Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin River Delta Estuary

Staff Report Summary

In February 2010, staff released Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin Delta Estuary, Staff Report (February 2010) for public review and comment. The revised Staff Report, dated April 2010, is available at http://www.waterboards.ca.gov/centralvalley/water_issues/ tmdl/central_valley_projects/ delta_hg/april_2010_hg_tmdl_hearing/index.shtm). The proposed Basin Plan amendments are included in Attachment 1 to Resolution R5-2010-xxxx, and the supporting documentation is included in the April 2010 Staff Report. The following is a summary of the proposed Delta Mercury Control Program for the Sacramento-San Joaquin River Delta Estuary.

Introduction

Staff developed a methylmercury and total mercury control program for the Sacramento-San Joaquin River Delta Estuary (Delta) that addresses federal requirements for a total maximum daily load (TMDL) and State requirements to amend the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) to implement a program to reduce mercury pollution in Delta fish. This report reviews the problem of mercury in the Delta and summarizes the proposed Basin Plan amendments for a control program for mercury and methylmercury (Delta Mercury Control Program). Attachment 1 of the Central Valley Water Board Resolution contains the February 2010 proposed Basin Plan amendments for the Delta Mercury Control Program.

The Delta Mercury Control Program is one of several control programs that have been developed or are under development to address mercury in the Central Valley Region. Mercury contamination in the Central Valley is widespread. Due to significant differences in sources, local hydrology, wildlife and human exposure, and available information, staff is completing a series of interrelated control programs. The Central Valley Water Board adopted mercury control programs that contained the federal TMDL elements for Clear Lake in 2002 and downstream in the Cache Creek watershed in 2005. These control programs were completed first because Cache Creek is the single largest contributor of mercury-contaminated sediment to the Delta and San Francisco Bay. After the Delta control program is completed, staff will develop mercury control programs to address the impaired tributaries upstream of the Delta and identify the major inorganic mercury and methylmercury sources in those watersheds.

Background

The Central Valley Water Board determined in 1990 that the Delta was impaired because Delta fish had elevated levels of mercury that posed a risk for human and wildlife consumers. In 1998, the State Water Board identified the Delta mercury impairment as a high priority water quality issue. As a result, the Delta was added to the Clean Water Act Section 303(d) List of Impaired Water Bodies.

Once a water body is added to the 303(d) List, the State is required to develop control programs that meet federal requirements for TMDLs to eliminate the impairments. A TMDL is the total maximum daily load of a pollutant that a water body can assimilate and still attain beneficial uses, such as the protection of humans and wildlife consuming locally caught fish.

In 1971, a human health advisory was issued for the Delta warning against the consumption of mercury-contaminated striped bass. Recent monitoring indicates that several more species, including largemouth bass and white catfish (two commonly-caught sport fish) have elevated concentrations of mercury in their tissue. In 2009, the Office of Environmental Health Hazard Assessment (OEHHA) issued updated safe eating guidelines for the Central and South Delta (including the San Joaquin River from the Port of Stockton to Pittsburg), the San Joaquin River from Friant Dam to the Port of Stockton, the Sacramento River and Northern Delta, the lower Cosumnes River, and the lower Mokelumne River. OEHHA advises that pregnant and nursing women and children avoid consuming bass (largemouth and striped) and Sacramento pikeminnow from the San Joaquin, Sacramento and lower Cosumnes and lower Mokelumne Rivers.

Methylmercury is the most toxic and bioavailable form of mercury. Methylmercury is the form that moves up the food chain and accumulates in fish. Mercury exists almost entirely in the methylated form in small and large fish. In aquatic ecosystems, inorganic mercury in the sediment is converted to methylmercury by sulfate reducing bacteria. The methylmercury fluxes into the overlying water where it is absorbed by phytoplankton. It subsequently increases in concentration in successive levels of the aquatic food web. Large fish can have methylmercury concentrations that are five to six million times higher than that of the water in which they live.

Methylmercury is a potent neurotoxicant. Methylmercury exposure causes multiple effects in humans, including altered tactile sensation, decreased concentration and memory, loss of muscle control, delayed neurological development, and in very high concentrations, birth defects and death. Wildlife species may also experience neurological, reproductive or other detrimental effects from mercury exposure. Humans and wildlife are exposed to methylmercury through consumption of contaminated fish.

The 2010 Delta TMDL report describes a statistically significant relationship between methylmercury concentrations in water and methylmercury concentrations in fish tissue. It is expected that by reducing methylmercury in water, fish tissue methylmercury concentrations will be reduced. In general, methylmercury concentrations in sediment and water are related to inorganic mercury concentrations in sediment; however, certain environments, such as many wetlands, are highly efficient at producing methylmercury.

In fact, one of the best predictors of methylmercury concentrations in water and in biota is the amount of wetland present in upstream watersheds.

To reduce the water quality impairment, there is a need to focus on 1) reducing the concentration of inorganic mercury in Delta sediment by reducing the concentration of mercury on sediment entering the Delta and 2) reducing discharges of methylmercury entering the Delta. The mercury control program seeks to reduce both sources of inorganic mercury and methylmercury to reduce fish tissue contamination. Much of the mercury that has contaminated the landscape came from mercury and gold mining activities that began in the 1850s. Widespread mercury contamination is now contributing to the formation of methylmercury.

Sources of methylmercury in Delta waters are inputs from upstream watersheds and within-Delta sources such as wetlands and open water habitats, municipal and industrial wastewater, agricultural drainage, urban runoff, and atmospheric deposition. During the relatively dry TMDL period (water years 2000-2003), about 43% of methylmercury loads to the Delta came from within-Delta sources and about 57% came from tributary inputs. Methylmercury flux from sediments in wetland and open water habitats in the Delta provided a substantial portion of the within-Delta loads (36% of all loads to the Delta). Wastewater treatment plants and agricultural runoff in the Delta accounted for about 4% and 2% of total methylmercury loads to the Delta, respectively. Research completed since the TMDL was developed indicates that the upstream watersheds contribute a larger portion of methylmercury loading to the Delta during wet years. The individual point and nonpoint sources of methylmercury within the upstream watersheds have not yet been quantified, but it is likely that the percentages of loading from different source types are similar to the distribution for in-Delta sources. Sources of inorganic mercury include wastewater, urban runoff, atmospheric deposition, and tributary watersheds, which contribute mercury from wastewater, urban runoff, atmospheric deposition, inactive mercury and gold mines, and streambeds downstream from mines. Most of the total mercury load to the Delta comes from tributary watersheds that will be the subject of future mercury control programs and other State and federal abandoned mine land evaluations. Reductions in direct methylmercury inputs to the Delta are expected to have immediate, local improvements in the Delta (e.g., during the next 20 years). Because so much legacy mercury is already deposited in the streambeds and banks of tributary watersheds and is moving its way slowly to the Delta, and most mine cleanup actions are expected to take place upstream of major dams, reductions in upstream, mine-related mercury sources are expected to result in long-term improvements (e.g., during the next 100 years) rather than short-term improvements. However, there are actions included in the proposed control program that can be implemented now that would result in more rapid reductions in the amount of mercury-enriched sediment entering the Delta.

The legal Delta boundary encompasses the southern two thirds of the Yolo Bypass, a 73,300-acre floodplain on the west side of the lower Sacramento River. Because the Yolo Bypass acts as a substantial source of methylmercury and total mercury to the Delta, the entire Yolo Bypass was included in the scope of the Delta TMDL. For example, a recently completed CalFed study found that *in situ* methylmercury

production within the Yolo Bypass when it was flooded averaged 40% of the methylmercury loading to the Delta from the entire Sacramento Basin. This is notable because the Yolo Bypass is only 59,000-acres while the Sacramento Basin is 16,765,000-acres or 285 times larger.

Proposed Basin Plan Amendments

The goal of the proposed mercury control program is to lower fish methylmercury levels in the Delta so that humans and wildlife can safely consume Delta fish. Major components of the proposed Basin Plan amendments are:

- Addition of the commercial and/or sport fishing (COMM) beneficial use designation for the Delta and Yolo Bypass;
- Numeric objectives for methylmercury in fish tissue that are specific to the Delta;
- An implementation plan for controlling methylmercury and total mercury (Delta Mercury Control Program); and
- A surveillance and monitoring program.

Beneficial Uses. The Basin Plan currently does not identify the commercial and sport fishing (COMM) beneficial use for the Delta. The staff recommendation is to add COMM as a designated beneficial use for the Delta and Yolo Bypass.

Fish Tissue Objectives. Staff proposes numeric objectives for methylmercury in fish tissue (referred to as fish tissue objectives) for the Delta. Staff evaluated five alternatives for the fish tissue objectives, including no action and a range of fish tissue objectives that are based on varying the amount and the trophic level[1] of fish that can be safely consumed by humans. The recommended alternative would establish Delta-specific methylmercury fish tissue objectives of 0.08 and 0.24 mg/kg in fish tissue for large trophic level 3 and 4 fish and 0.03 mg/kg for small trophic level 2 and 3 fish. The proposed objectives are protective of threatened and endangered wildlife species that consume large or small Delta fish. In addition, the proposed objectives allow people to safely eat 32 g/day (eight ounces, uncooked, per week) of a mixture of Delta fish along with a moderate amount of commercial fish. The 32 g/day consumption rate is consistent with the consumption rate that the San Francisco Bay Regional Water Quality Control Board (San Francisco Bay Water Board) staff used to calculate the fish methylmercury objective for San Francisco Bay, which was approved by the State Water Resources Control Board in July 2007.

Implementation Plan. To achieve the fish tissue objectives, the implementation plan, referred to as the Delta Mercury Control Program, contains actions and time schedules to reduce methylmercury and total mercury sources to the Delta and Yolo Bypass. Available information indicates that reducing the annual average methylmercury

[1] "Trophic level" refers to position in the food chain. Trophic level 4 fish are top predators, such as catfish and bass. Trophic level 3 fish are mid-food chain fish, such as bluegill. Trophic level 2 fish eat mainly phytoplankton, the first step on the food chain.

concentration in ambient Delta waters should reduce methylmercury concentrations in fish tissue. The amount of methylmercury reduction required in ambient water is used to determine how much the existing methylmercury inputs to the Delta need to be reduced to achieve the proposed fish tissue objectives throughout the Delta. The Delta is divided into seven areas, each with its own methylmercury load reduction requirements (in the form of load allocations for point and nonpoint sources), because the methylmercury sources to and level of fish impairment in each area are different.

The Delta Mercury Control Program is divided into two phases. Phase 1 (about 2011-2020) requires dischargers to develop and evaluate management practices to control methylmercury. Phase 1 includes total mercury mass limits and requires mercury minimization programs for discharges from NPDES-permitted facilities, and it requires the three largest stormwater agencies to implement pollution prevention measures to reduce mercury discharges in urban runoff. Phase 1 also provides a schedule and milestones for reducing mercury from the Cache Creek Settling Basin, and it establishes a schedule for staff development of upstream TMDLs.

The Delta Mercury Control Program plan requires a program review at the end of Phase 1, during which the Central Valley Water Board will consider: modification of fish tissue objectives, allocations and/or the final compliance date for the allocations; implementation of management practices and schedules for methylmercury controls; and adoption of a mercury offset program for dischargers who cannot meet their load and waste load allocations. The program review also will consider other potential public and environmental benefits and negative impacts (e.g., habitat restoration, flood protection, water supply, fish consumption) of attaining the allocations. Phase 2 (2020-2030) will require implementation of the methylmercury controls identified by the Phase 1 studies, consistent with any revisions to the Basin Plan that are adopted at the end of Phase 1, as well as continued implementation of inorganic mercury control efforts. The final compliance date for meeting the methylmercury allocations is 2030.

The implementation plan has the following major components:

- Methylmercury allocations (in the form of mass limits) are given to point and nonpoint sources in the Delta and Yolo Bypass. The USEPA requires that each source have an allocation. Dischargers would need to achieve their allocations by no later than 2030, or as modified in a subsequent Basin Plan amendment (i.e., at the end of the Phase 1 study period).
- During Phase 1, dischargers must conduct methylmercury control studies to develop and evaluate management practices to reduce methylmercury discharges. The dischargers may conduct studies to help identify variables that affect methylmercury production and degradation, including sources of inorganic mercury.
- The methylmercury studies are required from the following methylmercury sources within the Delta and Yolo Bypass: wastewater treatment plants, large municipalities with urban runoff, and irrigated agricultural lands and managed wetlands. Dischargers may conduct studies either individually or in collaboration with others.

- The methylmercury studies are also required for State and federal agencies whose water management projects affect the transport of mercury and the production and transport of methylmercury. Water management projects include changes to flood conveyance in the Yolo Bypass, salinity standards in the Delta, dredging projects, and other water management practices that may affect Delta methylmercury levels in open waters or the tributaries, including dredging and dredge material disposal activities in the Delta and the creation of new reservoirs in the tributary watersheds.
- The plan establishes total mercury mass limits and requires mercury minimization programs for NPDES facilities in the Delta and Yolo Bypass. It requires the three largest stormwater agencies to implement pollution prevention measures to reduce mercury discharges in their urban runoff.
- The plan includes key principles and a schedule for development of a mercury offset program. During Phase 1, dischargers may propose pilot mercury offset projects for public review and Board approval.
- At the end of Phase 1, staff will review study results, methylmercury control options and their potential positive and negative impacts, methylmercury allocations, fish tissue objectives, and compliance dates. As appropriate, staff will update the TMDL objectives, linkage, and source analyses and allocation calculations and propose changes to the Basin Plan for the Delta Mercury Control Program for Central Valley Water Board consideration. Revisions to the Basin Plan would contain the requirements for Phase 2 implementation of methylmercury controls.
- Because many of the activities to reduce mercury levels are long-term, the implementation plan requires dischargers to work with community-based organizations to develop and implement an exposure reduction program for people that eat Delta fish.
- The Cache Creek watershed is the most significant source of inorganic mercury to the Yolo Bypass, where large areas are being converted to wetlands. Reducing mercury loading from Cache Creek is a high priority. The implementation plan requires the development and implementation of a program to reduce mercury from the Cache Creek Settling Basin. .

Monitoring Program. The proposed Basin Plan amendments include a monitoring program to assess compliance with the fish tissue methylmercury objectives and the methylmercury and total mercury implementation plan. The program includes fish tissue and water monitoring.

Environmental Analysis

The February 2010 staff report contains an environmental analysis of the potential impacts of the proposed Basin Plan amendments in accordance with the California Environmental Quality Act (CEQA). Adoption of the proposed Basin Plan amendments will not by itself have a physical effect on the environment, nor will the Phase 1 studies. However, implementation actions taken by responsible entities to comply with some

components of the proposed implementation plan and improvements to the environment by controlling mercury and/or methylmercury may have the potential for adverse environmental effects. The environmental analysis determined that implementation of the proposed Basin Plan amendments could result in potentially significant impacts to biological resources, greenhouse gas emissions, hydrology/water quality, and utilities/service systems, unless mitigation is incorporated. The staff report summarizes reasonable actions to reduce the potential impacts from implementation projects. With only a few exceptions, potential impacts are expected to be limited and mitigated to less than significant levels, if not completely avoided, through careful project planning, design, and implementation. Mitigation measures lie within the jurisdiction of agencies implementing site-specific projects. The Central Valley Water Board does not have legal authority to specify the manner of compliance with its orders and thus cannot specify particular implementation projects nor dictate that specific mitigation measures be implemented by any particular project.

The environmental analysis found that implementation of methylmercury management practices to achieve safe fish mercury levels in the Yolo Bypass has the potential to result in cumulatively considerable impacts to habitat that supports endemic species with limited geographic ranges, such as Sacramento splittail and Delta smelt. Until the Phase 1 control studies have been completed, it is unknown whether the wetlands that act as substantial methylmercury sources in the Yolo Bypass also provide critical habitat to endemic species and whether it will be possible to avoid all potentially significant impacts.

Prudent implementation of the proposed Basin Plan amendments is expected to result in overall improvement in water quality in the waters of the Delta region and to have significant positive impacts to the environment and public health over the long term by enabling humans and wildlife to safely consume Delta fish.

A fishery containing popular but mercury-contaminated fish is an environmental justice issue. There are people in the Delta who consume local fish because of need, custom, or to supplement their diet. Implementation of the proposed Basin Plan amendments will result in overall improvement in water quality in the waters of the Delta region and will have significant positive impacts to the environment and public health over the long-term by enabling humans and wildlife to safely consume Delta fish.

Stakeholder & Peer Review Process

Developing a mercury control program for the Delta has been a lengthy process that has involved numerous stakeholders, including the regulated community, wetland managers, and environmental justice groups.

Staff held CEQA scoping meetings, public workshops, Board workshops, and numerous smaller stakeholder meetings. In June 2006, staff submitted the TMDL technical report and Basin Plan amendment staff report to scientific peer reviewers contracted by the State Water Board and made the reports available to the public. In April 2008, the Board opened the hearing process for adoption of the proposed amendments. At the April 2008 hearing, after extensive public testimony, the Board directed staff to work

with stakeholders to resolve their concerns on the fish tissue objectives, TMDL, and implementation plan.

From December 2008 through February 2010, staff held monthly formal stakeholder meetings and numerous focused workgroup meetings to work on the details of the Basin Plan amendments. The February 2010 Basin Plan amendments attached to this agenda package are the result of the lengthy formal stakeholder process. The draft staff report and TMDL report that accompany the proposed Basin Plan amendments are included with the Central Valley Water Board's April 2010 agenda package. The mercury TMDL website has a compilation of the formal stakeholder process, meeting agendas, documents, stakeholder comments, and working drafts of the Basin Plan amendments:
http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/stakeholder_meetings/.

Proposed Delta Mercury Control Program Effectiveness and Cost

Actions required by the proposed Delta Mercury Control Program to reduce methylmercury and total mercury will benefit not only the Delta but also the upstream watersheds. The Delta program will establish the framework for future tributary control programs.

It is important to recognize that the Delta fish impairment will be addressed by controlling both methylmercury discharges and by taking actions to reduce the concentration of mercury in sediment in key locations throughout the Delta and its tributary watersheds. Methylmercury management efforts, along with high-priority inorganic mercury control actions (e.g., reducing mercury discharges from the Cache Creek Settling Basin), will result in more immediate improvements in the local Delta area. Legacy mercury control actions that take place farther upstream will result in more widespread improvements (e.g., in the creeks downstream of a mine cleanups, as well as in the Delta and downstream San Francisco Bay), but it may take many decades before downstream improvements associated with mine cleanups are observed in the Delta.

Methylmercury sources need to be reduced by 0 to 78%, depending on the area of the Delta. Fish methylmercury concentrations in the Central and West Delta equal or approach the proposed fish tissue objectives, resulting in the need for little-to-no reductions in methylmercury inputs to these areas. Methylmercury source reductions of 44 to 80% are required for the upstream areas of the Delta and Yolo Bypass to achieve the proposed fish tissue objectives. Achieving the proposed methylmercury allocations for point and nonpoint sources within the Delta and Yolo Bypass will address about 30% of the methylmercury load reduction required to address the fish impairment throughout the Delta and Yolo Bypass. The rest of the required methylmercury load reductions will come from methylmercury and total mercury control actions that will be implemented in the upstream watersheds. Given that sources within the Delta and Yolo Bypass account for about 40% of overall methylmercury loading, this allocation approach assigns an equitable distribution of responsibility between sources within and upstream of the Delta. Upstream control programs are scheduled for development during

Phase 1. Note that the proposed Delta methylmercury Basin Plan amendments contain methylmercury allocations for the tributary watershed inputs that are needed to meet the Delta fish tissue objectives. Specific allocations and implementation actions for sources within the tributary watersheds will be assigned in the upstream TMDLs. The upstream programs will be able to coordinate with, and build upon, the methylmercury management studies conducted during Phase 1 of the Delta program by dischargers within the Delta and Yolo Bypass. In addition, the Delta and upstream control programs will need to identify and implement high priority legacy mercury reduction projects. It is expected that this combination of actions can achieve the fish tissue objectives throughout the Delta.

The potential costs of complying with the Delta Mercury Control Program requirements for studies, monitoring and implementation actions are substantial. The cost estimates include the Phase 1 control studies and potential actions to reduce total mercury loading and implementation of methylmercury management actions. The Phase 1 methylmercury control studies could cost between $5.5 and $14.7 million. Implementing the Delta Mercury Control Program could cost between $3.9 million and $26.5 million per year, with most of the implementation costs being incurred after 2020 (Phase 2). The total estimated costs for the agricultural methylmercury control studies to develop management practices to meet the Delta methylmercury allocations range from $290,000 to $1.4 million. The estimated annual costs for Phase 2 implementation of methylmercury management practices for agriculture range from $590,000 to $1.3 million. The implementation costs estimated for the Delta Mercury Control Program are comparable to costs estimates for other pollutant control programs in the region.