

Charge for the Independent Scientific Review Panel: Delta Mercury Control Program Phase 1

Tidal Wetlands and Open Water Studies: Methylmercury Control and Characterization/Control Reports

Background and Purpose

The Sacramento-San Joaquin Delta (Delta) is identified in the Clean Water Act Section 303(d) list of impaired water bodies due to harmful levels of mercury in some fish eaten by people and wildlife. In response, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) developed a methylmercury Total Maximum Daily Load (TMDL) and associated Delta Mercury Control Program (Mercury Control Program) to control mercury and methylmercury in the Delta. The TMDL is the analysis of the methylmercury impairments, a review of the primary sources, a linkage between the sources and the impairments, and recommendations for mercury reductions to eliminate the impairment. The Mercury Control Program is the implementation program for the TMDL, and addresses controls for mercury as well as methylmercury.

The TMDL and associated Mercury Control Program were adopted by the Central Valley Water Board as an amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) in April 2010. The TMDL and Mercury Control Program received final approval from the US EPA on 20 October 2011.

The Mercury Control Program is a two-phased process. During Phase 1, which began on October 20, 2011, the Central Valley Water Board required entities responsible for reducing methylmercury in the Delta to participate in studies to develop and evaluate ways to manage methylmercury. The Central Valley Water Board required development of study work plans, which were subsequently reviewed by a technical advisory committee to provide advice to ensure effective studies. These studies evaluated methylmercury source types by means of water and sediment sampling and pilot testing controls. For several source types, approved control studies included characterization of the source. Characterization was a necessary part of some studies because additional information regarding mercury cycling and loading of the source was needed before developing appropriate control studies and mercury models.

Prior to implementing Phase 2, the Basin Plan requires the Central Valley Water Board to assess the Phase 1 Mercury Control Program. This assessment will consider potential modification of methylmercury goals, objectives, allocations and/or the Final Compliance Date, implementation of management practices and schedules for methylmercury controls, adoption of a mercury

offset program, and the potential public and environmental impacts of attaining the allocations. This includes evaluation of the linkage analysis between objectives and sources and the attainability of the allocations. The assessment will be informed by the results of the Phase 1 control studies, the results of additional studies that were conducted, and data that was collected after the initial TMDL analysis.

Phase 2 of the Mercury Control Program begins after the conclusion of the Phase 1 Mercury Control Program Evaluation by the Central Valley Water Board, or 20 October 2022, whichever occurs first. Phase 2 will initiate implementation of effective mercury and methylmercury controls identified in Phase 1. Phase 2 will include revisions by the Central Valley Water Board to the TMDL and the Mercury Control Program, based on information from the Phase 1 Control Studies (including the Review Panel's findings), as well as additional relevant information and data that has emerged since the original development of the TMDL and Mercury Control Program.

The Central Valley Water Board has requested the Delta Science Program to convene the following:

1. An independent scientific review panel (Review Panel) to conduct a "review of the reports assessing mercury controls and source characterization to evaluate the scientific validity of the studies' methodology and findings. There are two separate reviews being conducted due to two different sets of deadlines for the Phase 1 study reports.
 - a. The first review, which was completed in August 2019, assessed the control study reports for municipal wastewater and urban stormwater runoff discharges. The Review Panel's findings were provided in a report entitled "Delta Mercury Control Program Phase 1 Methylmercury Control Studies Independent Scientific Review, August 2019".
 - b. The second review will occur in 2020 and will assess reports that include source characterization and mercury control methods for tidal wetlands and open water studies conducted by the Department of Water Resources (characterization/control study reports). Mercury source characterization was needed for these studies to evaluate potential control measures and to inform modeling.

Scope of the Review Panel

The focus of the second Review Panel is to evaluate the completeness and scientific validity of the tidal wetlands and open water characterization/control study reports, which will be submitted by the California Department of Water Resources in 2020. In addition, the Review Panel will determine whether the scientific methods used were consistent with those outlined in the workplans and whether the conclusions were reasonably derived from the data and were informed by the best possible scientific information. While the characterization/control study

reports are the primary documents to be reviewed, the study workplans will also be reviewed to ensure the stated scientific objectives were met in each study.

For each characterization/control study report, the Review Panel will provide written comments in response to the questions below. The Review Panel will have approximately 45 days to familiarize themselves with the materials and following an internal Review Panel discussion meeting, have approximately 30 days to develop written comments. The Review Panel may consider the results of other control studies or available information to expand the base from which the Review Panel draws conclusions.

Overview of the Characterization/Control Study Reports

In the case of characterization/control study reports, the Department of Water Resources included characterization of the assessed methylmercury source in the control study due to the substantial uncertainty in the production or loads of methylmercury. The characterization/control studies did not test a specific control in the study, but rather evaluated applicable parameters with the characterization assessments to suggest future control actions. These characterization studies included evaluations of methylmercury and total mercury concentrations and loads in source waters, receiving waters, and discharges to determine which discharges act as net sources of methylmercury and which land uses result in the greatest net methylmercury production. Characterization/control studies will help the Central Valley Water Board prioritize future control studies and implementation actions.

Completeness and Adequacy of Characterization/Control Study Reports

The review questions below are intended to 1) evaluate whether the report findings were consistent with the derived data and used the best possible scientific information, 2) assess whether research methods were consistent with the workplan, and 3) determine if a balanced approach was used in analyzing the data. It is not the intent of the review to develop recommendations to revise the characterization/control study final reports.

Questions Pertaining to the Tidal Wetlands and non-modeling studies of the Open Water Characterization/Control Study Reports:

The following questions apply to the tidal wetlands characterization/control study and the non-modeling studies associated with the open water characterization/control study.

1. How well do the results of the studies support the scientific objectives of the workplans?
 - a. How well do the results demonstrate the feasibility of the allocations?
 - b. Given the available scientific information, what are alternative methods to improve calculating load allocations?
2. With regards to mercury/methylmercury source characterization and control, how well does this report identify impacts of changing climatic conditions, outline next steps, and assess feasibility of future actions?

- a. Do the study results provide new or additional information about mercury or methylmercury sources, mass balances, or loads in the Delta or Yolo Bypass?
 - b. Will the studies help design future control studies?
 - c. What knowledge gaps must be filled to inform future control studies or management strategies?
 - d. How could changes in climate and other conditions in the Delta impact the relevance of study findings?
 - e. Does the final report suggest any appropriate controls, and if so, are they feasible?
3. Do you have comments on other scientific issues related to this study or mercury/methylmercury source type?

Questions Pertaining to the Modeling Study of the Open Water Characterization/Control Study Report:

The following questions apply to the modeling chapters of the open water characterization/control study.

Scientific Objective Fulfillment

1. Do the results of the modeling studies fully achieve the scientific objectives of the workplan?

Model Development

Theoretical Basis, Assumptions, and Uncertainty

1. How well does the model account for key processes, assumptions, and uncertainty? Are these documented adequately?
2. Are the assumptions used for missing or inadequate data appropriate?
3. Are priorities for future data collection (or model development, if needed) to reduce model prediction uncertainty identified and appropriate?

Data and Parameter Estimation

4. How relevant and reliable are the field data used for estimating parameters, establishing initial conditions, and specifying boundary conditions?

Verification, Calibration, and Validation

5. Were appropriate calibration, validation, and verification steps taken to ensure model performance and accuracy?
6. Were any revisions in model structure, initial or boundary conditions, parameter values, or assumptions made during the calibration, validation, and verification steps appropriate?

Model Applications

Sensitivity Analyses

1. Are the sensitivities of the model outputs to inputs and parameter values clearly identified?
2. Were the appropriate model inputs or parameters varied to conduct sensitivity analyses? Are there additional inputs or parameters you would recommend for sensitivity analysis investigation?

Scenario Analyses

3. If a scenario analysis was conducted, do the model studies appropriately represent the defined scenarios?
4. Are the scenarios examined and the model outputs adequate and appropriate to support decision making? Are there additional scenarios you would recommend for evaluation?

Questions Pertaining to Overall Assessment

The following questions are to be answered by each reviewer, as applicable, and compiled by the Lead Author.

1. What additional information would be needed, if any, to adapt the studies' results for changes in climatic and hydrologic conditions in the Delta?
2. How comprehensive is the current understanding of methylmercury sources and processes in the Delta and its tributaries? Is this extent of knowledge sufficient to identify scientifically robust mercury/methylmercury controls that will meet fish tissue objectives? What are the critical gaps in information that would prevent scientifically sound conclusions to be made regarding mercury/methylmercury controls?
3. Do the characterization/control study reports provide adequate support to change the Delta mercury load and waste load allocations? If so, in what direction (e.g., increase or decrease) does the report support a change in waste load allocations?
4. Do the study results adequately address the effectiveness of controlling inorganic mercury and methylmercury sources to attain assigned load and waste load allocations?
5. Does the evidence presented in the reports suggest that if mercury/methylmercury loads from the studied sources were reduced to the assigned allocation or beyond, would the reduction be sufficient to offset loads from other sources either within the Delta or upstream?

Review Materials

Review materials and supplemental documents are available upon request via archives@deltacouncil.ca.gov.

Final Characterization/Control Study Reports and Associated Workplans

1. DWR - Tidal Wetlands

- a. Mercury Imports and Exports of Four Tidal Wetlands in the Sacramento-San Joaquin Delta, Yolo Bypass, and Suisun Marsh for Delta Mercury Control Program Compliance April 3, 2020
- b. Workplan for Methylmercury Import and Export Studies on Tidal Wetlands in the Sacramento-San Joaquin Delta and Yolo Bypass, December 20, 2013
"Tidal_Workplan_Wetland_121913_Final.pdf"
2. DWR - Open Water; Studies and Model
 - a. The Final Report for the Open Water Control Study (August 31, 2020)
 - b. Open Water Workgroup Methylmercury Control Study Work Plan (December 20, 2013)
 - c. Technical Memorandum for the Methylmercury Control Study Workplan (December 20, 2013)

Supplementary Materials

These reports will be made available to the Review Panel to help inform the overall assessment questions, not for the completeness and adequacy questions.

Open Water

1. Memo summary Open Water original December 2013 work plan drafted by Jennie Fuller to inform the Review Panel #2 review of the Open Water Report "Memo Summary open water original December 2013 workplan"
2. First extension request approval from Central Valley Water Board, November 28, 2016, extending deadline from October 20, 2018 to December 31, 2019 "DWR 28 Nov2016"
3. Second extension request from DWR (April 24, 2019) to extend deadline from December 31, 2019 to June 30, 2020 "Open Water Extension Request 2019-04-24"
4. Second extension request referenced Final Sensitivity Analyses – part of second extension request "Final Sensitivity Analyses_042518"
5. Approval of second extension request from Central Valley Water Board (June 11, 2019) "Open Water extension request granted 190506"
6. Third extension DWR request (May 29, 2020) to extend deadline from June 30, 2020 to August 31, 2020 "Messer-Pulupa CVRWQCB MeHg Open Water Req for Ext FIN-SIG 2020-05-29"
7. Third extension Central Valley Water Board approval (June 16, 2020) "DWR Open Water Extension Approval Request"

Tidal Wetlands

8. Tidal Wetlands DWR second extension request (October 29, 2019) moving deadline from 31 December 2019 to 3 April 2020 "Tidal Wetlands Extension request April32020"
9. Central Valley Water Board approval of tidal wetland second extension request (November 27, 2019) "DWR Tidal Wetlands Extension Request Approval_112719"
10. Tidal Wetlands data from Final Report
11. Tidal Wetlands Progress Report (October 20, 2015) "tw progress report and monitoring plan.pdf"