



December 8, 2011

Mr. Vince Christian
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

RE: Tentative Order for the Central Contra Costa Sanitary District, No. R2-2011-XXXX, NPDES Permit No. CA0037648.

Dear Mr. Christian,

The Bay Area Clean Water Agencies (BACWA) submits these comments on the tentative order (TO) for the Central Contra Costa Sanitary District (CCCSO) National Pollutant Discharge Elimination System (NPDES) Permit (Order No. R2-2011-XXXX, NPDES Permit No. CA0037648). BACWA is a joint powers agency, formed under California Government Code section 6500 *et seq.*; our members own and operate publicly-owned treatment works (POTWs) and sanitary sewer systems that provide sanitary services to over 6.5 million people in the nine-county San Francisco Bay Area. BACWA members are public agencies, governed by elected officials and managed by professionals charged with protecting the environment and public health.

BACWA recognizes that the formal comment period for this TO closed on November 1, but respectfully request that these comments be entered into the record pursuant to Title 23 of California Code of Regulations, section 648.1(d). The TO publicly noticed by the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) did not raise issues warranting submittal of comments on behalf of BACWA and our member agencies. The District and BACWA were supportive of contents of the noticed TO and the direction of collaborative efforts underway with the Regional Water Board to better understand nutrient science and management needs. After the close of the comment period, however, BACWA became aware of comments submitted by the San Luis & Delta-Mendota Water Authority and the State Water Contractors (Water Agencies) that warrant our response because the issues raised have potentially significant implications for Bay Area POTWs.¹ We understand that the Regional Water Board may be considering imposing additional requirements on BACWA members as a result of the Water Agencies' comments. This turn of events concerns us greatly; we strongly recommend our comments be taken under consideration and that the TO be adopted as originally issued.

Specifically, the comments submitted by the Water Agencies cite recent studies on the potential impacts of ammonia discharges on Suisun Bay water quality. The letters request that, based on these studies, the District be required to nitrify their effluent or, in the alternative, undertake a very substantial research effort to determine whether the District is harming beneficial uses. The assertions made by the Water Agencies, if considered in discharge permitting, could have an impact on multiple BACWA members because some of the studies relied upon suggest that fully treated municipal wastewater is fundamentally

¹ Letter from the San Luis & Delta-Mendota Water Authority and the State Water Contractors regarding the Tentative NPDES Permit Renewal for the Central Contra Costa Sanitary District Wastewater Treatment Plant, dated October 31, 2011.

affecting the Bay-Delta food web. These assertions, however, are based on limited study results that are either preliminary or that other experts have questioned because a clear cause and effect relationship has not been demonstrated. Scientific peer review of these studies has not been completed, nor has a rulemaking process been undertaken to adopt revised state, or site specific, water quality standards. It is therefore premature to consider these studies as the basis for any changes to the TO at this time. Our comments identify some of the limitations of the research conducted to date and illustrate the complexity of both the Bay-Delta system and the scientific questions raised.

As is described in more detail below, BACWA and our member agencies have taken a proactive and collaborative approach to working with the Regional Water Board in understanding the possible effects of ammonium and other nutrients in San Francisco Bay. We understand the Regional Water Board's need to develop sound nutrient criteria and an implementation strategy. We emphasize, though, that this should be done through a joint fact-finding process with broad stakeholder involvement in order to minimize wasting resources through litigation and adversarial science. We hope that the Regional Water Board will carefully review the evidence provided and continue to work with BACWA, regional scientists, and other stakeholders in a coordinated and transparent way.

I. The District and BACWA Are Committed to Resolving Existing Uncertainties about Nutrient Impacts to San Francisco Bay Beneficial Uses.

The question of whether nutrient discharges from POTWs have the potential to impact beneficial uses is of paramount importance to BACWA and our members. The public agencies that own and operate POTWs must balance their mandate to protect environmental and public health with their responsibility to their communities to ensure that these services are reasonable and affordable.

No simple "end of pipe" or pollution prevention nutrient removal options exist for POTWs. Removal of ammonia from municipal wastewater is typically done biologically by nitrification, wherein ammonia ($\text{NH}_3/\text{NH}_4^+$) is oxidized to nitrite (NO_2^-), and then nitrite is oxidized to nitrate (NO_3^-). This oxygen intensive process requires capital improvements to allow for greater aeration and increased solids retention time, as well as chemical feed to provide alkalinity to support nitrification and to accommodate increased solids loading on the clarifiers. These changes to the treatment process are not only financially costly, but have significant environmental implications in terms of energy consumption and greenhouse gas emissions.

While the expense of these infrastructure and operational changes will depend on a particular agency's current treatment train and land availability, they are very significant. Such changes cannot and should not be undertaken without robust evidence that they are necessary and will provide benefits to the Bay commensurate with the economic and environmental costs. For these reasons, BACWA is committed to ensuring that the potential impacts of nutrient discharges are well understood and documented, and that any possible control measures implemented will result in the desired improvements to water quality.

BACWA has expressed this commitment through our support of the multiple nutrient-related initiatives underway in the region. We understand the State Water Board and Regional Water Boards' need to establish a nutrient monitoring program, better quantify loadings from various sources, develop load-response and other models, and develop Numeric Nutrient Endpoints (NNEs). BACWA has collaborated with Regional Water Board staff to further these efforts by providing funding to the San Francisco Estuary Institute (SFEI) for the June 29, 2011 Nutrient Science and Management Workshop and to

synthesize nutrient loading data in the South San Francisco Bay. Additionally, our member agencies have and will continue to provide nutrient effluent data above and beyond current monitoring requirements. We are also currently working with SFEI and Regional Water Board staff to determine how BACWA may provide longer-term financial support for efforts to more clearly identify and resolve key scientific and management questions related to potential nutrient impacts.

Our work also extends to the Suisun Bay Work Plan referenced in the Water Agencies' comment letter. We first became aware of this Surface Water Ambient Monitoring Program (SWAMP) funded effort in the fall of 2010 and shortly thereafter began participating in workgroup meetings. BACWA provided financial support for water chemistry analyses of samples; CCCSD provided in-kind services as well as funding to add a monitoring station and expand the analyte lists. Only one of the two years of work contemplated in the Work Plan has been completed. Data from this first year are not yet available and have not undergone any form of peer-review. BACWA hopes that, once the study concludes next year, the results of this and related projects will be presented in a public forum with opportunities for review and discourse.

II. Regulation Based on the Assertions in the Water Agencies' Comments is Inappropriate Because the Impacts of Ammonium on Suisun Bay are Controvertible.

In their comment letters on the District TO, the Water Agencies make numerous allegations regarding the certainty of the effect of the District's discharges of ammonium to Suisun Bay. These claims are inconsistent with the findings of the team of highly esteemed coastal estuarine experts charged with evaluating the impacts of nutrients, including ammonium, on the San Francisco Bay Estuary as part of the development of NNEs.² The Water Agencies also rely heavily on the results of a recently issued report by Dr. Swee Teh to allege the existence of ammonia toxicity in Suisun Bay.³ Serious questions exist regarding the key findings of that report, which has not been independently peer reviewed, and the subsequent use of those findings to demonstrate toxicity associated with the District's discharge. The Water Agencies also assert that these discharges are disrupting the Delta food web by changing the nutrient balance in the estuary. Such an allegation pre-supposes knowledge regarding the impact of nutrients in the San Francisco Estuary which does not currently exist, and asserts information as fact which has clearly not yet been resolved by San Francisco Bay scientific experts.

In the following discussion, facts are presented regarding the current state of knowledge of the effects of ammonium, specifically, and nutrients, in general, on San Francisco Bay. This information illustrates that the requested changes to the draft permit are without merit and demonstrates that the appropriate action by the Regional Water Board at this time is the adoption of the draft permit as publicly noticed.

² McKee, Lester; Sutula, Martha; Gilbreath, Alicia; Beagle, Julie; Gluchowski, David; Hunt, Jennifer; *Nutrient Numeric Endpoint Development for the San Francisco Bay Estuary: Literature Review and Data Gaps* (June 2011). (Hereinafter, McKee et al. 2011). Available at http://www.swrcb.ca.gov/rwqcb5/water_issues/delta_water_quality/ambient_ammonia_concentrations/tehetal_ammonium_exposure2011.pdf.

³ Teh, Swee; Flores, Ida; Kawaguchi, Michelle; Lesmeister, Sarah; and The Ching; *Full Life-Cycle Bioassay Approach to Assess Chronic Exposure of Pseudodiaptomus forbesi to Ammonia/Ammonium*, University of California at Davis; submitted to the State Water Resources Control Board pursuant to Agreement No. 06-447-300 (August 2011). (Teh et al., 2011). Available at http://www.swrcb.ca.gov/rwqcb5/water_issues/delta_water_quality/ambient_ammonia_concentrations/tehetal_ammonium_exposure2011.pdf.

A. Response to the allegation that ammonium levels in Suisun Bay are toxic to copepods and are linked to the District discharge.

Comments by the Water Agencies claim that the District's discharge is contributing to the toxicity of two copepods: *Pseudodiaptomus forbesi* (*P. forbesi*) and *Eurytemora affinis*. This is based on the recent research of Dr. Swee Teh at the University of California at Davis on only one of those species, *P. forbesi* (hereinafter, Teh et al. study). The comments also allege that toxicity to these copepods is significantly impacting the food web that supports aquatic life in the Bay-Delta estuary.

1. *Serious questions exist regarding reliance on the results of Dr. Teh's research in making changes to the District permit.*

The report issued by Dr. Teh presents results from studies which are described by the author as a "developmental protocol with a non-standard species."⁴ Given the unique and "developmental" nature of the test species and testing methods used, independent scientific review is needed to establish the validity of the study results. In fact, the report has not undergone formal peer review and has not been widely circulated within the scientific community to garner even informal peer review.

Review to date by other expert toxicologists has raised a serious question regarding the methodology used in data interpretation to derive the most significant results in the report. In addition, questions regarding the test methods and test results cast further doubt on the key conclusions contained in the report. These questions, enumerated below, highlight the need for independent peer review of the final report, and replication of the study itself, prior to applying in a regulatory context.

Data Interpretation

Independent analysis of the raw data for adult *P. forbesi* obtained from the 31-day life cycle testing performed in the Teh et al. study indicates that the test treatment at 0.36 mg/l is not statistically different from the control. This significantly changes a primary conclusion in the Teh et al. report, and essentially eliminates the concern about adult copepod toxicity in Suisun Bay. A revised chronic toxicity threshold therefore would be calculated as 0.53 mg/l (based on numbers of nauplii and juveniles in the 31-day reproduction test), rather than the reported 0.36 mg/l. As described in greater detail below, ambient levels of ammonium do not reach such threshold levels in Suisun Bay for periods long enough to cause chronic toxicity.

In addition to this significant concern, the following questions exist regarding test methods and test results. These issues warrant consideration by independent peer reviewers of the study to assess many aspects of this study, including even whether the 0.53 mg/l threshold value is valid.

Test Methods

A new test methodology was developed by Teh et al. to perform the study in question on *P. forbesi*. This raises inherent questions, owing to the lack of a track record for the method and the absence of a

⁴ Letter from Dr. Swee Teh, University of California at Davis, to Ms. Linda Dorn, Environmental Program Manager for the Sacramento County Regional Sanitation District, dated August 31, 2011.

standardized methodology to rely upon. A few of the issues relating to these novel test methods are provided below.

- Due to budget constraints, the Teh et al. study did not include use of reference toxicity tests, which is a relatively standard procedure in toxicity testing to confirm the sensitivity of the test organisms. Dr. Teh has stated in writing that he would propose to use reference toxicity testing in future studies and that he agrees it would be appropriate to do so.⁵
- The Teh et al. study was performed at a nominal salinity of two parts per thousand (ppt), bringing into question the applicability of these results in more saline environments. At the District's discharge points, the salinity varies from several to twenty ppt depending on Delta outflows and climatic conditions. Dr. Teh agrees that future studies should address salinity/conductivity tolerance questions.⁶
- Teh et al. selected a control survival threshold of 80% by which to judge the acceptability of a given test. This control survival threshold is relatively low and raises the possibility that unhealthy or substandard test organisms could have biased the results.
- Teh et al. used the initial measured concentrations of ammonium as the basis for reporting test results. Ammonium levels can increase over the test period. This approach, therefore, tends to overstate the toxic effect of a particular concentration because of the possibility that the test organisms were, in fact, exposed to higher concentrations than those reported.

Test Results

A major concern with the chronic toxicity test results summarized in the report is the high variability between replicates at the same concentration. Such variability would arguably be the basis for invalidation of the results. Teh et al., however, have relied on these data, without qualification, in concluding that an ammonium concentration of 0.36 mg/l was chronically toxic to *P. forbesi*.

2. *Information regarding the increasing abundance of these copepods (P. forbesi) in Suisun Bay contradicts the allegations made and highlights the uncertainties in our understanding of the Delta food web.*

Recent publications provide information that contradicts allegations and inferences contained in the Water Agencies' comment letter regarding the impact of the District discharge on copepod abundance. For example, the Dr. Teh et al. report notes that the California Department of Fish and Game 2007 to 2009 20 mm survey for *P. forbesi* found that the abundance at station 711 (near Rio Vista) increased, despite the presence of higher levels of ammonium at this location than exist in Suisun Bay (mean ammonium concentration of 0.27 mg/l versus mean ammonium concentration 0.15 mg/l at Martinez (Station 405)).

Additionally, the Interagency Ecological Program (IEP)'s Spring 2009 newsletter reported that *P. forbesi*, an introduced species first detected in 1988, "...has declined slightly since its introduction, [but] has

⁵ *Id* at 3.

⁶ *Id* at 6.

remained relatively abundant in summer and fall compared to other copepods.”⁷ The newsletter further noted that “[s]ummer abundance also increased slightly from 2007 to 2008, while fall abundance increased moderately and was the highest since 2002.”⁸ This evidence of increasing abundance of *P. forbesi* in Suisun Bay, despite the increased ammonia loadings and the increased ammonia ambient concentrations which are acknowledged for this period, is inconsistent with the allegation that ammonium toxicity is negatively impacting the abundance of this copepod in the Bay-Delta.

3. *The allegation that toxicity is occurring in Suisun Bay is based on an erroneous interpretation of available ambient ammonium data in Suisun Bay.*

The Water Agencies have used a data set that is not representative of ambient conditions in Suisun Bay to allege the existence of ammonium toxicity. Additionally, the methods used by the Water Agencies to assess the existence of chronic toxicity near the District’s discharge are flawed and do not support the allegations made regarding impacts to copepod species or the Delta food web.

The United States Geological Survey (USGS) data set at Station 8 (IEP Station D6), in the vicinity of the CCCSD outfall, indicates that ambient ammonia levels through 2010 never exceeded 0.25 mg/l. According to data collected from 2006 through 2009 by the University of California at Davis, mean ammonia-N concentrations at Martinez (Station 405), when ammonium discharges to the Bay-Delta system were the highest on record, were only 0.15 mg/L \pm 0.01.⁹ The mean plus two standard deviation (SD) values (the approximate 95th percentile value) of the Davis data was only 0.35 mg/l. The NNE Literature Review reports that the mean ammonium concentrations in Suisun Bay from 1999 through the present were even lower: 0.11 mg/l.¹⁰

Some of the data cited in the Water Agencies’ comment letter was obtained at the CCCSD outfall, in the immediate vicinity of the discharge plume, during periods of slack tide when mixing was at a minimum. Over the course of the normal tidal cycle, the mixing and advection that occurs at the District’s outfall rapidly disperses the plume and reduces such concentrations to ambient levels. The high values cited by Water Agencies as problematic were localized, short term (instantaneous) data values which are not appropriate measures of chronic toxicity, and are certainly not representative of ambient conditions in Suisun Bay. Moreover, the preponderance of the values observed at the CCCSD outfall was less than the District’s laboratory detection limit of 0.3 mg/l.

These data suggest that the levels of ammonium in Suisun Bay, including those in the vicinity of CCCSD’s discharge, do not reach threshold values over averaging periods needed to create chronic toxicity to *P. forbesi*, including either the 0.53 mg/l threshold value described above that is based on a revised interpretation of the Teh et al results, or the Teh et al. value of 0.36 mg/l cited in the Water Agencies’ letter.

⁷ Interagency Ecological Program Newsletter, Vol 22., No. 2(Spring 2009), p. 11 (available at http://www.water.ca.gov/iep/newsletters/2009/IEPNewsletter_FINALSpring2009.pdf).

⁸ *Id.*

⁹ Werner, Inge; Markiewicz, Dan; Deanovic, Linda; Connon, Richard; Beggel, Sebastian; Teh, Swee; Stillway, Marie; Reece; Charissa; *Pelagic Organism Decline (POD): Acute and Chronic Invertebrate and Fish Toxicity Testing in the Sacramento-San Joaquin Delta 2008-2010, Final Report*; submitted to the California Department of Water Resources by the University of California at Davis Aquatic Toxicology Laboratory (July 24, 2010), p. 20. Available at http://science.calwater.ca.gov/pdf/workshops/POD/Werner%20et%20al%202010%20POD2008-2010_Final%20Report.pdf.

¹⁰ McKee et al. 2011 at 148.

B. Response to allegation that ammonium linked to the District discharges is inhibiting diatom primary production in Suisun Bay.

The Water Agencies also state that the District is contributing to ammonium levels in Suisun Bay that exceed the “Dugdale threshold” and that these levels are causing a significant disruption in the Bay-Delta food web due to the inhibition of spring blooms of phytoplankton in Suisun Bay.

1. *The best available scientific understanding of SF Bay experts is that the importance of the suggested “inhibition effect” is uncertain.*

In the June 2011 report prepared for the Regional Water Board by SFEI and the Southern California Coastal Water Research Project (SCCWRP), numerous statements are made which contradict the assertion that ammonium is commonly accepted as having a significant impact in San Francisco Bay. The report, *Nutrient Numeric Endpoint Development for the San Francisco Bay Estuary: Literature Review and Data Gaps Analysis*, acknowledges the suggestion by Dr. Richard Dugdale and other researchers from the Romburg Tiburon Center that “ammonium inhibition could be one of the limiting factors that control primary productivity in the Bay.”¹¹ However, the report goes on to state that the impacts of ammonium on diatom blooms is not well-understood, is just one of many factors known to affect productivity, and that additional work is needed to resolve this issue:

“...the ecological importance of ammonium inhibition of spring diatom blooms is not well understood relative to factors known to control primary productivity...”¹²

“In SF Bay, the biomass associated with phytoplankton, measured as surface water chlorophyll *a* concentration, varies in space and time in response to nutrient availability from external loads and internal regeneration, grazing, stratification, water temperature, tidal energy, transparency, wind/wave energy, the availability of seed cysts, UV radiation effects on nitrate versus ammonium assimilation perhaps due to disruptions of enzyme pathways, differential uptake of nitrate and ammonium by larger versus smaller cells, inhibition of nitrate uptake by ammonium, predation by benthic invertebrates, and variations in the phase of the Pacific Decadal Oscillation and related changes to top down predation of benthic invertebrates.”¹³

“...the effect of ammonium inhibition on phytoplankton productivity throughout the Bay has not been modeled vis-a-vis other contributing factors...the next logical step is to develop models that synthesize understanding of the relative importance of ammonium and urea versus other factors controlling phytoplankton assemblages.”¹⁴

“Elevated ammonium concentrations have been suggested as a major mechanism by which spring diatom blooms appear to be suppressed in the North Bay and Lower Sacramento River...Despite this evidence, the ecological importance of ammonium inhibition of spring diatom blooms is not well understood relative to factors known to control primary productivity, particularly in other

¹¹ *Id* at 147.

¹² *Id* at 153.

¹³ *Id* at 46 (internal citations omitted).

¹⁴ *Id* at 154.

regions of the Bay where water column chlorophyll *a* appears to be increasing. Thus, *the linkage between ammonium concentrations and Bay beneficial uses is not at this time universally accepted*. San Francisco Bay Technical Advisory Team (TAT) members agree that additional data synthesis is required to better understand the role of ammonium in SF Bay.”¹⁵

It is important to note that members of the TAT responsible for scientific review of and input on the NNE document include James Cloern, a highly recognized expert in San Francisco Bay ecology and two members from the Romburg Tiburon Center, including Dr. Dugdale. The cited statements and recommendations of the NNE report should therefore be interpreted as current prevailing scientific opinion.

2. *The State Water Contractors are participating in Suisun Bay studies to address whether ammonium is inhibiting spring phytoplankton blooms*

Corroboration that the effect of ammonium in San Francisco Bay is “unsettled science” is reflected in the fact that studies are ongoing to determine the role of various factors, including ammonium, on the frequency and magnitude of phytoplankton blooms in Suisun Bay. One of the comment letter authors, the State Water Contractors, are participants in these studies and are therefore well aware of the ongoing uncertainties that exist regarding the validity and significance of the “Dugdale effect.” The Final SWAMP Work plan for FY 2010-2011 and 2011-2012 for Monitoring Spring Phytoplankton Bloom Progression in Suisun Bay explicitly states that “[t]he main purpose of this study is to...determine if there is inhibition, and, if so, to determine what is causing the inhibition.”¹⁶ *It would be premature to impose the NPDES permit requirements requested by the Water Agencies given the uncertainties regarding the existence or importance of the effect of ammonium in Suisun Bay and the fact that studies are currently ongoing to reduce these uncertainties.*

C. Response to allegation that the District nutrient loadings are changing nutrient ratios in Suisun Bay, resulting in a harmful shift in algal communities and other adverse ecological impacts.

The Water Agencies also suggest that research by Dr. Patricia Glibert confirms that nutrient loadings from the District contribute to changes in nutrient ratios in Suisun Bay, and that those changed ratios explain adverse ecosystem changes in the Bay-Delta, including the precipitous decline of key fish species.¹⁷ In fact, the cited work has not been accepted or endorsed by leading Bay-Delta scientists. For example, the San Francisco Bay NNE science team considered Dr. Glibert’s 2010 paper, but neither endorsed it or adopted it as fact in the final report.

It should also be noted that the work by Glibert in 2010, funded by the State Water Contractors, was criticized for its inappropriate use of statistical methods and other issues. In a peer-reviewed paper titled “Perils of Correlating CUSUM-transformed variables to infer ecological relationships (Breton et al..

¹⁵ *Id* at 155 (emphasis added).

¹⁶ Final SWAMP Workplan at 1.

¹⁷ Glibert, Patricia; *Long-Term Changes in Nutrient Loading and Stoichiometry and Their Relationships with Changes in the Food Web and Dominant Pelagic Fish Species in the San Francisco Estuary, California*; Reviews in Fisheries Science, Vol. 18, Issue 2 (August 2010). (Hereinafter, Glibert et al., 2010). Available at <http://www.sfcwa.org/2011/05/20/sed-lobortis-tellus-vel-ligula-pretium-mollis/>.

2006, Glibert 2010)¹⁸ authors James Cloern, Alan Jassby, Jacob Carstense, William Bennett, Wim Kimmerer, Ralph MacNally, David Schoellhamer and Monika Winder stated the following:

- “Glibert (2010) concluded that recent large population declines of diatoms, copepods, and several species of fish were responses to a single factor – increased ammonium inputs from a municipal wastewater treatment plant.”
- “Glibert’s study...contradicts the overwhelming weight of evidence that population collapses of native fish...and their supporting food webs in the San Francisco Estuary are responses to multiple stressors including landscape change, water diversions, introductions of exotic species and changing turbidity.”
- “...CUSUM transformation, as used by...Glibert (2010), violates the assumptions underlying regression techniques.”
- “...CUSUM-transformed variables often have an apparent statistically significant correlation even when none exists...”
- “...Glibert (2010) inferred a strong negative association between delta smelt abundance and wastewater ammonium from regression of CUSUM-transformed time series. However, the...correlation... is not significant...”

The Glibert 2010 work was also criticized as being incomplete for not having analyzed the importance of other factors, including export volumes, benthic grazing by invasive clams, major changes in the hydrologic regime in the Delta, and other stressors that are commonly recognized as major contributors to stress on the Delta ecosystem.

The recently released Glibert et al. 2011 paper - funded in part by the State Water Contractors, the San Luis & Delta-Mendota Water Authority and Metropolitan Water District - has not yet been effectively scrutinized by the San Francisco Bay NNE science team or other Bay-Delta experts. On its face, the subject paper is not a definitive piece of work on the effect of nutrients on the Bay-Delta ecosystem. The paper instead offers ecological stoichiometric theory as a hypothetical framework for consideration and suggests that nutrient stoichiometry may be a significant driver influencing food webs in the Bay-Delta ecosystem. The paper asserts the potential validity of this theory based on extensive, albeit selective, correlation analysis. The paper relies, at least in part, on the statistical analysis from the Glibert et al. 2010 paper that was so roundly criticized. The paper does not assert that it has developed conclusive scientific evidence for its theories applicable to the San Francisco Bay or Delta.

In fact, conclusory excerpts from the Glibert et al. 2011 paper state that “while compelling, the ecological stoichiometric model raises many questions that need further analysis in the San Francisco Estuary...” and “...regulation of the food web by nutrient controls is directly testable...there is much that needs to be explored to test these relationships directly.”¹⁹

¹⁸ Cloern, J.E., A.D. Jassby, J. Carstensen, W.A. Bennett, W. Kimmerer, R. Mac Nally, D.H. Schoellhamer and M. Winder. 2011. *Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006, Glibert 2010)*. *Limnology and Oceanography*, in press.

¹⁹ Glibert et al., 2011, at 84.

In summary, the cited papers by Glibert offer theories that are strongly supported by the Water Agencies but that have not been accepted or endorsed by the Bay-Delta scientific community, the Delta Science Program or any other reputable scientific body. This theory, while interesting and perhaps worthy of further exploration, is not an appropriate basis for the imposition of very costly changes to municipal wastewater management in the San Francisco Bay region.

III. The Regional Water Board Should Adopt the TO Without Changes.

It is a widely acknowledged that that San Francisco Bay-Delta is a complex ecosystem affected by myriad natural and anthropogenic factors. This is clearly evidenced by the wide range of factors that have been identified as potentially contributing to the decline in populations of Bay-Delta pelagic fish, including: Delta flows, turbidity, water diversions, habitat loss, introduced species, salinity, contaminants (including ammonium), and large-scale climatic shifts. Teasing out the relative effects of each of these factors has been and will continue to be challenging and require extensive resources.

As described above, the evidence relied upon by the Water Agencies' in their comment letter is far from conclusive. It is unreasonable and inappropriate at this time, therefore, to impose new permit requirements on the District. The imposition of nutrient limits based on nitrification is of great concern not just because of the inconclusiveness of the research done to date, but because this action would essentially circumvent the collaborative NNE process currently underway. The purpose of the NNE process is to develop nutrient water quality objectives. This rulemaking process is a transparent one with opportunity for stakeholder review and input. In contrast, this permit adoption process is an adjudicatory one with limited stakeholder involvement and little time for review of the bases for the requirements. Imposing limits in this permit, however, would have the effect of setting new de facto water quality objectives for ammonium in Suisun Bay.

We strongly urge the Regional Water Board to adopt the TO without any additional changes. BACWA will continue to work with staff, regional scientists, public agencies and the private sector to identify and fill data gaps related to this and other nutrient issues. The proper mechanism for resolving these scientifically, politically, and socio-economically difficult issues is a joint fact-finding process with transparency and broad stakeholder involvement that results in the establishment of water quality objectives that can then be implemented via permit and other management measures. This approach will reduce the likelihood of litigation and adversarial science and ensure that management options, should they become necessary, are carefully considered and well supported by science that is accepted by independent Bay-Delta experts.

Sincerely,



Amy Chastain
Executive Director

Enclosed:

Letter from Dr. Swee Teh, University of California at Davis, to Ms. Linda Dorn, Environmental Program Manager for the Sacramento County Regional Sanitation District, dated August 31, 2011.

Glibert, Patricia; *Long-Term Changes in Nutrient Loading and Stoichiometry and Their Relationships with Changes in the Food Web and Dominant Pelagic Fish Species in the San Francisco Estuary, California*; Reviews in Fisheries Science, Vol. 18, Issue 2 (August 2010).

Cloern, J.E., A.D. Jassby, J. Carstensen, W.A. Bennett, W. Kimmerer, R. Mac Nally, D.H. Schoellhamer and M. Winder. 2011. *Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006, Glibert 2010)*. Limnology and Oceanography, in press.