Revised Testimony of G. Fred Lee, PhD, BCEES, F.ASCE

Hearing DWR/USBR Request for Change in Point of Diversion for CA WaterFix
2016
DWR/USBR Assessment of Water Quality/Beneficial Use Impacts of Proposed WaterFix

DWR/USBR Asserted: Proposed Diversion 9,000 cfs Sacramento River Water at Proposed North Delta Intakes

Will Not Cause Adverse impacts on Delta Water Quality

P. Nader-Tehrani (p.3 l.11-12 dwr_66WQ):

“The focus of my testimony is on possible changes to water quality and water levels.”

Consideration of “Water Quality Impacts”

Narrowly Defined – Minimum D-1641

- Salinity (EC) for Only Part of Delta
- $\text{Cl}^-$ for Limited Area of Delta

Not Considered:

- Wide Range of Existing & Potential Pollutants Impairing Water Quality/Beneficial Uses of Central Delta
Porter Cologne Act Definitions

CHAPTER 2. DEFINITIONS [13050. - 13051.] (Chapter 2 added by Stats. 1969, Ch. 482.)
§ 13050. [Definitions]

(f) “Beneficial uses” of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

(g) “Quality of the water” refers to chemical, physical, biological, bacteriological, radiological, and other properties and characteristics of water which affect its use.
“In order for the State Water Board to approve a change petition, the petitioner must: 1) demonstrate that the change will not initiate a new water right or injure any legal users of water; and 2) provide information on how fish and wildlife would be affected by the change and identify proposed measures to protect them from any unreasonable impacts of the change.”

“Water Quality Impact” Evaluation Made by DWR/USBR Does Not Meet Those Conditions
Cross-Examination of DWR/USBR Regarding Impacts Other Than EC & Cl-
Responders Stated Those Issues Covered by Draft EIR/EIS

My Overall Assessment in Comments on BDCP Draft – Exhibit CSPA-58:


“Overall, the draft BDCP EIR/EIS and approaches used in its development are inadequate in scope and reliability for evaluating the potential impacts of diverting substantial amounts of Sacramento River water around or through the Delta on chemical constituents and water quality in Delta channels. The draft EIR/EIS basically used model output of expected changes in the concentrations of a few water quality parameters that have not been found to exceed a water quality objective at a few selected locations in the Delta as was done for this draft EIR/EIS. The approach used does not adequately or reliably consider the range of water quality impacts caused by the wide variety of potential pollutants present in the various Delta channels, that can be expected to result from the removal of large amounts of high-quality Sacramento River water from the Delta by this project.”

“An area of the Delta of importance and with which Dr. Lee is particularly familiar is the Central Delta where the Sacramento River mixes with the San Joaquin River below Columbia Cut.”

“A properly developed EIR/EIS would have included a detained analysis of potential errors in predicting constituent concentrations in the various Delta channels and in predicting the changes in flow and associated impacts on constituent concentrations, distribution, and effects. As it stands now Chapter 8 of this EIR/EIS does not reliably inform the public or decision-makers about the magnitude of the errors in estimates and conclusions inherent in the BDCP analysis of the impact of the diversions on Delta water quality/beneficial uses.”
Expertise & Experience

>50 yrs Professional Experience Water Quality Evaluation/Management – Summary Resume (Exhibit CSPA-5)

- Environmental Engineering, Aquatic Chemistry, Water Quality/Public Health
- Investigation/Management Water Quality Problems: Domestic Water Supply; Beneficial Uses of Surface, Ground, Estuarine, Nearshore Marine Waters

Education

- BA San Jose State University – Environmental Health Science
- MSPH University North Carolina, Chapel Hill
- PhD Harvard University – Environmental Engineering (minors: Water Chemistry, Public Health)

Recent Honors

- Fellow, ASCE; Outstanding Senior Life Member, Sacramento Section ASCE
Expertise & Experience

>25 yrs Delta Water Quality Issues – Exhibit CSPA-60

Consultant to Delta Wetlands, Inc. 1989
- Used DWR & USGS Data on Delta Water Quality Characteristics to Assess Anticipated Utility of & Water Quality in Proposed Delta Island Water Supply Reservoirs

US EPA-Appointed US Representative to Steering Committee for $50-million, 5-yr OECD Eutrophication Study
- 200 Waterbodies in 22 Countries – Western Europe, North America, Japan, Australia
- Investigate Aquatic Plant Nutrient Load-Eutrophication Response Relationships & Models
- Responsible for Synthesizing & Evaluating US Portion
- Assessment & Documentation of Predictive Capabilities of Nutrient Load-Response Models Developed
- Subsequently Expanded Data Base and Model Evaluation for >750 Waterbodies Worldwide
Expertise & Experience

Delta Water Quality Issues (cont’d)

Findings of Delta Wetland Islands Evaluation

Proposed Island Reservoirs Would Have Poor Water Quality

Excessive Growths of Algae & Aquatic Plants Due to Amounts of Nutrients (N & P) in Delta Channel Waters

Relative to Morphological Characteristic & Hydraulic Residence Time of Proposed Reservoirs

DWR Staff Subsequently Drew Similar Conclusion

Consultant to DeltaKeeper (W. Jennings) on Low-DO in SJR DWSC near Stockton

Advised SJR DWSC Low-DO TMDL Steering Committee on Low-DO Problems in DWSC
Expertise & Experience

Delta Water Quality Issues (cont’d)

- Selected to Help Rewrite Originally-Rejected Proposal for CALFED Support to Investigate Causes, Implications & Potential Remedies for Low-DO; Revised Proposal Was Funded
- Selected PI for $2-million, 12-Investigator CALFED Low-DO Project
- Developed Synthesis Report of Project Findings (Exhibit CSPA-62):
  
  

- Developed Supplemental Reports, Including (Exhibit CSPA-63):
  
Figure 1 – Exhibit CSPA-64
Map of the Delta
- San Joaquin River (SJR)
- Turner Cut
- Columbia Cuts
- Flow Direction
Low-DO Study

Low-DO Condition Rarely Occurs Downstream of Turner Cut

Additional Sampling Cruises of Central Delta Channels Including Turner Cut & Columbia Cut

Findings Report – Exhibit CSPA-65


Cruises Confirmed: SJR DWSC Water Is Drawn into Central Delta Primarily via Turner Cut & to Lesser Degree, Columbia Cut
Inadequacies of WaterFix Impact Assessment

Understanding Impacts of DWR/USBR North Delta Exports

DWR Water Quality Sampling Cruises on SJR from Prisoners Point in Western Delta to Port of Sacramento – Summer-Fall

Example of Results Shown in Figure 2 (Exhibit CSPA-66) and Figure 3 (Exhibit CSPA-67)

[Results Made Available by Jenna Rinde, Environmental Scientist Department of Water Resources Division of Environmental Services Bay-Delta Monitoring and Analysis Section West Sacramento, CA [jenna.rinde@water.ca.gov]]
Figure 2 – Exhibit CSPA-66
DO Summary Report for Stockton Ship Channel: 15 August 2016 [from: jenna.rinde@water.ca.gov]
Figure 3 – Exhibit CSPA-67
Specific Conductance of DWSC 8/15/16 [from: jenna.rinde@water.ca.gov]
Significance of Findings of DWR Cruises

Sacramento River Water Drawn across Central Delta to South Delta Export Pumps at Banks & Jones Pumping Stations

- EC of SJR at Stations 12 & 13 (Where SJR Enters DWSC)
  - ~700-750 uS/cm
- No SJR Water in DWSC Downstream of Station 7
- All Upstream SJR Water & Its High Pollutant Load Is Drawn into Central Delta

With WaterFix Diversions

- South Delta Export Pumps Will Withdraw ≥45% of Exported Water from South Delta
- Strong Pull of Sacramento River Water to South Delta Will Continue
- SJR Water & Its Pollutants Will Continue to Be Drawn into Central Delta
“Listing a water body as impaired in California is governed by the Water Quality Control Policy for developing California's Clean Water Act Section 303(d) Listing Policy. The State and Regional Water Boards assess water quality data for California's waters every two years to determine if they contain pollutants at levels that exceed protective water quality criteria and standards. This biennial assessment is required under Section 303(d) of the Federal Clean Water Act.”

According to D. McClure (SWRCB Staff, Personal Communication to G. Fred Lee, August 24, 2016) This Is Currently Applicable
<table>
<thead>
<tr>
<th>Region</th>
<th>Waterbody Name</th>
<th>Pollutant</th>
<th>Pollutant Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Sacramento River (Knights Landing to the Delta)</td>
<td>Chlordane</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Sacramento River (Knights Landing to the Delta)</td>
<td>DDT (Dichlorodiphenyltrichloroethane)</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Sacramento River (Knights Landing to the Delta)</td>
<td>Dieldrin</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Sacramento River (Knights Landing to the Delta)</td>
<td>Mercury</td>
<td>Metals/Metalloids</td>
</tr>
<tr>
<td>5</td>
<td>Sacramento River (Knights Landing to the Delta)</td>
<td>PCBs (Polychlorinated biphenyls)</td>
<td>Other Organics</td>
</tr>
<tr>
<td>5</td>
<td>Sacramento River (Knights Landing to the Delta)</td>
<td>Unknown Toxicity</td>
<td>Toxicity</td>
</tr>
<tr>
<td>Region</td>
<td>Waterbody Name</td>
<td>Pollutant</td>
<td>Pollutant Category</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Chlorpyrifos</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>DDT</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Diazinon</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Dioxin</td>
<td>Other Organics</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Furan Compounds</td>
<td>Other Organics</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Group A Pesticides</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Invasive Species</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Mercury</td>
<td>Metals/Metalloids</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Organic Enrichment/Low DO</td>
<td>Nutrients</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>PCBs</td>
<td>Other Organics</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Pathogens</td>
<td>Fecal Indicator Bacteria</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (SSC)</td>
<td>Unknown Toxicity</td>
<td>Toxicity</td>
</tr>
</tbody>
</table>
# Table 1 — Exhibit CSPA-69 (cont’d)
Current US EPA 303(d) List of Water-Quality-Limited Segments – Central Delta

<table>
<thead>
<tr>
<th>Region</th>
<th>Waterbody Name</th>
<th>Pollutant</th>
<th>Pollutant Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>Chlorpyrifos</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>DDT (Dichlorodiphenyltrichloroethane)</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>Diazinon</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>Group A Pesticides</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>Invasive Species</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>Mercury</td>
<td>Metals/Metalloids</td>
</tr>
<tr>
<td>5</td>
<td>Delta Waterways (central portion)</td>
<td>Unknown Toxicity</td>
<td>Toxicity</td>
</tr>
</tbody>
</table>

“Impaired Waterbodies”

- SWRCB/USEPA 303(d) List of WQO Violations Limited Compared to a Comprehensive List of Constituents & Areas of Delta That Are Experiencing Impaired Water Quality
- Current Water Quality Monitoring Program for Delta Waters Grossly Deficient to Adequately Evaluate Current Water Quality Standard Violations
- Deficiencies Recognized for Many Years – e.g., Exhibits CSPA-70, CSPA-71, CSPA-72
- Several Attempts to Significantly Improve Current Delta Water Quality Monitoring Program – Deficiencies Remain
Deficient Delta Water Quality Monitoring


**CVRWQCB Has Initiated Program to Develop a More Comprehensive Water Monitoring Program**

[http://www.swrcb.ca.gov/centralvalley/water_issues/delta_water_quality/comprehensive_monitoring_program/]
Impact of WaterFix on Central Delta Water Quality

- SJR DWSC at Turner Cut – High Pollutant Concentrations/Loads
  - Drawn into Central Delta Primarily via Turner Cut
- Sacramento River Water Drawn into Central Delta
  - Mixes with SJR DWSC Water
  - Dilutes Pollutants from SJR DWSC – Aiding Water Quality
- Proposed WaterFix North Delta Diversion of Sacramento River:
  - Will Reduce Volume/Flow of Sacramento River Water Entering Central Delta
  - Will Increase Adverse Impacts of Pollutants in Turner Cut on Water Quality/Beneficial Uses of Central Delta Waters
Transmittal Letter & Comments: Exhibit CSPA-74

Summarized Overall Conclusion of ISB Regarding Technical Merit & Deficiencies of WaterFix RDEIR/SDEIR:

“We focused on how fully and effectively it considers and communicates the scientific foundations for assessing the environmental impacts of water conveyance alternatives.”

“The effects of California WaterFix extend beyond water conveyance to habitat restoration and levee maintenance. These interdependent issues of statewide importance warrant an environmental impact assessment that is more complete, comprehensive, and comprehensible than the Current Draft.”
Algae & Aquatic Plants

ISB Comments Summary of WaterFix Draft REIR/SEIS Water Quality Discussion of Impacts of Tunnel Diversion Project. Comments included the following, referencing Chapter 8:

“8-75, line 6: The failure to consider dissolved P (DP) should be addressed; there is much greater uncertainty. The adherence of some P to sediment does not prevent considerable discharge of P as DP. Also on page 8-95 line 40, qualify predictions due to lack of consideration of DP.”

Amount of Dissolved P Transported into Central Delta by Sacramento River Significantly Impacts phytoplankton population in Central Delta

- Reducing P Load & Concentrations Reduces Algal Biomass in Delta – Even When Available P Is Surplus

Proposed WaterFix Diversion of Sacramento River Water Will

- Reduce Amount of Sacramento River Water That Enters Central Delta
- Effectively Increase Phosphorus Input to Central Delta
- Effectively Increase Phytoplankton Population in Central Delta
Algae & Aquatic Plants

Reduced Dilution of P Concentration in Central Delta Leads to

- Impaired Water Quality including:
  - increased algae & aquatic plants
  - odors
  - low DO
  - sediment toxicity
  - floating scum
  - blocked ag water intake screens

Adverse Impacts/Injuries to Public/Users of Central Delta Will Be Discussed in Testimony Presented in Part 2 of This Hearing

- fishing
- boating
- swimming
- aesthetic quality of water
Algae & Aquatic Plants

Increasing Aquatic Plant Biomass Adversely Affects Water Quality/Beneficial Uses & Injures Public Interests

My Experience

>50 years Investigating Impacts of P Concentrations & Loads, & Water Inflow on Amount of Algae, Blue-green Algae/Bacteria, & Aquatic Weeds (e.g., Water Hyacinth, Egeria) in Hundreds of Waterbodies in US & Abroad Including an ice-covered Antarctic lake

Published >100 papers/Reports on These Issues

Dr. Erwin van Nieuwenhuyse’s Findings

Described Response of Avg. Summer Chlorophyll Concentration in Delta to an Abrupt & Sustained Reduction in P Discharge from Sac Regional Sanitation District WWTP

Important Information on Impact of Sac Regional Phosphorus Discharge on Planktonic Algae in Delta
Algae & Aquatic Plants

Key Publications Discussed & Incorporated into Testimony:


South Delta – Old River

Low-DO Studies of DWSC Showed Diversion of SJR into Old River at Head of Old River Resulted in more severe Low-DO Problems in DWSC

- Reduced SJR flow through DWSC
- Increased Residence Time of SJR Water & Oxygen-Demanding Materials in DWSC
- Result: Greater Low-DO Problems

Arranged Special Cruise of South Delta Channels

Summary of Findings:

South Delta Cruise Findings

- Recent Large Fish Kill in South Delta Channel near Tracy Blvd Bridge - South Delta Channel Fish Kills Will Be Discussed in Testimony Presented in Part 2 of This Hearing
  - DWR Continuous DO Monitoring: DO Low Night Before Cruise
- Low-DO Condition
  - Likely Cause of Fish Kill
  - Results from Low Flow in Channel
    - Owing to Presence of DWR Barrier at Western End of That Part of Old River Channel
    - Impacted by pumping at Banks & Jones Export Pumps
- Proposed WaterFix North Delta Water Diversions on Sacramento River Will, at Times, Result in Decrease in Amount of Water Exported by South Delta Diversions
Impact of WaterFix on South Delta

Amount of South Delta Water Exported Will Be Less Than Occurs during NAA (no action alternative)

Exhibit DWR-5-errata
Reduced Pumping from South Delta

Can Be Expected to
- Reduce Flow of Water thru South Delta Channel at Barrier
- Increase Residence Time of Water in Channel between Tracy Blvd Bridge & Barrier
- At Times, Result in Greater DO Depletion Than Would Occur under NAA

This is Another Potentially Significant Adverse Impact of Proposed North Delta Diversion of Sacramento River Water
- Should Have Been Evaluated by DWR/USBR
Effects of Delta Flow Diversions - USGS Scientists’ Review

http://repositories.cdlib.org/jmie/sfews/vol5/iss3/art2

Excerpts from Abstract

“We use selected monitoring data to illustrate how localized water diversions from seasonal barriers, gate operations, and export pumps alter water quality across the Sacramento-San Joaquin Delta (California).”

“Reduction of export pumping decreases the proportion of Sacramento- to San Joaquin-derived fresh water in the central Delta, leading to rapid increases in salinity.

Delta Cross Channel gate operations control salinity in the western Delta and alter the freshwater source distribution in the central Delta. Removal of the head of Old River barrier, in autumn, increases the flushing time of the Stockton Ship Channel from days to weeks, contributing to a depletion of dissolved oxygen.

Each shift in water quality has implications either for habitat quality or municipal drinking water, illustrating the importance of a systems view to anticipate the suite of changes induced by flow manipulations, and to minimize the conflicts inherent in allocations of scarce resources to meet multiple objectives.”
## Effects of Delta Flow Diversions - USGS Scientists’ Review

Monsen et al. (Exhibit CSPA-73) Table 1 - Water Quality Comparison between the Sacramento River, San Joaquin River, and In-Delta Agricultural Return Water for Water Years 1999-2001

<table>
<thead>
<tr>
<th>Water Quality Parameter</th>
<th>Sacramento at Freeport ¹</th>
<th>San Joaquin at Vernalis ²</th>
<th>In-Delta Agricultural Return Water ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Conductance (mhos cm⁻¹)</td>
<td>144 ± 28</td>
<td>621 ± 183</td>
<td>562 ± 206</td>
</tr>
<tr>
<td>pH</td>
<td>7.8 ± 0.2</td>
<td>8.0 ± 0.4</td>
<td>6.8 ± 0.4</td>
</tr>
<tr>
<td>Alkalinity (mg CaCO₃ L⁻¹)</td>
<td>55 ± 12</td>
<td>85 ± 24</td>
<td>83 ± 18</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg L⁻¹)</td>
<td>9.8 ± 1.4</td>
<td>9.6 ± 1.4</td>
<td>5.5 ± 2.1</td>
</tr>
<tr>
<td>Nitrite-Nitrate (mg N L⁻¹)</td>
<td>0.12 ± 0.05</td>
<td>1.62 ± 0.59</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (mg P L⁻¹)</td>
<td>0.024 ± 0.007</td>
<td>0.107 ± 0.054</td>
<td></td>
</tr>
<tr>
<td>Dissolved Organic Carbon (mg C L⁻¹)</td>
<td>1.84 ± 0.53</td>
<td>2.83 ± 0.47</td>
<td>14.1 ± 7.7</td>
</tr>
<tr>
<td>Total Dissolved Selenium (nmol L⁻¹)</td>
<td>0.91 ± 0.27</td>
<td>8.6 ± 2.5</td>
<td>Negligible ⁴</td>
</tr>
</tbody>
</table>

¹ USGS Water Quality Database (WY1999-WY2001) for Sacramento (USGS 11447650) and San Joaquin (USGS 11303500) rivers unless otherwise noted.

² California Department of Water Resources Municipal Water Quality Investigations Program (WY1999-WY2001) for Bacon Island Pumping Plant (DWR B9V7588/1342), and Twitchell Island Pumping Plant 1 (DWR B9V8066/139) (CDWR 2003). DOC data only from Bacon Island. Different crops produce varying levels of DOC, agricultural return water DOC is expected to vary significantly throughout the Delta.


⁴ Personal communication AR Stewart, 14 May 2003

Sacramento River Water Has Much Lower Concentrations of Several Potential Pollutants Than SJR
Monsen et al. (Exhibit CSPA-73) Highlighted Importance of Considering Effects of Manipulation of Delta Water on Pollutant Impact: Will Be Discussed in Testimony for Part 2 of This Hearing *(Excerpts)*

- Processes that change concentration fields of pollutants are ecologically important because the toxicity and accumulation of pollutants in food webs are concentration dependent.
- The new pyrethroid pesticides are extremely toxic to invertebrates with sublethal effects at concentrations measured in parts per trillion.
- The herbicide diuron inhibits phytoplankton photosynthesis in the Delta at concentrations > 2 ug L⁻¹.
- Phytoplankton accumulate methyl mercury at concentrations 10,000 times those in water.
- Bioaccumulation of toxic metals (e.g. copper, cadmium, silver, chromium) in invertebrates and fish depends on concentrations of those elements in water and prey.
- We have learned empirically how individual diversions modify salt concentrations across the Delta, but we have not yet considered how they modify distributions of land-derived pollutants and their threats to wildlife or human health.
Unrecognized & Unregulated Pollutants

Experience in Developing, Evaluating, Applying Water Quality Criteria, Standards, Objectives for Protection of Water Quality, Including Invited Peer-Reviewer for

- NAS-NAE “Blue Book” of Water Quality Criteria
- AFS Peer-Review Panel for US EPA “Red Book” of Water Quality Criteria
- US EPA “Gold Book” of Water Quality Criteria

Summary of Experience in Exhibit CSPA-81:


DWR/USBR Evaluation of Impact of North Delta Sacramento River Diversions Relies on Exceedance of Limited Number of WQOs

- Highly Unreliable for Evaluating Impacts on Water Quality/Beneficial Uses
Unrecognized & Unregulated Pollutants

- Increasing Concern about Impacts of Unmonitored, Unregulated, & Unrecognized Chemicals in Receiving Waters
  - Especially Those Waters – Like the Delta – That Receive Large Amounts of Agricultural Runoff & Domestic Inputs
- Exhibit CSPA-82 – Numbers of Chemicals Registered for Commercial Use in US
Unrecognized & Unregulated Pollutants

- Ignored in Evaluation of Water Quality/Beneficial Use Impacts of WaterFix
  - Concern for Potential Impacts of Individual Unregulated Chemicals & Unrecognized Pollutants
  - Potential Additive & Synergistic Impacts between/among Regulated & Unregulated Chemicals That Can Impact Water Quality
- Short-Sighted Evaluation Leading to DWR/USBR Conclusion that WaterFix Tunnel Diversions Will Not Cause Adverse Impacts to Delta Water Quality
  - While Sacramento River Water Likely Contains Some Unregulated Pollutants
    - In General Much Higher Quality Than SJR
    - Reduction of Sacramento River Water Flow Will Certainly Diminish Water Quality at Confluence of Sacramento & San Joaquin Rivers
Unrecognized & Unregulated Pollutants

Issues Discussed in Numerous Publications Including:


Summary of Key WaterFix Operation Impacts

- Amount of P Entering Turner Cut Influenced by Amount of SJR DWSC Water Entering
  - Affected by South Delta Export Pumping of South Delta Water
  - WaterFix Operations Will Impact Amount of P Entering Central Delta
    - Will Impact Aquatic Plant Growth & Water Quality/Beneficial Uses of Central Delta
- Less Water Entering Turner Cut Will
  - Increase Residence Time of Pollutants in Central Delta
  - Increase Water Quality Impacts/Harm from Aquatic Plants
- P Carried into Central Delta via Sacramento River
  - Impacts Phytoplankton Growth & Impacts/Harms Central Delta Water Quality
- Operation of Proposed WaterFix Diversions Will
  - Increase Pollutant Concentrations in Central Delta
  - Increase Residence Time of Pollutants in Central Delta
  - Increase Water Quality Impacts/Harm to Users of Central Delta Water
  - Increase Water Quality Impacts/Harm to South Delta Old River Channel Users
    - Due to Increased Water/Pollutant Residence Time

All of These Impacts/Harms to Delta Water Users Should Have Been Evaluated by DWR/USBR in Its Petition to Change Point of Diversion of Sacramento River Water