

**Need for Reliable Water Quality Monitoring/Evaluation  
of the Impact of Delta Water Exports on  
Water Quality in the Delta and its Tributaries.**

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The current State Water Resources Control Board (SWRCB) review of water rights (water flow management) in the San Joaquin River (SJR) and the Delta is developing an update of water management policies and its impact on water quality/beneficial uses of the Delta and its tributaries. Over the past 16 years that we have been involved in water quality issues in the Delta and its tributaries, we have had the opportunity to become familiar with the existing water quality database and the impact of how water flow management policies that are controlled by past water rights decisions of the SWRCB impact water quality. Beginning in 1999, in connection with our involvement as advisors to the SJR Deep Water Ship Channel (DWSC) DO TMDL Steering Committee and as the CALFED supported PI for a \$2 million directed action project devoted to investigating the characteristics and factors influencing the low DO problem in the DWSC, we had the opportunity to become familiar with the existing water quality database on the characteristics of the San Joaquin River and its tributaries. Similarly, we have been active on the Sacramento River Watershed Program and its water quality monitoring program since it was initiated in the mid 1990s. This activity has enabled us to become familiar with the current understanding of water quality in the Sacramento River and its tributaries.

We have been involved in Delta water quality issues since the summer 1989. During the past two years we have investigated the current database on Delta water quality with particular reference to how Delta water flow management impacts water quality. In June 2004 we developed the report, "Overview of Sacramento-San Joaquin River Delta Water Quality Issues," Lee and Jones-Lee (2004a) that specifically discussed the current water quality characteristics of the Delta and how water flow manipulations especially South Delta water exports by the State (SWP) at Banks and federal (CVP) at Tracy projects are potentially impacting water quality in the Delta. While as discussed below, there are well documented examples of where flow diversions/manipulations in the San Joaquin River watershed and in the South Delta are significantly adverse to water quality, overall it is concluded that, at this time, there is a lack of understanding of how water flow management authorized/mandated by the SWRCB as part of its water rights decisions has been and is impacting water quality.

- Excessive fertilization of Delta waters that develop aquatic plant growths that impact contact recreation, domestic water supply water quality and use of Delta water for drip irrigation.

Before any additional export of South Delta water is permitted, the water exporter should be required to fund studies that,

- Adequately define the current impacts of existing Delta water exports on aquatic life related Delta water quality. This will require funding a comprehensive water quality monitoring/evaluation program to better define existing aquatic life related water quality impacts of South Delta water exports that includes substantial funds that can be used to search for new unidentified water quality problems,
- Develop and implement a mitigation program for current water quality impacts of existing Delta water exports on Delta aquatic life,
- Estimate the potential impacts of proposed future additional Delta water exports on aquatic life related beneficial uses of the Delta,
- Develop and begin to implement a mitigation plan for the potential water quality impacts of additional South Delta water exports.

Lee and Jones-Lee (2004a) discussion of Delta water quality issues list current water quality objective violations that have led to TMDLs. As discussed by Lee and Jones-Lee (2004a) SWRCB water rights decisions that impact flow of water into the Delta and within the Delta, impact the magnitude and location of water quality objective violations in the Delta.

SWRCB (2000) Order for D-1641 states on page 148,

*6. The water quality objectives condition shall be updated to read as follows:*

*The quantity of water diverted under this permit is subject to modification by the Board if, after notice to the permittee/licensee and an opportunity for hearing, the Board finds that such modification is necessary to meet water quality objectives in water quality control plans which have been or hereafter may be established or modified pursuant to Division 7 of the Water Code. No action will be taken pursuant to this paragraph unless the Board finds that:*

*(1) adequate waste discharge requirements have been prescribed and are in effect with respect to all waste discharges which have any substantial effect upon water quality in the area involved, and (2) the water quality objectives cannot be achieved solely through the control of waste discharges.*

0000013

As indicated, the current D-1641 provides the SWRCB with the obligation to critically examine how the past and any proposed water diversion/manipulations have in the past and may in the future impact Delta water quality.

### **Delta Water Quality Monitoring Programs**

The key to reliably managing water quality in the Delta is a comprehensive water quality monitoring and evaluation program. There are several water quality monitoring programs being conducted in the Delta and its nearby tributaries. In general, these programs have specific objectives related to managing Delta resources. The most

needed SJR DWSC flow provided the State and Federal export projects do not divert most of the SJR Vernalis flow into the South Delta at the Head of Old River (HOR). As discussed by Lee and Jones-Lee (2003, 2005) operating the HOR to be developed operable barrier to allow most of the SJR Vernalis flow to pass through the DWSC to Turner Cut before export by the Projects from the South Delta will reduce the cost of oxygen demand control and aeration to control the low DO problem in the DWSC.

**It will be important that the SWRCB correct the problems that have been created by the State and Federal export projects export of South Delta water through the HOR to the South Delta as part of its current deliberations on D-1641 water rights.**

**Other Water Quality Problems Impacted by D-1641.** If the current SWRCB water rights review for Delta and its tributaries is to accomplish the needed water quality management to adequately address current water quality problems in the Delta and its tributaries, there is need for the SWRCB to address the full range of water quality problems that exist in the Delta that are impacted by flow manipulations in the SJR DWSC watershed including South Delta exports. The Lee and Jones-Lee (2004a) report on Delta Water quality issues provides detailed guidance on the approach that needs to be adopted to begin to address these problems. A section of the Lee and Jones-Lee (2004a) of Delta water quality issues devoted to water quality monitoring is presented below.

#### **Need for Expansion of the Delta Water Quality Monitoring/Evaluation Program**

There is need to significantly expand the water quality monitoring/evaluation program for the Delta. This is a significantly neglected area. While there is an Interagency Ecological Program (IEP) monitoring program that is required as part of implementation of D-1641, it is not focused on water quality and is largely conducted with limited regard to providing information pertinent to water quality assessment. The current Delta water quality monitoring program needs to be expanded so that the focus is on an assessment of beneficial use impairment, rather than the current approach of monitoring algae, zooplankton, fish and sediment organisms. There is a variety of factors, such as invasive species, that can influence phytoplankton, zooplankton and benthic organism populations, which cause the IEP EMP to fail to provide the information needed on the impacts of chemical stressors and water exports on Delta aquatic-life-related beneficial uses.

As discussed above, the Delta channels and near tributaries have been found to be impaired under the Clean Water Act section 303(d). The monitoring program that is needed should specifically focus on assessing the current status of the impairment for each of the 303(d) listings needs to be developed. Particular reference should be given to whether the impairment, which is generally based on excessive concentrations of a chemical constituent, is a "real" impairment, or represents the application of worst-case-based water quality criteria/standards to Delta waters. Further, the monitoring program should specifically address the magnitude, area and duration of the impairment. With respect to duration, is it a pulse-type duration associated with and following pesticide application, or is the impairment during a season - year-round? This information can then be used to prioritize the second phase of the monitoring.

flow of the lower Stanislaus River. The Exchange Contractors indicated that since cold water migratory fish reproduction does not occur in the lower Stanislaus River the releases of water from New Melones reservoir is not necessary to protect cold water fish spawning in the lower Stanislaus River. If the DO WQO for the lower Stanislaus River is lowered to 5 mg/L, the water releases from New Melones Reservoir could be made at other times to help solve the CVRWQCB CWA 303(d) listing for excessive TDS (salt) concentrations in the San Joaquin River at Vernalis.

An issue that has not been addressed in this matter is the potential impacts of reducing the flow out of New Melones Reservoir on the current water quality problems in the lower Stanislaus River. At this time the US EPA (2003) has established Clean Water Act section 303(d) limited conditions in the lower Stanislaus River for several pollutants/conditions. This reach of this river is listed as impaired for diazinon, "Group A Pesticides," mercury, and "Unknown Toxicity." TMDLs have been scheduled for remediation of the violation of the WQOs caused by these conditions.

Reducing the flow of high quality water in the lower Stanislaus River that is derived from New Melones Reservoir would represent a degradation of existing water quality due to the likely increase in the concentrations of the listed pollutants. Such an increase in concentration of the listed pollutants would likely represent a violation of the Antidegradation requirements of the US EPA Clean Water Act and the State of California Porter Cologne Act. This issue needs to be considered as part of a proposal to change the lower Stanislaus River DO WQO that would result in decreased releases of New Melones Reservoir water. This may require that a comprehensive monitoring/evaluation program be implemented to develop the information needed to understand the impacts of altered New Melones Reservoirs releases on the water quality impacts in the lower Stanislaus River with particular reference to the 303(d) listed pollutants in the lower Stanislaus River.

#### **Altered Lower San Joaquin River Flow**

The San Joaquin River (Merced River to South Delta Boundary) is 303(d) listed as impaired for boron, chlorpyrifos, DDT, diazinon, electrical conductivity, Group A Pesticides, and Unknown Toxicity. Several of the current proposals for solving the CWA 303(d) listing for excessive salt concentrations at Vernalis include the potential for reduced flows of the SJR at Vernalis. Reduced flow of the San Joaquin River at Vernalis as part of solving the salt TMDL could aggravate impairments by the 303(d) listed pollutants. There is need for studies to evaluate the impact of reduced SJR flow on the existing pollutants impacts. A comprehensive water quality monitoring program needs to be developed and implemented as part of developing the salt TMDL to evaluate whether any reduction of flow of the SJR at Vernalis is in violation of the Federal and State antidegradation requirements.

The Stanislaus River and San Joaquin River flow manipulations as part of satisfying one TMDL such as for excessive salt must be based on an adequate database that is the result of comprehensive monitoring/evaluation similar to that discussed for the Delta in this report. The SWRCB water quality monitoring advisory panel recommended below

### **CALFED/CBDA's Activities in Addressing Water Quality Problems in the Delta**

When CALFED first became active, there was a major effort to develop a water quality management program in the Delta and its tributaries. The consulting firm that had the initial contract to support CALFED activities assigned the responsibility for developing these programs to an individual(s) with limited understanding and experience in water quality issues. This person(s) made significant errors in evaluating water quality in the Delta, such as claiming that there were major heavy metal problems in the Delta due to stormwater runoff from urban areas that necessitated the collection and treatment of all urban stormwater runoff to remove heavy metals. Eventually, as a result of comments made by various individuals, including the authors, on the unreliability of the proposed water quality management program, that effort was terminated and replaced by a new effort involving committees of interested experts advising CALFED on the water quality problems that exist in the Delta and its tributaries. This led to the development of a Comprehensive Monitoring, Assessment and Research Program (CMARP, 1999). While this approach had considerable technical merit, CALFED management did not follow through, and all of the effort made by many individuals was lost several years ago. Since then, CALFED/CBDA's water quality management program has been essentially restricted to a major effort devoted to mercury and the low-DO problem in the first seven miles of the Deep Water Ship Channel below the Port of Stockton. There has been no effort devoted to many of the other well-documented water quality problems that exist in the Delta, such as those associated with the previous 303(d) lists and the 2002 303(d) list of impaired Delta channels.

### **Delta Water Quality Research Needs**

Presented in the Lee and Jones-Lee (2004a) report and for some issues discussed below is a summary of the areas of Delta water quality-related investigations needed to better define the known and potential water quality problems that are impacting the beneficial uses of Delta waters. The information gained from such investigations would be an important step in developing a technically valid, cost-effective program to manage Delta water quality as well as the impacts of the D-1641 allowed exports on South Delta water on Delta water quality. Additional information on each of the areas summarized below is provided in the Lee and Jones-Lee (2004a) report.

***Organochlorine Pesticides, PCBs and Dioxins.*** The finding of excessive bioaccumulation of the organochlorine legacy pesticides (such as DDT, chlordane, dieldrin, toxaphene, etc.), PCBs and dioxins (OCs) in Delta and near-Delta tributary fish mandates that a substantial research effort be initiated on the current degree and extent of excessive bioaccumulation of OCs in edible Delta fish. Also the amount of these chemicals entering the Delta from tributary, agricultural, urban and wastewater sources needs to be defined. Studies need to be conducted on the role of Delta sediments as a source of OCs that are bioaccumulating to excessive levels in Delta channel fish. US EPA aquatic organism bioaccumulation testing should be conducted to determine whether the organochlorines are present in sediments at sufficient concentrations of bioavailable forms to bioaccumulate to excessive levels in Delta fish. Where this occurs studies need to be conducted to develop biota sediment accumulation factors which can

independent experts should work together to properly evaluate the potential adverse impacts of Delta water exports. Where this team finds potential problems with a particular type of pollutant, such as an organochlorine pesticide, mercury, currently used pesticides, heavy metal inputs from tributaries, etc., studies should be conducted to evaluate how the movement of water in the Delta caused by the export projects impacts the effects of these constituents on Delta water quality.

***Phytoplankton Primary Production within the Delta.*** An assessment should be made of the factors controlling phytoplankton primary production within the Delta. Particular emphasis should be given to why, based on the nutrient content of Delta waters, there is not more primary production. It has been found that Delta waters, when allowed to stand, such as in a water supply reservoir, will produce substantial crops of phytoplankton. What is the role of light limitation due to inorganic turbidity and color on primary production? Is the export of water from the Delta creating insufficient time in Delta waters during the summer and fall months for the phytoplankton to develop before the water is exported from the Delta via the export pumps? What is the role of the export projects' drawing large amounts of low-nutrient Sacramento River water through the Delta in the limitation of algal production? Another area of concern is whether invasive species are significantly controlling phytoplankton biomass through harvesting of phytoplankton.

Another research area is an evaluation of the importance of phytoplankton derived from the San Joaquin River watershed as a source of assimilable organic carbon for the Delta food web. There is need to better understand the food web in the Delta and especially what controls the lowest trophic level biomass. Of concern is whether reducing the algal loads to the Central Delta would be detrimental to the food web.

***Biomarkers, PPCPs, Endocrine Disrupters, Etc.*** A substantial research effort should be initiated on the occurrence of sublethal effects of various types of chemicals, such as PPCPs, endocrine disrupters and low levels of pesticides (at concentrations below those that are acutely toxic to aquatic life) on Delta water quality. Particular attention should be given to waters near the cities of Stockton and Tracy and downstream of the Sacramento Regional County Sanitation District discharges to the Delta, as well as other upstream communities that discharge wastewaters to Delta tributaries. Consideration should also be given to any discharges/runoff from dairies and other animal husbandry facilities as a source of PPCPs.

***Delta Sediments.*** A comprehensive program of investigating the toxicity of Delta sediments should be initiated, using a variety of sensitive test organisms. Where toxicity is found, sediment-based toxicity investigation evaluations should be conducted to determine the cause of the toxicity and the sources of the constituents responsible for the toxicity. This work should include the development of biological effects-based sediment quality objectives for Delta sediments. Total chemical concentrations or co-occurrence-based sediment quality objectives should not be used in the Delta or other waterbodies that are tributary to the Delta (or, for that matter, elsewhere) as a basis for evaluating

reducing the flow of the SJR into the South Delta via Old River on water quality in the South Delta.

There is also need to understand the origin of the low DO that occurs in Old River near the Tracy Boulevard bridge, and what can be done to control it, as well as the low DO that occurs in Middle River within the South Delta.

There is need to investigate the potential occurrence of low DO in the Central Delta, especially Turner Cut and Whiskey Slough, under worst-case conditions of oxygen demand loads from the DWSC.

### **HR 2828**

HR2828, Water Supply, Reliability, and Environmental Improvement Act states,

*“(D) PROGRAM TO MEET STANDARDS-*

*(i) IN GENERAL- Prior to increasing export limits from the Delta for the purposes of conveying water to south-of-Delta Central Valley Project contractors or increasing deliveries through an intertie, the Secretary shall, not later than 1 year after the date of enactment of this Act, in consultation with the Governor, develop and initiate implementation of a program to meet all existing water quality standards and objectives for which the Central Valley Project has responsibility.”*

In order to properly implement HR 2828 there will be need to develop and implement a comprehensive water quality monitoring/evaluation program for the Delta of the type discussed herein.

### **Overall Conclusion**

There are significant water quality problems in the Delta and its tributaries that are being impacted by the water rights decisions made by the SWRCB. Past water rights decisions have not adequately/reliably addressed how flow diversions/manipulations in the Delta and its tributaries impact Delta water quality. At this time, except for the low DO problem in the SJR DWSC, how the past water rights decisions impact the magnitude, location and duration of aquatic life toxicity, excessive bioaccumulation of organochlorine legacy pesticides, PCBs, dioxins, in edible fish tissue, mercury methylation that leads to excessive fish tissue residues that are a threat to those who use fish as food etc is unknown. There is an urgent need to for the SWRCB to build into the future water rights decisions, the requirement those who divert water, discharge waste waters and irrigation tail waters, as well as all of those who use the waters that are diverted from the Delta and its tributaries, provide the funds needed to support/fund a comprehensive water quality monitoring program to reliably determine how the diversion/manipulation water and discharge of waste waters/tail waters impact Delta and its tributaries water quality.

### **Need for Independent Data Review and Report Development**

There is a significant problem with agencies such as those involved in IEP EMP failing to conduct comprehensive data review and report development that addresses the key issues

Lee, G. F. and Jones-Lee, A., "San Joaquin River Deep Water Ship Channel Low DO Problem and Its Control," PowerPoint slides presented at SETAC World Congress Portland, OR, November 2004. Updated December (2004c).  
<http://www.members.aol.com/annejlee/LowDOSummaryDec2004.pdf>

Lee, G. F., and Jones-Lee, A., "Impact of SJR & South Delta Flow Diversions on Water Quality," PowerPoint Slides, Presentation to CA Water Resources Control Board, D1641 Water Rights Review, January 24 (2005).  
<http://www.members.aol.com/annejlee/D1641SlidesSWRCBJan2005.pdf>

Lee, G. F.; Jones-Lee, A. and Ogle, R. S., "Preliminary Assessment of the Bioaccumulation of PCBs and Organochlorine Pesticides in *Lumbriculus variegatus* from City of Stockton Smith Canal Sediments, and Toxicity of City of Stockton Smith Canal Sediments to *Hyaella azteca*," Report to the DeltaKeeper and the Central Valley Regional Water Quality Control Board, G. Fred Lee & Associates, El Macero, CA, July (2002). <http://www.gfredlee.com/SmithCanalReport.pdf>

SWRCB "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" State Water Resources Control Board Sacramento, CA March 15, (2000).

Taberski, K., "A Regional Board Perspective on the RMP: Ten Years of Benefits, and Challenges for the Future," In: Pulse of the Estuary 2004: Monitoring & Managing Water Quality in the San Francisco Estuary, SFEI Contribution 78, San Francisco Estuary Institute, Oakland, CA, pp 38-45 (2004).

US EPA, "The Section 303(d) List of Water Quality Limited Segments," US Environmental Protection Agency Region 9, Available from California State Water Resources Control Board website ([http://www.swrcb.ca.gov/tmdl/303d\\_lists.html](http://www.swrcb.ca.gov/tmdl/303d_lists.html)), July (2003).