources out of its plan area, the Board avoids responsibility for undertaking reasonable and feasible water quality control actions that would address.

Land Retirement

While drainage reduction through source control and reuse have likely led to reductions in salt, selenium and boron discharges into Mud Slough, the role of land retirement has not been adequately analyzed to determine its role in reducing the amount of pollution discharged by the Grassland Bypass Project. Land retirement policies are currently voluntary.[208]

A crucial component of such an alternative that the Board should consider in the SED, but has failed to so far, is inclusion of a program for retiring cultivated land in the western San Joaquin Valley from irrigation water use. Including west side land retirement in this alternative would enable the Board to inform itself and the public of the benefits in water quality improvements for the San Joaquin River and the aquifers of the San Joaquin Valley that would follow from implementing such a program.

While drainage reduction through source control and reuse have likely led to reductions in salt, selenium and boron discharges into Mud Slough, the role of land retirement has not been adequately analyzed to determine its role in reducing the amount of pollution

[208] United States Bureau of Reclamation. 2005. Draft Environmental Impact Statement on the San Luis Drainage Feature Re-Evaluation, Mid-Pacific Region, Sacramento, California, May, 1,591 pages. Accessible online at http://www.usbr.gov/mp/sccao/sld/docs/index.html; and United States Bureau of Reclamation. 2006. Final Environmental Impact Statement on the San Luis Drainage Feature Re-Evaluation, Mid-Pacific Region, Sacramento, California, Accessible online at http://www.usbr.gov/mp/sccao/sld/docs/index.html.

discharged by the Grassland Bypass Project. Land retirement policies are currently voluntary. The State Water Board should analyze an alternative that includes a comprehensive land retirement program that would greatly reduce the discharge of salts, boron, and selenium to the San Joaquin River and western valley aquifers that drain toward the river.

Table A-2 Drainage and Water Quality Effects of Land Retirement in the Broadview Water District Along West Side of San Joaquin River

Broadview Water District Water Quality Indicators	*Existing Conditions*	*Under Proposed Action Conditions*	*Estimated Reduction Attributable to Proposed Action*
Drainage to San Joaquin River	3,700	1,100	2,600
Estimated Salt Production (tons/year)	24,300	7,300	17,000
Estimated Selenium Production (pounds per year)	2,140	640	1,500
Estimated Boron Production (pounds per year)	74,000	22,000	52,000

Source: Environmental Sciences Associates 2004; California Water Impact Network.

The 2004 Draft Environmental Assessment on Broadview Water Contract Assignment Project identified significant reductions in the volume of drainage water, salt, selenium and boron from the retirement from irrigation of 10,000 acres in the Broadview Water District, as shown in Table A-2.[209]

The Northerly subarea of Westlands Water District, which drains subsurface flows to the Grassland area, has also had substantial land fallowing/retirement due to shallow salty groundwater within the root zone.[210] So much land has been retired in the Northerly subarea of Westlands that Westlands does not believe it is cost effective to install drainage service for the remaining acreage.[211] It is unknown how much total land has been retired in Westlands' Northerly subarea, but it is likely to be at least 40,000 acres. (Water Education Foundation, n.d.) Based on the estimates from the Broadview Contract Assignment Project Draft Environmental Assessment, extrapolation of potential drainage, salt, selenium and

[209] Environmental Sciences Associates. 2004. *Broadview Water Contract Assignment Project Environmental Assessment/Finding of No Significant Impact,* prepared for US Bureau of Reclamation, April. Accessible online at http://www.c-win.org/webfm_send/195.
[210] California Water Research Associates. 2011. *Mendota: Evidence That Soil and Groundwater Salinization is the Predominant Cause of Land Fallowing*, June. Accessible online at http://www.scribd.com/doc/56909617/Mendota-Evidence-that-soil-and-groundwater-salinization-is-the-predominant-cause-of-land-fallowing.
[211] United States Court of Federal Claims. 2012. Complaint of Westlands Water District in *Westlands Water District v. The United States*. Case 1:12-cv-00012-ECH, Document 1, 58 pages.

boron savings from the retirement of an estimated 40,000 acres in the northerly area of Westlands and the 10,000 acres in Broadview could result in the following reduction in discharges:

Drainage to San Joaquin River (AF)	13,000
Salt (tons)	85,000
Selenium (lbs.)	7,500
Boron (lbs.)	260,000

The above sample estimated numbers could represent a significant percentage of the total reduction in drainage volume, salt, selenium and boron from inception of the Grassland Bypass Project in 1996 through 2010 and do not count other retired lands such as Widren, Eagle Field and Mercy Springs water districts, and may not include all of the retired lands within Westlands' northerly subarea. Most of the reduction in drainage, salt, selenium and boron discharged from the Grassland Bypass Project would come from retirement of irrigation from lands with drainage problems and reductions in water deliveries due to drought. Other measures may be given unwarranted credit for the savings. However, there has not been a definitive study on the issue to determine the specific reason for reductions in pollution.

As of early 2012, significant new grants and subsidies have been awarded to the Grassland Drainers through the Panoche Drainage District. The Selenium Demonstration Treatment Facility at Panoche is estimated to cost $37 million, averaging over $78,000 per acre-foot of treated drainage water. In September 2011, the Pacheco Water District was awarded a $262,000 CALFED water efficiency grant to line three miles of open channel (US Bureau of Reclamation 2011) in order to reduce seepage and creation of drainage water. The lowest annual volume of drainage water discharged into Mud Slough from the Grassland Bypass Project was 13,166 acre-feet in Water Year 2009. As recently as Water Year 2005, drainage volume was 29,957 AF. (McGahan 2010) The efficacy of the proposed treatment methodology has yet to be proven, as noted above.

The Bureau of Reclamation's National Economic Development feasibility analysis found that land retirement is the most cost effective solution to resolve problems associated with irrigation of these toxic soils. (US Bureau of Reclamation 2008) The Bureau's Land Retirement Demonstration Project has shown significant and immediate success in lowering contaminated groundwater levels and selenium exposure from land retirement. Presser and Schwarzbach of the US Geological Survey found that:

> When lands are retired, there is an overall reduction in water applied to a district. In general, less water applied as irrigation means less drainage produced, which in turn means less drainage requiring treatment and storage.[212]

Ceasing imported water deliveries from the Delta to these toxic lands need not preclude agriculture. The lands could return to dry farming (where growers rely on rainfall for their crops, as occurred in this area prior to the arrival of surface water supplies in the 1960s and 1970s). The west side of the San Joaquin Valley sees rainfall of between 5 and 10 inches a year. Before completion of the California Aqueduct in 1967, groundwater was the primary source of irrigation water in the area. This dependence led to land subsidence of an average

[212] Presser and Schwarzbach, 2008, *op. cit.*, p. 9.

of one foot across the whole region, but as much as 29 feet in some localized areas. But presently, imported supplies have shifted the groundwater budget from one of overdraft to one of surplus. Groundwater elevations in the area of Panoche and Cantua creeks in the western San Joaquin Valley rose 100 to 200 feet between 1967 and 1984. Belitz and Phillips state that this rise in the water table "represents a recovery of nearly one half the total drawdown that had occurred" prior to development of imported water supplies.[213]

The lands may also be used for other purposes compatible with adjacent land uses such as solar "farms." Solar farms would provide much needed sustainable electricity to complement the hydropower generation from the east side's dams on the San Joaquin River and its tributaries.

Land retirement already occurs here. Since the 1990s, Westlands Water District (the largest water district in California's Central Valley) has purchased outright about 100,000 acres of drainage problem lands within its limits. However, the land retirement alternative appears to have plateaued in deference to continued delivery of imported subsidized water.

Researchers have not undertaken yet to model the potential impacts of climate change for the forecasting and handling of toxic contaminants like selenium in the state's water quality regulation and policy frameworks. C-WIN urges the State Water Resources Control Board to seek such research as soon as possible. Presser and Schwarzbach have laid out the two principal scenarios, however, which state and federal regulators, and the communities of the San Joaquin Valley will increasingly have to confront:

> The draining of accumulated reservoirs of salt and selenium stored in the soils and aquifers of the valley to surface impoundment [i.e., to some form of surface storage such as evaporation ponds and other treatment processes] may have large-scale implications for the future of the valley in terms of tradeoffs of contaminated groundwater aquifers (i.e., life of the aquifer for irrigation and drinking water use) for contaminated land-surfaces (i.e., creation of salt waste dumps and landfills for designated bio-treatment waste).[214]

There is hazardous agricultural drainage water collecting in aquifers year after year in the western San Joaquin Valley. There is already a significant unaddressed backlog of seleniferous hazards waiting to be addressed. C-WIN believes that California's water regulators should act now to stop creation of yet more hazardous wastewater by retiring lands from irrigation with imported surface supplies in areas known to contain high selenium concentrations, under the prohibition on waste and unreasonable use of water in the California Constitution, Article X, Section 2.

San Luis Drainage Feature Re-Evaluation

As a result of years of litigation regarding drainage issues and a Ninth Circuit Court of Appeals decision on the responsibility of Reclamation to provide drainage service to Westlands and other San Luis Unit contractors, Reclamation issued a final Environmental Impact Statement and Record of Decision (ROD) for the San Luis Drainage Feature Re-

[213] Belitz, K. and S.P. Phillips. 1995. Alternative to agricultural drains in California's San Joaquin Valley: Results of a regional-scale hydrogeologic approach. *Water Resources Research* 31(8): 1847.
[214] Presser and Schwarzbach, 2008, *op. cit.*, p. 14.

Evaluation. The Final Environmental Impact Statement was issued in 2006, with the Record of Decision issued in 2007. (US Bureau of Reclamation 2005, 2006)

While the environmentally preferred alternative in the San Luis Drainage Feature Re-Evaluation Environmental Impact Statement was the "In Valley/Drainage Impaired Land Retirement" alternative which would have retired all 298,000 acres of drainage impaired lands in Westlands, Reclamation selected the "In-Valley Water Needs Land Retirement" alternative to retire just 194,000 acres of impaired lands, which also includes existing land that is retired.

The San Luis Drainage Feature Re-Evaluation Record of Decision called for a combination of land retirement, reuse, reverse osmosis, biotreatment and evaporation ponds to reduce the formation of drainage and to treat drainage that remains. It includes continuation of the Grassland Bypass Project, with little or no additional land retirement in that area. The U.S. Fish and Wildlife Service recommended that Reclamation consider an alternative retiring all of the 379,000 acres of drainage impaired lands in the San Luis Unit (including the Grassland area), but Reclamation did not consider retirement of the portion of the San Luis Unit within Grassland Drainage Area. (US Bureau of Reclamation 2005: Appendix M)

The National Economic Development Act (NED) analysis for the San Luis Drainage Feature Re-Evaluation Environmental Impact Statement showed that the "In Valley/Drainage Impaired Land Retirement" alternative was the most cost effective, with a $5 million/year benefit. However, Reclamation requested and received a waiver of the National Economic Development Act requirement to adopt the most cost effective alternative and instead adopted the "In-Valley Water Needs Land Retirement" alternative, which would lose approximately $10 million/year. (US Bureau of Reclamation 2005: Appendix N, Cost-Benefit Analysis, Table N-10, p. N-17)

The Environmental Working Group report, "Throwing Good Money at Bad Land" estimated that crop subsidies provided to the drainage impaired lands in the San Luis Unit are approximately $10 million per year. (Environmental Working Group 2011) Environmental Working Group estimated that adding the crop subsidies to the drainage subsidies for San Luis Drainage Feature Re-Evaluation would result in a $20 million loss to the taxpayers, and concluded that land retirement would be the most cost effective solution to resolving drainage problems.

As of early 2012, resolution of drainage issues within the San Luis Unit remains problematic. The ceiling of appropriations for the San Luis Unit is lower than the projected cost of a drainage collection and treatment system for all drainage impaired lands, and Reclamation has identified and recommended increases in federal subsidies will be necessary to allow the project to proceed. (US Bureau of Reclamation 2008) Westlands Water District filed a lawsuit in the federal claims court in January 2012 asking for damages from Reclamation's lack of progress in providing drainage service. (Unites States Federal Court of Claims 2012)

Presser and Schwarzbach (2008) recommended a "Decision Analysis" process to resolve San Luis Drainage problems, but to date no action has been taken to initiate such a process. They also recommended as much land retirement as possible, noting, "Land retirement is a key strategy to reduce drainage because it can effectively reduce drainage to zero if all drainage-impaired lands are retired." (Presser and Schwarzbach 2008) However, despite

land retirement recommendations from them and the Bureau's San Luis Drainage Feature Re-Evaluation ROD's inclusion of 194,000 acres of retired land, there has been no additional land retirement within the San Luis Unit since 2007.[215]

Presser and Schwarzbach identified several problems for implementation of the San Luis Drainage Feature Re-Evaluation Record of Decision as follows:

4. "Regardless of what drainage plan is implemented, the amount of salt in groundwater will increase. Based on projections of future total dissolved solids in groundwater of the Westland and Northerly Areas, the useable life of the aquifer under various irrigation and drainage management goals is estimated to be between 25 and 220 years." (Presser and Schwarzbach 2008: 2)

5. They recommend a "program that substitutes groundwater pumping for surface water delivery, thus helping to shift the groundwater budget from large surplus to small deficit and to stem any expansion of the drainage problem through time with continued irrigation." (Presser and Schwarzbach 2008: 3)

6. A Decision Analysis process would allow objective and scientific analysis of different treatment options, but it would require stakeholder participation. (Presser and Schwarzbach 2008: 3)

7. "A drainage alternative that exports wastewaters outside of the valley may slow the degradation of valley resources, but drainage alone cannot alleviate the selenium build-up in the valley, at least within a century, even if influx of selenium from the Coast Ranges could be curtailed." (Presser and Schwarzbach 2008: 6)

8. "If the goal is to create a sustainable integrated production/habitat system, then up-gradient land retirement emerges as the most logical strategy. Implementation of a successful land retirement program may require an approach that weighs independently the benefits of drainage reduction, selenium reduction, habitat creation, water acquisition and removal of lands that are no longer productive. Such an approach would also serve to identify target lands within each category that might not be considered for land retirement under a voluntary land retirement program." (Presser and Schwarzbach 2008: 10)

9. "The stream of RO [Reverse Osmosis] treated water produced would be available for other uses, but some water- quality issues (e.g., boron and mercury) remain for the product water. For example for planning for agricultural use of RO product water, it would be necessary to dilute the concentration of boron in the product water by up to 36-fold with CVP water to obtain a boron concentration that would not impair plant growth (San Luis Drainage Feature Re-EvaluationE Environmental Impact Statement, 2007, Response to Comments)." (Presser and Schwarzbach 2008: 15)

10. "A review of treatment technologies in 2004, evaluated the advantages and disadvantage of a number of technologies specifically tested on agricultural

[215] Lee, S. 2012. Personal communication representing U.S. Bureau of Reclamation Central Valley Project Improvement Act Land Retirement Program with Tom Stokely, Water Policy Coordinator, California Water Impact Network, February 13.

drainage waters from the valley. Some initial reduction of selenium concentration is possible (e.g., from 400 µg/L to 100 µg/L), but achieving levels low enough to meet regulatory requirements (2-5 µg/L) to protect the environment were found difficult and expensive." (Presser and Schwarzbach 2008: 25)

11. "The concentration of selenium in liquids associated with the sludge bio-waste in the scenarios illustrated in figures 6-12 may be as high as 1,068 µg/L if a two-fold concentrating factor is assumed. The final concentration of selenium in the bio-waste would depend on an assumed density, but the potential exists for the production of liquids and solids that would be designated or hazardous selenium wastes. The selenium criteria for a hazardous waste are 1,000 µg/L for a liquid and 100 µg/g wet weight for a solid (U.S. Department of Health and Human Services, 1996)." (Presser and Schwarzbach 2008: 27)

12. "If 100,000 acres of land is retired under the *Groundwater Quality* alternative, then 412,772 tons salt/year are available for storage at the end of the evaporation process. Assuming a bulk dry density of 1 g/cm3, then 13.24 million feet^3 [cubic feet of] salt are produced per year. At one-foot depth, this amount would cover 311 acres. In 50 years, the salt waste pile would rise to 50 ft. on the assumed 311 acres. This amount would be produced each 50 years into perpetuity." (Presser and Schwarzbach 2008: 27)

13. "…[A]irborne particulates from salt waste piles may provide an additional pathway of exposure to wildlife and humans. Air quality problems may arise from wind-driven salt particles containing selenium." (Presser and Schwarzbach 2008)

14. "A scenario that successfully scales-up drainage water reuse, selenium bio-treatment, and evaporation of water to concentrate salt to magnitudes effective in treating planned volumes of drainflow may create new selenium exposure pathways that pose potential risks at levels that are currently undefined. However, selenium risk may be greatest at reuse areas." (Presser and Schwarzbach 2008: 28)

A September 1, 2010, letter from the Michael Conner, Commissioner of Reclamation to Senator Dianne Feinstein identified numerous problems with implementation of the San Luis Drainage Feature Re-Evaluation ROD. Reclamation had attempted to negotiate a legislative settlement with the San Luis Unit contractors and interested public in 2007 and 2008, but no consensus could be reached. The letter identifies the inadequate authorization ceiling of appropriations for San Luis Drainage Feature Re-Evaluation implementation and also states that while the 2008 Feasibility Report identified that the San Luis Drainage Feature Re-Evaluation Record of Decision is financially and economically infeasible "*because the costs exceed the national economic benefits and are beyond the ability of the beneficiaries to repay*."

Despite the recommendation from Reclamation to increase the authorized ceiling of appropriations for the San Luis Unit and increase allowable subsidies, Congress has taken no action. There is only adequate funding authorization remaining to construct drainage collection and treatment facilities in one subarea of Westlands. Reclamation and Westlands continue to negotiate which area that will be (northerly sub-area or central sub-area of Westlands). Meanwhile, Reclamation continues to deliver hundreds of thousands of acre-feet, sometimes over a million acre-feet of water to the San Luis Unit. Each acre-foot of

clean water delivered to that area results in creation of highly seleniferous drainage water that either goes into shallow or deep aquifers, and/or the Grassland Bypass Project for discharge into Mud Slough and the San Joaquin River. As long as irrigation deliveries continue to these poisoned lands, pollution will occur.

Conclusion
The State Water Resources Control Board has the authority to bring order, economic sanity, and environmental protection to drainage, salinity, and selenium problems of the Bay-Delta Estuary and the western San Joaquin Valley by acting through the Bay-Delta Water Quality Control Plan to prioritize land retirement as the most economically feasible option for reducing saline and seleniferous drainage to the lower San Joaquin River and the Bay-Delta Estuary. The time for Board action is long past due.

Other CEQA Problems with the Draft SED

The "rule curve" methodology for modeling water supply effects (i.e., Appendix F1, Tables F.1-1 to F.1-3 supporting Chapter 5) of alternatives is problematic. It is problematic because it does not make clear whether all beneficial uses are being included in the methodology. Does the analysis in Appendix F1 cover the competing demands for water of all beneficial uses, or is the rule curve only accounting for propertied beneficial uses and only seeming like it supplies an analysis of all beneficial uses?

Groundwater analysis (chapter 9) assumes that any and all surface water diversions no longer available from the tributary streams will be replaced with groundwater pumping. This assumption is entirely consistent with assumptions about grower behavior with irrigation water supplies in modeling packages like DWR's CalSIM II and the US Geological Survey's use of the Farm Process module in its overall Central Valley Hydrologic Model.

However, the Ag Resources chapter (Ch. 11) makes an opposing assumption: it assumes instead that loss of surface water diversions leads farmers to taking (often prime) irrigated land out of production, a dubious assumption that contradicts the impact analysis method in Chapter 9 for groundwater impacts. The effect of these conflicting methods is to exaggerate the overall impacts of the Board's proposed plan amendments on agriculture. This exaggeration of impacts is essentially double counting of impacts, distorting the reader's perception of the plan amendment's impacts on both groundwater and agricultural resources. The Board cannot have it both ways with groundwater and irrigated land cultivation impacts. Either there will be groundwater substitution primarily, a mix of groundwater substitution and land fallowing, or mostly land fallowing. But to base impacts on the worst case of both ends of the spectrum is absurd and baseless. It results in making LSJR 3 and LSJR 4 look worse overall than they would otherwise be.

Also in the Agricultural Resources Chapter 11, the definition of Prime Farmland of Statewide Importance includes the criterion that the land's water supply is available to it 8 of every 10 years. On this basis, more marginal lands should see irrigation surface diversions taken away first under water rights priorities, before taking water from Prime Farmland or even Unique Farmland. The SED should make reasonable assumption that Prime means Prime. Has the Board's methodology accounted for this likelihood? It's not speculative that water rights priorities should apply to these lands for analytic purposes.

Alternative	*Farm Equivalents Affected*	*Percent of All Farms in California*
LSJR 2	41	0.05%
LSJR 3	290	0.35%
LSJR 4	466	0.57%

The overall agricultural resources effects are not given a sufficient economic context. Since this is a statewide program it's reasonable to look at the consequences of some negative agricultural economic effects (which are not well analyzed) in a statewide context. Here we estimate the number and percent of total state farms taken out of production this way from the SED's data.

The following Environmental Water Caucus affiliated organizations support the conclusions shown in the San Joaquin SED comment letter dated March 26, 2013, and the attached report.

The corresponding logos are shown at the front of this document.

Gary Adams
California Striped Bass Association

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Policy Director
California Coastkeeper

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