California Regional Water Quality Control Board

Central Valley Region

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TO: Dr. Gerald Bowes
Division of Water Quality
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FROM: Kenneth D. Landau
Assistant Executive Officer

DATE: 3 November 2005

SIGNATURE: Kenneth D. Landau

SUBJECT: REQUEST FOR SCIENTIFIC PEER REVIEW FOR A PROPOSED BASIN PLAN AMENDMENT TO ADDRESS METHYLMERCURY IN THE DELTA

We are requesting that State Board begin the selection process for scientific peer reviewers for proposed Basin Plan amendments for the control of mercury in the Sacramento-San Joaquin Delta Estuary (Delta). Health and Safety Code Section 57004 requires scientific peer review prior to action by the Regional Board. Amendments to the Basin Plan would be presented to the Central Valley Regional Board for their consideration in June 2006.

The Delta is listed pursuant to the Federal Clean Water Act, Section 303(d), as impaired due to mercury. The impairment is due to elevated concentrations of mercury in fish tissue and water. The Delta's beneficial uses that are currently unmet due to the elevated mercury levels are safe fisheries for humans and wildlife.

The proposed Basin Plan amendment would incorporate site-specific water quality objectives for methylmercury concentrations in resident fish. The amendment will also contain an implementation plan, time schedule, and monitoring plan to achieve the proposed objectives.

Appropriate disciplines for the peer reviewers would be: fluvial geomorphology, environmental biology with expertise in bioaccumulative contaminants, metals biochemistry/geochemistry, aquatic chemistry, and statistics.

Staff is currently preparing a draft Basin Plan amendment report and CEQA analysis that will detail the proposed amendments and present alternatives for implementation. The draft staff report will be ready for scientific peer review by 8 December 2005. We request that peer review be completed and written comments submitted by 15 January 2006.

The points of contact for this peer review request are Melanie Medina-Metzger (916-464-4644, mmedina-metzger@waterboards.ca.gov) or Patrick Morris (916-464-4621, pmorris@waterboards.ca.gov).

Attachments

Attachment 1
Summary of the Basin Plan Amendment

The Central Valley Regional Water Quality Control Board has determined that Delta waterways are impaired due to elevated levels of mercury in fish. To address mercury in the Delta, Regional Board staff is proposing additions to three Chapters of the Basin Plan: Water Quality Objectives, Implementation, and Surveillance and Monitoring.

A mass balance for methylmercury in the Delta suggests that tributaries contribute more than 60% of Delta methylmercury inputs and that sediment flux from wetlands and open channels contributes about 30%. Other sources of methylmercury include municipal wastewater, urban runoff, and agricultural return flows. Sources of total mercury include tributary inflows from upstream watersheds, municipal wastewater, atmospheric deposition, and urban runoff. Tributary sources account for about 97% of the total mercury and about 99% of the total suspended solids (TSS) fluxing though the Delta, with more than 80% of the total mercury and TSS loading coming from the Sacramento Basin.

Regional Board staff is recommending a Delta-specific water quality objective in terms of a concentration of methylmercury in trophic level four fish. The three alternatives for water quality objectives that were considered and criteria for evaluation are described in the draft Basin Plan Amendment staff report. Derivation of the recommended objectives considers human and wildlife health and follows closely the method used by the USEPA to determine that agency's recommended numeric criterion for methylmercury.

Statistically significant relationships were found between methylmercury concentrations in unfiltered (raw) water and fish in the Delta. Regional Board staff used the relationships to describe the linkage between methylmercury in water and fish and to determine an aqueous methylmercury concentration "implementation goal" that corresponds to the proposed methylmercury fish tissue objective. By comparing the aqueous methylmercury goal with current concentrations, Staff identified the reductions in methylmercury levels needed to attain the goal and target. Percent reductions in methylmercury concentrations (and loads) required to meet the goal range from 0% for inputs to the Central Delta subregion to more than 70% for inputs to the Yolo Bypass and Mokelumne River subregions.

The proposed Basin Plan amendment presents an implementation plan for reducing aqueous methylmercury loads in the different subregions of the Delta. Essentially, a methylmercury TMDL must be developed for each Delta subregion because the extent of fish impairment, the methylmercury sources, and the percent reductions needed to meet the proposed implementation goal are different in each subregion. The implementation plan includes three components: (1) control of methylmercury sources; (2) control of total mercury sources; and (3) reduce the public's exposure to methylmercury from fish consumption. Implementation alternatives were evaluated in terms of source type, effort, time to affect change, feasibility, cost and achievement of water quality objectives.

Attachment 2
Summary of Technical and Scientific Issues

The statute mandate for external scientific peer review (Health and Safety Code Section 57004) states that the reviewer's responsibility is to determine "**whether the scientific portion of the proposed rule is based upon sound scientific knowledge, methods and practices**".

We request that you make this determination for each of the following issues that constitute the scientific portion of the proposed regulatory action. An explanatory statement is provided for each issue to focus the review.

1. The derivation of a linkage between methylmercury in water, largemouth bass and trophic level 4 fish.

Regional Board staff used the relationships between length and methylmercury tissue concentration of largemouth bass samples collected in September/October 2000 by the San Francisco Estuary Institute at multiple Delta locations to estimate methylmercury concentrations in largemouth bass of a standard size (350 mm). Staff described the linkage between methylmercury in Delta water and fish using the regression between the average methylmercury concentration of water sampled between March and October 2000 and the standard 350 mm largemouth bass. The March-October 2000 data were pooled by Delta subregion to calculate monthly averages. Monthly averages were used to ensure that the March-October 2000 average was not biased by months with different sample sizes. The year 2000 largemouth bass data were used in the linkage analysis because the exposure period of these fish had the greatest overlap with the available water data; monthly water data were collected during the last eight months of the life of the fish.

The regression analysis showed that average concentrations of methylmercury in biota correlate significantly with unfiltered, aqueous methylmercury. This approach is similar to using site-specific bioaccumulation factors (BAF; ratio between methylmercury in fish to water). This analysis is more robust than simple BAFs because there were multiple collection sites within the Delta with varying concentrations of methylmercury in fish.

Staff used the relationship between methylmercury in 150-500 mm TL4 non-migratory fish sampled between 1998 and 2001 and the standard 350 mm largemouth bass to express the proposed TL4 fish tissue objective (0.30 mg/kg) in terms of 350 mm largemouth bass. The resulting largemouth bass "implementation goal" (0.28 mg/kg) was substituted in the water/bass regression equation to determine a corresponding safe level of methylmercury in water (0.073 ng/l). Staff recommends an implementation goal for methylmercury in water of 0.06 ng/l, which incorporates a margin of safety of ~18%.

2. Analysis of annual total mercury and suspended sediment loads and conclusions drawn from the analysis.

Water, methylmercury, total mercury and suspended sediment budgets were prepared for the Delta. In addition, water, total mercury and suspended sediment balances were prepared for the Sacramento Basin. For most tributary sources, statistically significant relationships exist between flow and total mercury concentration and/or flow and suspended sediment concentration. For these sources, regression equations were used to predict concentrations that correspond to daily flow volumes. Annual loads were calculated by multiplying the average daily flow by the predicted daily concentration and summing over the year. To estimate annual loads for sources that did not have statistically significant relationships

between flow and concentration, the average of available concentration data was multiplied by the annual discharge.

Uncertainty of the regressions was estimated by calculating the 95% confidence intervals for the mean response (see Appendix J of the draft TMDL report). Upper and lower concentration limits were calculated for each day of the flow record and then multiplied by flow to determine the upper and lower loads. In addition, confidence intervals for the sums of the Delta and Sacramento Basin input and export loads were calculated. This was done to determine whether the Delta and Sacramento Basin total mercury and sediment budgets "balanced" (i.e., there was not a statistically significant difference between the sum of the inputs and exports).

3. Effectiveness of proposed implementation actions in achieving the desired reductions in methylmercury in ambient water and fish tissue.

Methylmercury production is affected by multiple factors, including concentrations of available mercury in sediment, sulfate, nutrients, pH of overlying water, and degree of anoxia. The proposed implementation plan addresses factors that affect methylation. One example is the proposed requirement that new water impoundments or wetlands projects produce no net increases in methylmercury loads. In addition, the proposed implementation plan recommends reducing total mercury loads entering the Delta, which is expected to result in decreases of methylmercury production. Also during implementation, Regional Board staff will incorporate new information about controlling methylation and demethylation in the Delta and its tributary watersheds.

4. Overarching questions.

Reviewers are not limited to addressing only the specific issues presented above. Additionally, we invite you to contemplate the following "big picture" questions.

(a) In reading the staff technical reports and proposed implementation language, are there any additional scientific issues that are part of the scientific portion of the proposed rule not described above? If so, please make the determination defined above from the statute language.

(b) Taken as a whole, is the scientific portion of the proposed rule based upon sound scientific knowledge, methods, and practices?

Reviewers should also note that some proposed actions may rely significantly on professional judgment where available scientific data are not as extensive as desired to support the statute requirement for absolute scientific rigor. In these situations, the proposed course of action is favored over no action.

The preceding guidance will ensure that reviewers have an opportunity to comment on all aspects of the scientific basis of the proposed Regional Board action. At the same time, reviewers also should recognize that we have a legal obligation to consider and respond to all feedback on the scientific portions of the proposed rule. Because of this obligation, we encourage you to focus your feedback on the scientific issues that are relevant to the central regulatory elements being proposed.

Attachment 3
Individuals Involved in the Development of the Proposed Basin Plan Amendment

The following scientists, engineers and agencies collected data and provided analyses that were used by Regional Board staff in development of the Delta methylmercury TMDL and implementation plan. Corresponding authors are listed in **bold** text.

Terry Adelsbach, U.S. Fish and Wildlife Service
Charles Alpers, U.S. Geological Survey
Ronald Antweiler, U.S. Geological Survey
Chance Asher, University of California, Davis, Division of Microbiology
Shaun Ayers, University of California, Davis, Dept. of Environmental Science and Policy
Nicholas Bloom, Studio Geochimica
Ann Byington, Moss Landing Marine Laboratories
Jerry Boles, Department of Water Resources
Ron Churchill, California Department of Conservation, California Geological Survey
John Clinkenbeard, California Department of Conservation, California Geological Survey
Dave Crane, California Department of Fish & Wildlife, Water Pollution Control Laboratory
Bill Croyle, Central Valley Regional Water Quality Control Board
Claus Suverkropp, Larry Walker Associates (provided Sacramento River Watershed Program data)
Jay Davis, San Francisco Estuary Institute
Barbara Dawson, U.S. Geological Survey
Peter Dileanis, U.S. Geological Survey
Joe Domagalski, Ph. D., U.S. Geological Survey
Chris Foe, Central Valley Regional Water Quality Control Board
Wes Heim, Moss Landing Marine Laboratories
Ben Greenfield, San Francisco Estuary Institute
Gary Ichikawa, Moss Landing Marine Laboratories
Brenda Johnson, University of California, Davis, Dept. of Wildlife, Fish & Conservation Biology
Donna Knifong, U.S. Geological Survey
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Anne Liston, University of California, Davis, Dept. of Environmental Science and Policy
Jason May, U.S. Geological Survey
Stephen McCord, Larry Walker Associates (Sacramento River Watershed Program)
Lester McKee, San Francisco Estuary Institute
Cathy Munday, U.S. Geological Survey
Sean Mundell, Moss Landing Marine Laboratories
Douglas Nelson, University of California, Davis, Division of Microbiology
Pacific Eco Risk (Sacramento River Watershed Program data)

Steve Nebozuk, Sacramento Regional County Sanitation District, Coordinated Monitoring Program Manager (provided CMP data)

Del Rasmussen, State Water Resources Control Board, Division of Water Quality, State Mussel Watch Program / Toxic Substances Monitoring Program

Dan Russell, U. S. Fish and Wildlife Service

Jennifer Shelton, U.S. Geological Survey

David Schoellhamer, U.S. Geological Survey

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Tom Suchanek, Ph. D., U.S. Geological Survey, Western Environmental Research Center

Howard Taylor, U.S. Geological Survey

Ronald Weyland, University of California, Davis, Dept. of Environmental Science and Policy