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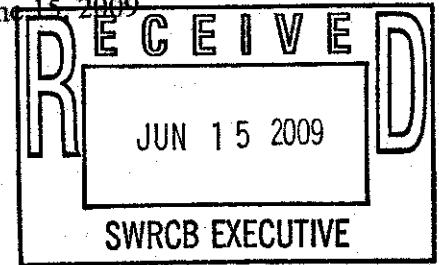
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Technology in balance with nature

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Mr. Curtis Yip  
Environmental Scientist  
Bay Delta Unit  
Division of Water Rights  
P.O. Box 2000  
Sacramento, CA 95812-2000

**Comments on Draft Staff Report 2009 Periodic Review of the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan)**

Dear Mr. Yip:

The Sacramento Regional County Sanitation (SRCSD) appreciates the opportunity to provide information to the State Water Resources Control Board (State Water Board) for its use in the basin planning process to determine what, if any, changes should be made to the Bay-Delta Plan. SRCSD provides wastewater collection and treatment services to 1.3 million residents of the greater Sacramento area. Our mission is to protect human health and keep the Sacramento River clean and safe. We take our mission very seriously and work on a daily basis to meet our obligations to protect water quality and beneficial uses in the Delta. Our excellent compliance record with our NPDES permit speaks to this commitment and performance.

SRCSD applauds the effort of the State Water Board in preparation of the staff report, particularly in their use of the information supplied from the August 29, 2008 "Request for Written Input on Factual Issues Regarding the Bay-Delta." The staff report is written in a concise manner and organized to allow the reader to easily understand how the recommendations and conclusions were derived. The staff recommendations for issues worth further review as part of the basin planning process are very significant and important issues that need further review to protect beneficial uses of waters in the Delta. SRCSD appreciates the State Water Board's commitment to stakeholder involvement and pursuit of science based decisions.

The related proceedings of the staff report makes it very clear that the State Water Board has its own independent judgment in all the Delta efforts underway, and that implementation of the Bay Delta Conservation Plan will require changes to the Bay Delta Plan and water right permits that implement that plan. SRCSD has been an active participant in the Central Valley-Salinity Alternatives for Long Term Sustainability (CV-SALTS) basin planning process and is pleased to see the State Water Board recognize that the

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setting of salinity objectives for the South Delta must be integrated with CV-SALTS. SRCSD is concerned about the Water Board's ability to provide sufficient staffing and funding to stay actively engaged in Delta issues. While there are many priorities for the Water Boards, SRCSD contends that dedication of resources towards Delta issues is of critical importance. In providing funding, it is important to keep in mind that there are many diverse uses and beneficiaries of the Delta, and that everyone has an obligation to participate in developing and implementing solutions.

Overall, the staff report is balanced, well written and includes recommendations from stakeholders. SRCSD's comments on the various sections of the staff report are general for the subject areas of "Issues Previously Identified for Further Review" and "Additional Issues Identified for Further Review". For the subject area of "Issues Not Recommended for Further Review", SRCSD is providing very specific comments related to ammonia and toxicity that support the State Water Board's recommendations.

#### *Issues Previously Identified for Further Review*

- The review of the evaluation of Southern Delta Salinity Objectives is very helpful in understanding how the objectives were originally established in the 1970's. The reliance on assuming a 100 percent yield for estimating the maximum salinity concentrations needs review and updating. Permit writers at the Regional Water Quality Control Boards using this assumption in evaluating site specific salinity limits may be inappropriate. Granted the southern delta salinity objectives were never meant to be used as de facto permit limits, but when numeric objectives are established there is a tendency to apply those objectives in NPDES permits.
- SRCSD appreciates the clear discussion on San Joaquin River flows and the relationship to salinity in the south Delta.

#### *Additional Issues Identified for Further Review*

- The review of Delta outflow export/inflow objectives is appropriate and the discussion of why this must be reviewed is the most factual listing of the known effects of the State Water Project and Central Valley Project have on the beneficial uses of Delta water.
- SRCSD is very concerned with the impact of export volumes on flow conditions in the Sacramento River. The concern is that the magnitude and timing of withdrawals, as proposed in the Bay Delta Conservation Plan, would increase the frequency of river reversals and low flow conditions in the Sacramento River at the Sacramento Regional Wastewater Treatment Plant's (SRWTP) outfall. An increase in the frequency of reversals and low flow conditions would significantly impact the design and operation of the SRWTP. Additionally changes in flow will alter the ecosystem in unknown ways, which should be further reviewed.
- SRCSD strongly supports the conclusion that the State Water Board considers changes to the monitoring and special studies program that coordinate the multitude of monitoring programs in the Delta for assessment, data compatibility, and decision making.

### ***Issues Not Recommended for Further Review***

SRCSO is providing the following technical comments regarding ammonia and toxicity as these specific comments are based on current available information and are intended to provide more context on the current scientific understanding of ammonia and the Delta.

#### ***Ammonia Objectives***

- Page 32, Paragraph 2: *"Additional sources of ammonium to the Delta and Suisun Bay include other wastewater treatment plants, agricultural run-off, atmospheric deposition, internal cycling, and possibly discharges from wetlands."*

Comment: The SRCSD appreciates the acknowledgement of a broad view of all sources of ammonia/um and encourages inclusion of all potential sources of ammonium to the Delta and Suisun Bay in the research framework recommended by the experts who participated in the CALFED Science Program Ammonia Workshop in March 2009.

- Page 32 - *"Recent studies suggest that water quality objectives and effluent limits based on these criteria may allow concentrations of ammonia in surface water that could result in adverse effects on the Bay-Delta ecosystem. For example, two recently published studies found that elevated ammonium levels ( $>4 \mu\text{mol/L}$  or  $\sim 0.056 \text{ mg/L}$ ) in Suisun Bay, can suppress the growth of phytoplankton in this area even when there is sufficient light (Wilkerson et al. 2006, Dugdale et al. 2007). In response to these recent studies, the State and Regional Water Boards are investigating whether more stringent ammonia criteria may be necessary to protect aquatic life in the Delta."*

Comment: Please note that an expert panel of invited scientists at the March 2009 CALFED Science Ammonia Workshop, questioned the validity of Dr. Dugdale's hypothesis that ammonium was a driving factor limiting algae growth in Suisun Bay. Dr. Dugdale's hypothesis was identified for further research to clarify the role of ammonium on algae growth in the Delta in the Framework for the following research topics:

- Topic 1: Modeling analysis of historical controls on phytoplankton populations.
- Topic 2: Sources and fates of N and P
- Topic 7: Lag times in phytoplankton bioassays

([http://www.science.calwater.ca.gov/pdf/workshops/workshop\\_ammonia\\_research\\_framework\\_final\\_041609.pdf](http://www.science.calwater.ca.gov/pdf/workshops/workshop_ammonia_research_framework_final_041609.pdf)).

Also, note that the threshold limit for effects cited in the Dugdale and Wilkerson papers (2007, 2006), and cited on Page 34 as  $0.056 \text{ mg/L}$ , is not necessarily a "high ammonium level" as stated. This ammonium concentration is well below current EPA (1999) criteria.

- Page 33, Paragraph 3: *"Primary production rates and standing chlorophyll a levels associated with phytoplankton (openwater algae) in the Delta and Suisun Bay are among the lowest of all the major estuaries in the world"*

Comment: The San Francisco Estuary (SFE) is commonly referred to as a "high nutrient/low productivity" estuary, owing in part to its position near the low end of the scale for an often-cited relationship between fishery yield and primary production for 36 marine systems published by Nixon

(1988)<sup>1</sup>. However, the above statement from the Staff Report exaggerates the ranking of the SFE with respect to phytoplankton biomass and world estuaries. The recent meta-analysis of chlorophyll-a patterns in 154 estuaries worldwide by Cloern & Jassby (2008) (see Figure 1 below from their publication) shows that annual mean chlorophyll-a levels in the SFE are actually intermediate on the global scale for aquatic ecosystems on the land/sea interface. Additionally, Cloern & Jassby found in their meta-analysis that most (73%) annual mean biomass values for chl. a in the global dataset fall within the range of 1-10  $\mu\text{g chl.a/L}$ . The upper end of this range (10  $\mu\text{g/L chl. a}$ ) has been frequently referred to in pelagic organism decline (POD) literature as a critical threshold, below which estuarine zooplankton are likely to be food limited. However, the widespread occurrence of mean annual chl. a levels below 10  $\mu\text{g/L}$  in estuaries occupying positions across the global spectrum of secondary productivity suggests that the trophic significance of chl.a levels below 10  $\mu\text{g/L}$  has been exaggerated in the POD debate.

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<sup>1</sup> Nixon, S. W. 1988. Physical energy inputs and the comparative ecology of lake and marine ecosystems. *Limnol. Oceanogr.* 33: 1005-1025.

FIGURE 1

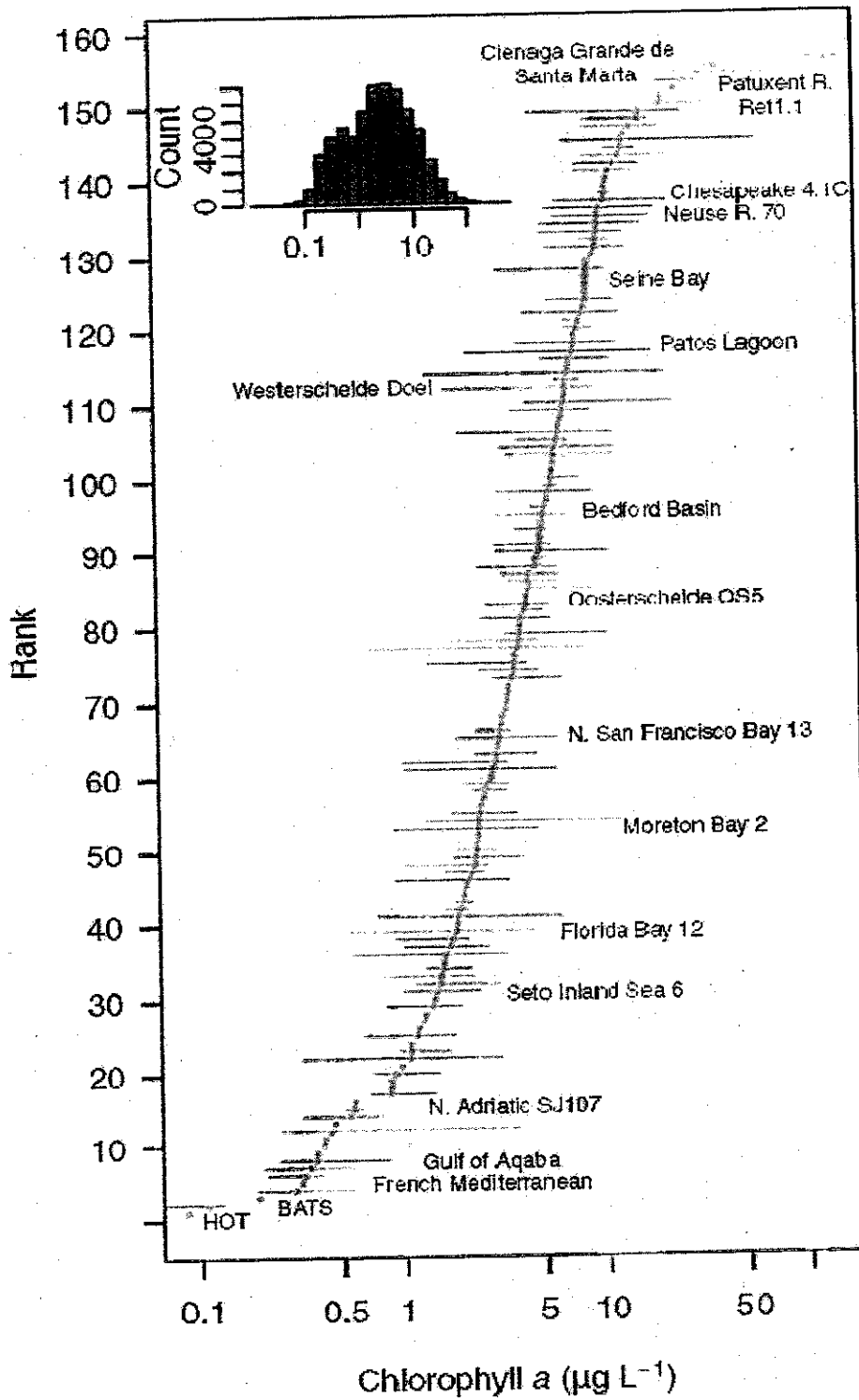


Figure 1. Median (red dots) and range (blue lines) of annual mean phytoplankton biomass (chl. a) at 154 sites representing land/sea interfaces such as estuaries, enclosed bays, tidal rivers, fiords, and coastal sites. Figure is from Cloern & Jassby (2008) Ecology Letters. (doi 10.1111/j.1461-0248.2008.01244.x).

- Page 35, paragraph 2: *“Questions remain about the potential for chronic (i.e., long-term, sub-lethal) impacts from ammonia as well as the impacts in sensitive delta smelt spawning areas (e.g., Cache Slough). Un-ionized ammonia concentrations in the Delta do exceed levels where histopathological effects have been observed (US EPA 1999)”*.

Comment: This passage in the Staff Report could be interpreted to mean that un-ionized ammonia concentrations in the Delta are routinely above levels where histopathological effects have been observed, according to the US EPA's 1999 Freshwater Ammonia Criteria document. In the EPA document<sup>2</sup>, the low end of the range of chronic concentrations cited as affecting growth rates of salmonids is cited as 0.002 mg NH<sub>3</sub>-N/L (un-ionized fraction only). Although the Interagency Ecological Program (IEP) Environmental Monitoring Program (EMP) ceased monitoring pH at its Delta monitoring stations in 1995 (preventing the calculation of unionized ammonia from total ammonia measurements), several *other* monitoring entities (USGS, DWR-MWQI, SRCSD) have measured total ammonia, water temperature, pH and electrical conductivity at a of variety freshwater and estuarine sites in the SFE during years subsequent to 1995. These data, summarized in Table 1 for freshwater stations for POD years (2000-2008), indicate that mean concentrations of un-ionized ammonia are below 0.002 mg NH<sub>3</sub>-N/L at the majority of locations for which recent records exist.

The cumulative probability function for the data set summarized in Table 1 puts the EPA low-end effects concentration (for growth) into further perspective. For Figure 2, data were combined for all freshwater stations listed in Table 1, with the exception of the Freeport stations (which were omitted owing to their position upstream from the SRWTP discharge). The figure shows that 80% of the individual records for un-ionized ammonia available from the freshwater Delta for POD years (N= 637 samples, 2000-2008) are below the low-end chronic effects concentration cited in EPA 1999 for salmonids.

Additionally, “no apparent growth effect” concentrations for *non*-salmonid species are cited in EPA (1999) as ranging upward from 0.030 mg NH<sub>3</sub>-N/L – a threshold which exceeds all of the un-ionized ammonia concentrations from the Delta summarized in Table 1 and Figure 2. Eddy (2005) supported the conclusion that concentrations less than 0.021 mg/L NH<sub>3</sub>-N should be considered protective of most marine and estuarine fish, including salmonids. Ambient concentrations are below this threshold level (Figure 2).

The observations above suggest that it would be misleading to imply that, based on the available data for the Delta, un-ionized ammonia concentrations are typically above chronic effects concentrations discussed in the histopathological effects section of EPA (1999).

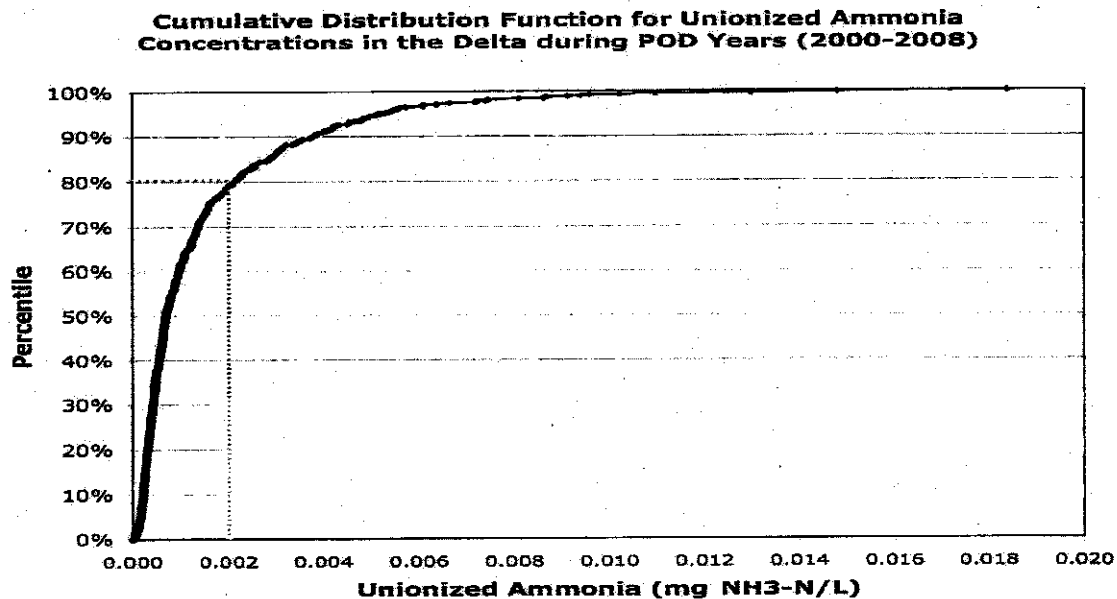
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<sup>2</sup> Histopathological effects are discussed in Appendix 5 of EPA (1999).

**Table 1. Unionized ammonia concentrations in surface water samples at monitoring stations in the freshwater Delta during POD years (2000-2008)<sup>(1)</sup>.**

Project	Station Code	Station Name	Number of Samples	Unionized Ammonia (mg-N/L)	
				Mean	Maximum
DWR-MWQI	B0702000	San Joaquin R. near Vernalis	58	0.0005	0.0032
USGS	11303500	San Joaquin R. near Vernalis	127	0.0017	0.0148
DWR-MWQI	B9591000	Contra Costa Pumping Plant #1	51	0.0006	0.0023
DWR-MWQI	B9D75351342	Old River near Byron	69	0.0006	0.0055
DWR-MWQI	B9D75811344	Old River at Bacon Island	66	0.0008	0.0031
DWR-MWQI	KA000000	Clifton Court Intake	21	0.0007	0.0016
USGS	381427121404901	Lower Yolo Bypass near Rio Vista	2	0.0004	0.0007
DWR-MWQI	KA000331	H.O. Banks Pumping Plants	100	0.0012	0.0075
USGS	11447650	Sacramento River at Freeport	108	0.0004	0.0048
SRCSD CMP	Freeport	Freeport	5	0.0007	0.0012
SRCSD CMP	River Mile 44	River Mile 44	40	0.0021	0.0094
DWR-MWQI	B9D82211312	Sacramento River at Hood	104	0.0032	0.0184

(1) All freshwater Delta stations are included in the table for which ammonia, pH, water temperature, and electrical conductivity were all measured in water samples taken during the POD years.



**Figure 2. Cumulative distribution of un-ionized ammonia concentrations (N = 639) from freshwater Delta monitoring stations at which total ammonia, pH, water temperature and EC were measured during POD years (2000-2008). Station names and monitoring entities are identified in Table 1. Data for Freeport were omitted from the cumulative distribution.**

- Page 35, second paragraph: *"In general, un-ionized ammonia levels in the Delta appear to be too low to cause acute mortality of even the most sensitive species."*

Comment: It is appreciated that the Staff Report recognizes that ambient concentrations of ammonia downstream of SRWTP "is in compliance with the USEPA ammonia criteria." The ammonia/criteria, includes concentrations below which chronic and acute effects are unlikely to occur. The statement should be modified to properly reflect the known data by deleting "In general" and, in order to avoid misunderstanding and confusion with the details described in other sections, explicitly include chronic toxicity, as defined by the USEPA (1999).

Of course, there are uncertainties regarding potential ammonia toxicity to species not tested and locations not sampled, but it is speculative to say that the EPA criteria are not protective of delta species until tests can show this. To date the data do not suggest any adverse effects. Dr. Inge Werner (UC Davis) is conducting toxicity testing with juvenile delta smelt and has found that they are about as sensitive as rainbow trout, which are protected by the EPA criteria. Therefore, current knowledge suggests that smelt are protected, since ambient ammonia/criteria concentrations in the delta (pH and temperature corrected) are below both acute and chronic EPA criteria.

- Page 35, third paragraph: *"There may be the potential for toxic ammonia levels to be reached in very productive areas in the southern Delta or smaller productive sloughs or shallow areas throughout the Delta, when high concentrations of un-ionized ammonia coincide with warm temperatures and elevated pH (phytoplankton productivity increases pH that influences how much un-ionized ammonia is present). The relatively few ammonium, temperature, and pH data available in many of these areas are currently being compiled and evaluated."*

Comment: The statement that the potential for chronic effects are uncertain is contrary to the preponderance of data. There are only a handful of outliers in the 1000s of data that exceed or come close to exceeding the EPA criteria. If one includes the monitoring efforts of the USGS, IEP, and DWR-MWQI, over ten thousand measurements of total ammonia, pH and water temperature have been made at estuarine and freshwater sites in Suisun Bay and the Delta over the last three decades. The EPA chronic criterion is exceeded by ambient ammonia concentrations in less than five grab samples in this large historic dataset. Chronic toxicity derives from long term exposure; therefore, mean ambient conditions should be given more weight than isolated maximum concentrations. There have been no recorded exceedences of 30 day average USEPA chronic criteria in the Delta. Additionally, the USEPA ammonia chronic criteria are based on data for sensitive fish and an invertebrate species that have been carefully evaluated in accordance with national quality assurance guidelines.



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- Page 36- Conclusions-The discussion above, regarding the potential for chronic effects from ammonia based on available data should be recognized and reiterated in the conclusion after mentioning the potential for acute ammonia effects.

#### ***Toxicity Objectives***

- Page 37, last sentence of discussion: *"Another method of estimating exposure to contaminants is use of biomarkers, which is a measure of sub-lethal chemical endpoints such as enzyme activity or endocrine disruption that cannot be measured with standard toxicity tests."*

Comment: The District supports continued research to identify contaminants in the Delta that are adversely affecting sensitive species.

It should be noted that biomarkers are a useful tool for evaluating contaminant exposures, but do not necessarily mean that there is an adverse effect to the organism. Molecular indicators of exposure, such as biomarkers, are not well linked to adverse effects in organisms, population, and ecosystems. Therefore, as indicators, care must be taken in interpreting these data and they should not be considered on par with other sub-lethal effects more directly linked to organism health (e.g., growth, reproduction).

We hope that the State Water Board will consider the above comments as they continue activities to review the Bay-Delta Plan. As always, the District stands ready to participate in the process, and appreciates the effort the Water Boards have put forward to involve stakeholder's participation in this process. Thank you again for your consideration of our input. If you have any questions regarding our comments, please contact Terrie Mitchell at 916-876-6092.

Sincerely,



Mary K. Snyder  
District Engineer

cc: Pamela Creedon, Central Valley Regional Water Quality Control Board  
Debbie Webster, Central Valley Clean Water Association  
Stan Dean, District Manager, SRCSD  
Terrie Mitchell, Legislative and Regulatory Affairs Manager, SRCSD  
Cliff Dahm, CalifED