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

Draft Staff Report for Public Review

TABLE OF CONTENTS

TABLE OF CONTENTS, *continued*

TABLE OF CONTENTS, *continued*

TABLE OF CONTENTS, *continued*

TABLE OF CONTENTS, *continued*

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

§	Section
303(d) List	Clean Water Act Section 303(d) List of Impaired Water Bodies
ATSDR	U.S. Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation factor
Basin Plan	Central Valley Region Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
BCF	Bioconcentration factor
BMP	Best management practice
bwt	Body weight
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CCSB	Cache Creek Settling Basin
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDHS	California Department of Health Services, re-organized in 2007 and renamed "California Department of Public Health" (CDPH). Reports issued before the 2007 re-organization are cited as "CDHS" reports.
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CFSII	Continuing Survey of Food Intake by Individuals
CTR	California Toxics Rule
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board (a.k.a. Central Valley Water Board)
CWA	Federal Clean Water Act
CWC	California Water Code
DMC	Delta Mendota Canal
DTMC	Delta Tributaries Mercury Council
DWR	California Department of Water Resources
EC	Electrical Conductivity
FCM	Food chain multipliers
GIS	Geographic Information Systems
GLWQI	Great Lakes Water Quality Initiative Final Rule
HCI	Hydrologic Classification Index
HCP	Habitat Conservation Plan
Hg	Mercury
hr	Hour
LMB	Largemouth bass
LOAEC's	Lowest observed adverse effect concentrations
LOAEL	Lowest-observable adverse effect level
MCL	California/USEPA drinking water standards maximum contaminant levels
mgd	Million gallons per day
MES	Mass Emissions Strategy
MeHg	Methylmercury
MS4	Municipal Separate Storm Sewer System
MRC	Mercury Study Report to Congress
MRL	ATSDR Minimal Risk Level
na	Not available
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NCCP	Natural Communities Conservation Plan
NOAEL	No-observable adverse effect level

ACRONYMS, *continued*

NPDES	National Pollutant Discharge Elimination System
NPS	Non point source
NRC	National Research Council
o/oo	Parts per thousand (salinity)
O&M	Operation and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
RfD	Reference dose
RSC	Relative source contribution
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board (a.k.a. San Francisco Bay Water Board)
SFEI	San Francisco Estuary Institute
SRWP	Sacramento River Watershed Program
SLC	State Lands Commission
SWMP	Storm Water Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board (a.k.a. State Water Board)
TDSL	Total diet safe level
TL3	Trophic level 3
TL4	Trophic level 4
TLR	Trophic level ratios
TMDL	Total Maximum Daily Load
TMDL Report	Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury Staff Report, provided as Appendix A to this report.
TSS	Total suspended solids
UC Davis	University of California, Davis
USACE	US Army Corps of Engineers
USBR	US Bureau of Reclamation
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFDA	US Food and Drug Administration
USFWS	US Fish and Wildlife Service
WHO	World Health Organization
ww	Wet weight concentration (e.g., for fish tissue mercury concentrations)
WWTP	Wastewater treatment plants
X2	Location in the Bay-Delta Estuary with 2-o/oo bottom salinity
yr	Year

UNITS OF MEASURE

μg	microgram
μg/g	microgram per gram
μg/l	microgram per liter
μm	micrometer
cfs	cubic feet per second
cm	centimeter
g	gram
g/day	gram per day
g/l	gram per liter
in/yr	inches per year
kg	kilogram
l	liter
m	meter
mg	milligram
mg/g	milligram per gram
mgd	million gallons per day
Mkg	million kilograms
ml	milliliter
mm	millimeter
ng	nanogram
ng/l	nanograms per liter
o/oo	parts per thousand (salinity)
ppb	parts per billion; usually µg/kg
ppm	parts per million; usually mg/kg or μg/g
ppt	parts per trillion; usually ng/kg

RECOMMENDED FORMAT FOR COMMENT LETTERS

Comment letters to the Central Valley Water Board on staff recommendations serve two purposes: 1) to identify areas of agreement; and 2) to suggest revisions to staff recommendations. Clear statements of both areas of agreement and suggested revisions will assist the Central Valley Water Board and staff in determining what action, if any, to take. The following format for comment letters is recommended because it will enable the Central Valley Water Board and staff to clearly identify and respond to the specific concerns of the commenter.

Format for Comments Suggesting Revisions

The recommended format is to number the comment, state the topic in one sentence, provide a supporting argument, and make a specific recommendation. Supporting arguments should include citations, where appropriate. The recommended format is:

Comment #. *One sentence describing the topic.*
Section #, Paragraph # (only for comments regarding the staff report).
Text specifying the argument.
Text describing the suggested revision.

Additionally, for suggested revisions to the proposed Basin Plan amendments, please use underline/strikeout to show changes from the staff proposal. Commenters should support their statements with legal or scientific citations, where appropriate.

Format for Comments Supporting Staff Recommendations

The recommended format is to number the comment, state the topic in one sentence, state the section number and paragraph number (only for comments regarding the staff report), and make a statement of concurrence. An example of the recommended format is:

Comment #. *One sentence describing the topic.*
Section #, Paragraph # (only for comments regarding the staff report).
Statement of concurrence.

Commenters may include reasons for support, especially if the reasons differ from the staff rationale, or if the staff rationale could be further enhanced or clarified. Commenters also may support their statements with additional legal or scientific citations.

1 INTRODUCTION AND BACKGROUND

California Water Code Section 13240 requires each of the State's Regional Water Quality Control Boards (Regional Water Boards) to prepare and adopt Water Quality Control Plans, also known as Basin Plans, to regulate water quality. In addition to complying with California law, Basin Plans also satisfy the requirements of Section 303(c) of the Federal Clean Water Act (CWA), which requires states to adopt water quality standards to meet Federal regulatory requirements. Basin Plans are adopted and amended by the Regional Water Boards using a structured process that includes opportunities for full public participation and State environmental review. A Basin Plan identifies:

- Beneficial uses to be protected;
- Water quality objectives; and
- Implementation plans for achieving the water quality objectives.

This report addresses proposed amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan). The Basin Plan currently in effect was originally adopted by the Central Valley Regional Water Quality Control Board (Central Valley Water Board or CVRWQCB) in 1975. Updated editions were issued in 1989, 1994, and 1998.

Regional Water Boards adopt and amend basin plans through a structured process involving peer review, public participation, and environmental review. Regional Water Boards must comply with the California Environmental Quality Act (CEQA)(Public Resources Code (PRC) §21000 et seq.) when amending their basin plans. The Secretary of Resources has certified the basin planning process as exempt from the CEQA requirement to prepare an environmental impact report or other appropriate environmental document (PRC 21080.5; Title 14 CCR §15251(g)). Instead, State Water Board regulations require the Regional Water Boards to prepare a written report and an accompanying CEQA Environmental Checklist and Determination with respect to Significant Environmental Impacts (CEQA Checklist) (Title 23 CCR §3775 *et seq.*).

The proposed amendments discussed in this Central Valley Water Board staff report address the regulation of methylmercury and total mercury in the Sacramento-San Joaquin Delta Estuary (the Delta). This report provides an evaluation of a variety of alternatives for water quality objectives (herein after referred to as fish tissue objectives) for the Delta and implementation options for achieving the fish tissue objectives. This report also includes an evaluation of the potential environmental impacts of the proposed objectives and implementation plan. This report contains an analysis of implementation alternatives and evaluation of their potential environmental impacts, the CEQA environmental checklist and conclusions of the environmental analysis.

The proposed Basin Plan amendments for control of methylmercury and total mercury in the Delta will be legally applicable once they are adopted by the Central Valley Water Board and approved by the State Water Board, the State Office of Administrative Law, and the U.S. Environmental Protection Agency (USEPA). Implementation will begin after the Basin Plan amendments are legally applicable.

The Basin Plan amendments proposed for adoption by the Central Valley Water Board are presented after the Executive Summary at the beginning of this report. Chapter 1 of this report provides an introduction and background for the Basin Plan amendment process. Chapter 2 describes beneficial uses and existing conditions of the Delta. Chapter 3 presents the evaluation of alternative fish tissue objectives. Chapter 4 describes implementation alternatives. Chapter 5 details the recommended monitoring and surveillance plan. Chapter 6 summarizes existing Federal and State laws and other policies that are relevant to the proposed fish tissue objectives and implementation plan. Chapter 7 provides the CEQA checklist. Chapter 8 describes the public participation and agency consultations that took place throughout the TMDL and Basin Plan amendment development process. Appendix A is the methylmercury total maximum daily load (TMDL) technical staff report for the Delta (the TMDL Report), which provides the basis of many sections of the proposed Basin Plan amendments and this staff report. Appendix B provides the calculations for the different fish tissue objective alternatives. Appendix C provides the calculations of the estimated costs that support the economic consideration of the proposed fish tissue objectives and implementation program.

1.1 Watershed Area to Be Considered

The Sacramento-San Joaquin Delta Estuary combined with the San Francisco Bay (the Bay-Delta Estuary) forms the largest estuary on the western coast of North America. The Delta encompasses a maze of river channels and embanked islands encompassing approximately 738,000 acres in Alameda, Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties (DWR, 1995).

This staff report and the proposed Basin Plan amendments address the impairment of waterways inside of the "legal" Delta boundary defined by California Water Code Section 12220 (Figure 1.1). The list of Delta waterways in Appendix 43 of the proposed Basin Plan amendments at the beginning of this report includes all distinct, readily identifiable water bodies within the boundaries of the legal Delta that are hydrologically connected by surface water flows (not including pumping) to the Sacramento and/or San Joaquin rivers. The waterways include flowing rivers, creeks and other upland tributaries, as well as sloughs, backwaters and constructed channels. Small agricultural drains on Delta islands or uplands were not considered "Delta waterways" and are therefore not included in the list in Appendix 43. Identification of the specific waterways clarifies application of the proposed fish tissue objectives. It is not the intent of the proposed amendments to establish fish tissue objectives in canals or drains that are not hydrologically connected by surface water flows or are not distinct and readily identifiable.

The proposed implementation plan addresses methylmercury and total mercury loads in the legal Delta and sources of both in the tributary watersheds. To better address tributary sources, the Delta was divided into eight sub-regions based on hydrology. These include:

- Sacramento River: This subarea is dominated by Sacramento River flows. It is bound to the east by the legal Delta boundary and to the west by the eastern levee of the Sacramento Deep Water Ship Channel. Although drawn as a defined line, the Sacramento River subarea's boundary with the South Yolo Bypass, Central Delta, and West Delta subareas is defined by a gradient in water quality characteristics that varies depending on the tidal cycle, magnitude of wet weather flows, diversions by within-Delta

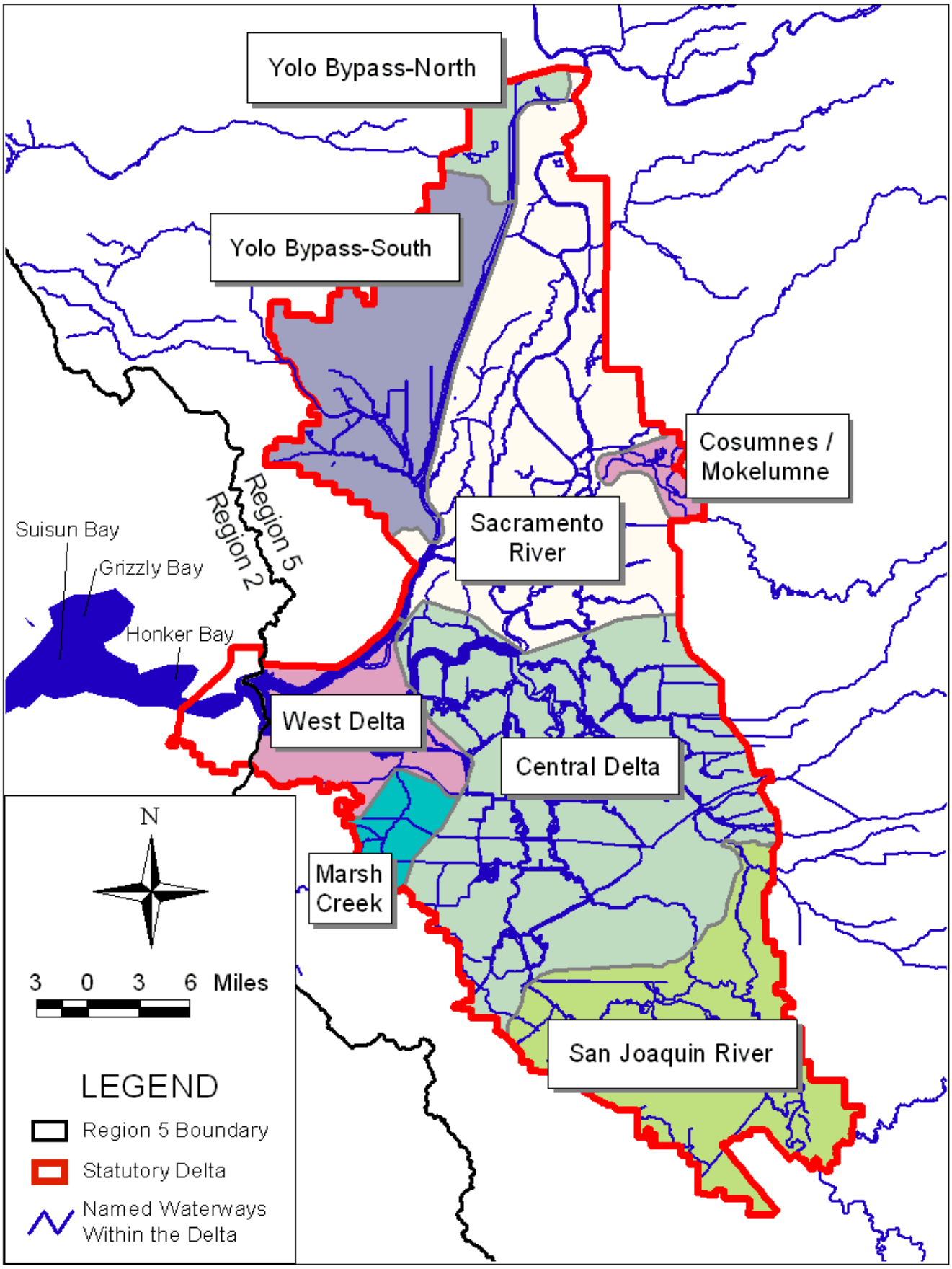

Figure 1.1: The Legal Delta Boundary Including the Eight TMDL Hydrologic Subareas

control structures, and releases from reservoirs in the upstream watersheds. The boundary shown in Figure 1.1 is based on available information.

- Yolo-Bypass (North & South): The Yolo Bypass is a floodplain on the west side of the lower Sacramento River (see Figure E.2 in Appendix E of the TMDL Report). The Fremont and Sacramento weirs route floodwaters to the Yolo Bypass from the Sacramento and Feather Rivers and their associated tributary watersheds. Cache and Putah Creeks, Willow Slough and the Knights Landing Ridge Cut from the Colusa Basin Drain all drain directly to the Yolo Bypass. Only the southern portion of the Yolo Bypass lies within the legal Delta. This portion is divided into "north" and "south" subareas by Lisbon Weir, which limits the range of tidal fluctuations upstream of the weir.
- Cosumnes/Mokelumne: This subarea includes the lower Cosumnes and Mokelumne Rivers and is defined by the legal Delta boundary to the east and the Delta Cross Channel confluence with the Mokelumne to the west.
- Marsh Creek: This subarea is defined by the portion of the Marsh Creek watershed within the legal Delta boundary that is upstream of tidal effects.
- West Delta: This subarea encompasses the confluence of the Sacramento and San Joaquin Rivers, which transport water from the Central Valley to the San Francisco Bay. The western boundary of the West Delta subarea is defined by the jurisdictional boundary between the Central Valley Water Board and the San Francisco Bay Regional Water Quality Control Board (a.k.a. San Francisco Bay Water Board or Region 2). Water quality characteristics are determined by the tidal cycle, magnitude of wet weather flows, controlled flow diversions by within-Delta structures, and releases from reservoirs in the upstream watersheds.
- Central Delta: This subarea includes a myriad of natural and constructed channels that transport water from the upper watersheds to San Francisco Bay to the west and the State and Federal pumps to the southwest. The Central Delta tends to be most influenced by Sacramento River water.
- San Joaquin River: This subarea is defined by the legal Delta boundary to the east and south, and the Grantline Canal coupled with the beginning of the Stockton Deep Water Channel to the north. At present, the San Joaquin River is almost entirely diverted out of the Delta through the Old River and Grantline Canal for export to areas south of the Delta via the State and Federal pumping facilities near Tracy.

1.2 Need for an Amendment to the Basin Plan

Section 303(d)(1)(A) of the Clean Water Act requires the Regional Water Boards to:

- Identify the Regions' waters that do not comply with water quality standards;
- Rank the impaired water bodies, taking into account factors including the severity of the pollution and the uses made of such waters; and
- Establish water quality management strategies (TMDLs) for those pollutants causing the impairments to ensure that impaired waters attain their beneficial uses.

In 1990, the State Water Board adopted the Clean Water Act 303(d) list that identified the Delta as impaired due to mercury pollution. The listing was based on a 1971 human health advisory

issued for the Delta advising pregnant women and children not to eat striped bass. In 1994, the California Office of Environmental Health Hazard Assessment (OEHHA) issued an interim advisory for San Francisco Bay and the Delta that recommended no consumption of large striped bass and shark because of elevated concentrations of methylmercury and polychlorinated biphenyls (OEHHA, 1994). Additional monitoring indicates that several more species, including largemouth bass and white catfish (two commonly-caught local sport fish), also have elevated concentrations of methylmercury in their tissue (Davis *et al.*, 2003; Slotton *et al.*, 2003; LWA, 2003; SWRCB-DWQ, 2002). OEHHA released a draft advisory for the south Delta in March 2007 that addresses a variety of fish and shellfish species.

At this time, the Basin Plan does not include numeric fish tissue objectives for methylmercury in Delta fish or an implementation plan to control methylmercury or total mercury in the Delta. Therefore, Central Valley Water Board staff proposes that the Basin Plan be amended to include fish tissue objectives for methylmercury, as well as reduction strategies for methylmercury and total mercury for the Delta and its tributary watersheds.

The Central Valley Water Board will develop a water quality management strategy for each water body and pollutant in the Central Valley identified on California's 303(d) List. The management strategy for control of mercury in Delta is being conducted in several stages:

- Total Maximum Daily Load Development: Involves the technical analysis of the sources of pollutant, the fate and transport of those pollutants, the numeric target(s), and the amount of pollutant reduction that is necessary to attain the target(s). The TMDL Report for the Delta was first released to the public for comment in August 2005; a revised version was released in June 2006 for scientific peer review. This report formed the basis of many parts of the proposed Basin Plan amendment staff report. Comments received on the 2005 and 2006 draft TMDL Reports were considered in the development of this staff report and the updated TMDL Report presented in Appendix A.
- Basin Planning: Focuses on the development of Basin Plan amendments and staff report that includes information and analyses required to comply with CEQA. The Basin Planning process satisfies State Water Board regulations for the implementation of CEQA. The Basin Plan amendments will include those policies and regulations that the Central Valley Water Board believes are necessary to attain the fish tissue objectives.
- Implementation: Establishes a framework that ensures that appropriate management practices or technologies are implemented (§13241 and §13242 of the Porter-Cologne Water Quality Act).

2 BENEFICIAL USES AND EXISTING CONDITIONS

2.1 Delta Beneficial Uses Cited in the Basin Plan

The Federal Clean Water Act and the State Porter-Cologne Water Quality Act require identification and protection of beneficial uses of water. Beneficial uses are designated by the Central Valley Water Board and are shown in Table II-1 of the Basin Plan (CVRWQCB, 2007). Table 2.1 lists the existing and potential beneficial uses of the Delta. The Delta provides habitat for warm and cold-water species of fish and their associated aquatic communities. Additionally, the Delta and its riparian areas provide valuable wildlife habitat. There is significant use of the Delta for fishing and collection of aquatic organisms for human consumption (covered under COMM, the commercial and sport fishing designation). Further, water is diverted from the Delta for municipal (MUN) and agricultural (AGR) use.

Beneficial uses of the Delta that are impaired due to elevated methylmercury levels in fish are recreational fishing (REC-1), wildlife habitat (WILD), and human consumption of aquatic organisms. High methylmercury levels in fish pose risks for people and wildlife that eat Delta fish. A summary of Delta fish methylmercury levels is presented in Section 2.2. In addition, certain areas of the Delta (Yolo Bypass and Marsh Creek) may not support the municipal (MUN) beneficial use.

The Delta provides habitat for diverse populations of wildlife. Over two hundred and eighty species of birds and fifty species of fish inhabit the freshwater portion of the Delta, making it one of the State's most important wildlife habitats (Herbold *et al.*, 1992). Delta wildlife species that are primarily or exclusively piscivorous (that is, feed on fish) and therefore most likely at risk for mercury toxicity include: American mink, river otter, bald eagle, kingfisher, osprey, western grebe, common merganser, peregrine falcon, double crested cormorant, California least tern, and western snowy plover[1] (USEPA, 1997; CDFG 2002). Peregrine falcons are not piscivorous, but they eat birds that feed in the aquatic food chain. Bald eagles, California least terns and peregrine falcons are listed by the State of California or by the U.S. Fish and Wildlife Service (USFWS) as either threatened or endangered species. The Delta is a foraging and possible wintering habitat for bald eagles (USFWS, 2004). California least terns also forage in the Delta. There is at least one nesting colony of these terns within the Delta (USFWS, 2004). Although most of the Delta habitat is not preferred by peregrine falcons for nesting, several pairs have nested on bridges in the area (Linthicum, 2003). Although other wildlife species eat fish in the Delta, consumption patterns of the species listed above span the range of sizes of fish eaten.

[1] The CDFG *California Wildlife Habitat Relationships* database also reports observations of brown pelicans and clapper rails in the Delta. Both of these species are federally listed as endangered and depend on the aquatic food web. However, staff of the Biological Contaminants Division of the US Geological Survey (USGS) confirmed that brown pelicans and clapper rails prefer salt-water habitats and are only occasional visitors to the Delta regions (personal communication from Dr. S. Schwarzbach, USGS, to J. Cooke, CVRWQCB, April 2003).

Table 2.1: Existing Beneficial Uses of the Delta

Beneficial Use [a]	Status
Municipal and domestic supply (MUN)	Existing [b]
Agriculture – irrigation and stock watering (AGR)	Existing
Industry – process (PROC) and service supply (IND)	Existing
Contact recreation (REC-1) [c]	Existing [b]
Non-contact recreation (REC-2) [c]	Existing
Freshwater habitat (warm and cold water species)	Existing
Spawning, reproduction and/or early development of fish (SPWN) (warm water species)	Existing
Wildlife habitat (WILD)	Existing [b]
Migration of aquatic organisms (MIGR) (warm and cold water species)	Existing
Navigation (NAV)	Existing

(a) This table lists the beneficial uses designated for the Delta in Table II-1 of the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (CVRWQCB, 2007; available at: http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/SacSJR.pdf).

(b) These are beneficial uses impaired by mercury in the Delta.

(c) REC-1 includes recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing and fishing. REC-2 includes recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, hunting and sightseeing.

2.2 Existing Concentrations of Methylmercury in Delta Fish

High levels of mercury in fish are of concern to people and wildlife that eat Delta fish. Table 2.2 summarizes average methylmercury concentrations in fish tissue for the eight Delta subareas by trophic level (TL).[2] Common small (<50 mm) TL2 and 3 fish species in the Delta include inland silverside, mosquitofish and threadfin shad. Common TL3 fish include bluegill, carp, redear sunfish, Sacramento sucker, and Chinook salmon (a.k.a. king salmon). Common TL4 fish include largemouth and striped bass, channel and white catfish and Sacramento pikeminnow. Most fish data summarized in Table 2.2 were collected between 1998 and 2001. Additional information is provided in the TMDL Report.

Significant regional variations in fish tissue mercury concentrations exist in the Delta. Elevated concentrations occur along the periphery of the Delta while lower body burdens are measured in

[2] Trophic levels are the hierarchical strata of a food web characterized by organisms that are the same number of steps removed from the primary producers. The USEPA's 1997 Mercury Study Report to Congress used the following criteria to designate trophic levels based on an organism's feeding habits:

Trophic level 1: Phytoplankton.
Trophic level 2: Zooplankton, benthic invertebrates, and plant-eating fish (Delta examples: clams, shrimp).
Trophic level 3: Organisms that eat zooplankton and other TL2 organisms (Delta examples: bluegill, carp, crayfish, Sacramento splittail, salmon, sucker, shad, sturgeon, and yellowfin goby).
Trophic level 4: Organisms that eat trophic level 3 organisms (Delta examples: largemouth, smallmouth, and striped bass; white catfish; and crappie).

the central Delta. Concentrations are greater than levels recommended as safe by the USEPA and USFWS (see Chapter 3) at all locations except in the central Delta. Percent reductions in fish methylmercury levels ranging from 0% to more than 70% in the peripheral Delta subareas will be needed to achieve fish mercury levels protective of people and wildlife species that eat Delta fish.

Table 2.2: Weighted-Average Methylmercury Concentrations in Delta Fish

Key Species of Concern	Fish Species Trophic Level Food Group	Species-Specific Target (mg/kg)	MeHg Concentration by Delta Subarea (mg/kg) [a]							
			Central Delta	Marsh Creek [b]	Moke-lumne River	Sacra-mento River	San Joaquin River	West Delta	Yolo Bypass North [c]	Yolo Bypass South [c]
Human	TL4 Fish (150-500 mm)	0.24	0.26	na	0.92	0.56	0.50	0.32	0.51	0.53
Human	TL3 Fish (150-500 mm)	0.08	0.08	na	0.28	0.21	0.11	0.11	0.28	0.19
Osprey	TL4 Fish (150-350 mm)	0.26	0.20	na	0.75	0.46	0.42	0.24	0.50	0.47
Grebe	TL3 Fish (150-350 mm)	0.08	0.08	na	0.29	0.17	0.12	0.08	na	na
Kingfisher	TL3 Fish (50-150 mm)	0.05	0.03	0.10	0.09	0.04	0.04	0.03	na	0.07
Least Tern	TL2/3 Fish (<50 mm)	0.03	0.02	na	0.07	0.03	0.04	0.03	na	0.05

(a) Samples were comprised of both individual fish and composites of multiple fish. Weighted average mercury concentration is based on the number of fish in the composite samples analyzed, rather than the number of samples. Fish mercury data were not available for every TL food group in every Delta subarea.

(b) Fish data collected in 1995 and 1996.

(c) Fish mercury data were not available for all trophic level food groups in the Yolo Bypass.

2.3 Proposed Modification to Beneficial Uses Identified in the Basin Plan

As noted in Section 2.1, the Basin Plan lists the existing and potential uses of the Delta. The Basin Plan provides a standard definition for commercial and sport fishing (COMM). The COMM designation is defined as "uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes" (CVRWQCB, 2007). The Basin Plan does not include the COMM designation for the Delta. However, commercial and sport fishing is a past and present use of the Delta. To document the use of the Delta as a fishery, staff proposes to include the COMM beneficial use designation in the Basin Plan for the Delta. The inclusion is not expected to change fishing habits or patterns. Staff proposes to add the COMM designation as a potential, rather than existing, beneficial use because the recommended fish tissue objectives are not yet achieved throughout the Delta.

The Delta provides habitat for as many as fifty freshwater, saltwater and anadromous fishes (Moyle, 2002), including popular sport species such as bass, salmon, sturgeon and catfish. The California Department of Fish and Game (CDFG) issues commercial fishing licenses in California and reports active commercial fishing in the Delta. CDFG's Marine Resources

website provides summary data for commercial landings and associated costs for fishing years 2001 and 2002. The predominant species targeted include bay shrimp, crayfish and threadfin shad. Threadfin shad are used mainly as baitfish for catching striped bass. Historical data for other commercial fishing activities are not available.

Noncommercial fishing is common throughout the Delta and takes place year round. On average, sport fishing license sales in the six Delta counties account for 19% of all licenses issued in California for striped bass, salmon and steelhead. It is unknown what portion of those licenses was purchased for fishing within the statutory Delta boundary. However, creel surveys and interviews indicate that sport and subsistence anglers actively fish the Delta waterways year-round by boat and from banks. CDFG's creel surveys indicate that multiple species are caught and kept, including catfish, striped bass, black bass, and Sacramento pike minnow, Chinook salmon (a.k.a. king salmon), American shad, splittail, sunfish, sturgeon, starry flounder, common carp, Sacramento sucker, steelhead trout and rainbow trout. Recent interviews of selected groups in the Delta region found that members of Southeast Asian, Latino, African-American, and Russian communities regularly eat local fish, especially striped bass and catfish (CDHS, 2004 & 2006; Silver *et al*, 2007; see Section 4.6.3 in the TMDL Report). Several fishing derbies for striped bass, black bass and sturgeon take place in the Delta every year. Sacramento blackfish, shimofuri goby and clams may also be collected from the Delta (Moyle, 2002; anecdotal information). However, the CDFG creel surveys (CDFG, 2000-2001), anecdotal information provided by CDFG staff (Schroyer, 2003), and the other recent interviews indicate that many Delta anglers target salmon, sunfish, striped bass, largemouth bass and catfish and are not as likely to take home clams and shrimp species. For specific information on fish licenses and CDFG's creel survey data, refer to Appendix C of the TMDL Report.

3 FISH TISSUE OBJECTIVES

Water quality objectives are established in Basin Plans by the Regional Water Boards to reasonably protect beneficial uses. Water quality objectives provide a specific basis for the measurement and maintenance of water quality. For this report, water quality objectives are referred to as fish tissue objectives.

The Basin Plan for the Sacramento and San Joaquin River Basins does not contain numeric objectives for fish tissue methylmercury within the legal Delta boundary and not until recently have fish tissue objectives been proposed for any of the Delta's tributary watersheds (e.g., Clear Lake and Cache Creek). Methylmercury concentration in fish tissue is considered an appropriate objective for the Delta because it is the most toxic form of mercury; it is the form by which people and wildlife may be exposed in the Delta at levels to cause adverse effects; it provides the most direct assessment of fishery conditions and improvement; and a safe fishery is the foremost unmet beneficial use of the Delta.[3]

This chapter evaluates five possible alternatives for fish tissue objectives to address methylmercury in Delta fish. In developing the alternative fish tissue objectives below, Central Valley Water Board staff considered (1) existing conditions in the Delta (see Chapter 2), (2) numerical guidelines and recommended criteria available from USEPA, USFWS and other agencies, and (3) that the current listing of Delta waterways as impaired for mercury because of fish consumption advisories (OEHHA, 1994 & 2007).

Fish tissue concentrations in the Delta exceed human and wildlife guidelines of NAS, USEPA, and USFWS. The proposed objectives incorporate current USEPA and USFWS information regarding methylmercury toxicity to people and wildlife (see Section 4.5.1 of the TMDL Report).

3.1 Alternatives Considered

To develop fish tissue objective alternatives, staff used a formula that incorporated the safe daily intake of methylmercury (reference dose), consumer's body weight, and fish consumption rate. See Appendix B for calculations of the alternatives. Chapter 4 (Numeric Targets) in the TMDL Report provides detailed explanations of these calculations and:

- Shows how the safe level of mercury in fish varies between fish trophic level and length;
- Evaluates the safe level of mercury in fish for human consumption under 15 different scenarios based on different consumption rates and trophic level (TL) distributions (see Table 4.5 in the TMDL Report).

[3] In the Delta TMDL Report, Central Valley Water Board staff provided safe methylmercury concentrations in piscivorous and omnivorous birds eaten by bald eagles and peregrine falcons. Existing concentrations in such "avian prey" are not known. Because people do not typically eat birds that are preyed upon by bald eagles and peregrine falcons, it would be difficult to determine whether a safe concentration in avian prey is protective of people who eat Delta fish. For these reasons, Central Valley Water Board staff is not proposing tissue objectives for avian prey species. The USFWS concluded that meeting protective levels in fish tissue would adequately reduce methylmercury levels in the avian prey species that eat Delta fish or invertebrates (USFWS, 2004).

- Determines whether safe levels for human and wildlife consumption of large TL4 fish equate to safe levels for wildlife consumption of small fish.

This alternatives analysis focuses on five of the scenarios described in the TMDL Report. The alternatives vary in the amount and trophic level of fish that can be safely eaten by people and wildlife, as depicted in Table 3.1. Numeric objectives are proposed as average concentrations in fish muscle tissue (for large fish) or in whole fish (for small fish).

Although the fish tissue objectives are based on bodyweights and consumption rates for adults, the objectives also protect children. Though children have smaller bodyweights than adults, children also typically eat less fish than adults (OEHHA, 1999). Therefore, children are only at risk of mercury toxicity if they eat more than the average portion for their body size.

Wildlife species most at risk from methylmercury are primarily or exclusively piscivorous. Species at risk in the Delta include the American mink, bald eagle, California least tern, common merganser, double crested cormorant, kingfisher, osprey, peregrine falcon, river otter, western grebe, and western snowy plover. Evaluation of the alternatives takes into account protection of wildlife. In addition, Alternatives 3 and 4 include an objective for small (less than 50 mm total length) TL2 and TL3 fish to ensure that wildlife species eating these fish are protected.

The following sections describe the alternatives' fish tissue objectives with their corresponding human consumption rates.

Table 3.1: Comparison of Fish Tissue Objective Alternatives

Alternative	**Proposed Objective for MeHg in Large TL4 Fish** (mg/kg)	**Potential Human Consumption Rates & Trophic Level Distributions of Delta Fish Consumed** [(b)]
2	0.58	3.8 g/day of TL2 fish, 8.0 g/day of TL3 fish, and 5.7 g/day of TL4 fish, for a sum of 17.5 g/day
3 [(a)]	0.29	17.5 g/day of large TL4 fish
4 [(a)]	0.24	32 g/day of a 50/50 mix of large TL3 and 4 fish
5	0.05	142.4 g/day of large TL4 fish

(a) Alternatives 3 and 4 also propose an objective for small, whole TL2 and TL3 fish of 0.03 mg/kg to protect wildlife species that eat small fish. In addition, Alternative 4 proposes a methylmercury objective for large TL3 fish of 0.08 mg/kg.

(b) Consumption rates are in terms of uncooked fish.

3.1.1 Alternative 1. No Action

Alternative 1 contains no fish tissue objective for the Delta. The existing toxicity-related narrative objective of the Basin Plan would still apply: "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal or aquatic life." The criterion likely to be used to interpret the narrative objective is the California Toxics Rule (CTR) criterion of 50 ng/l for total recoverable mercury in water.

This alternative does not sufficiently protect people or sensitive fish-eating wildlife that eat Delta fish. Although water column total mercury concentrations are less than the CTR throughout the Delta (see Chapter 7 in the TMDL Report), fish mercury levels still exceed safe levels for people and wildlife. As explained later in Section 3.2.3 of this chapter, water column total mercury concentrations lower than the CTR criterion would be needed to protect people and wildlife species that consume Delta fish, and the safe levels would vary throughout different areas of the Delta. For that reason, Alternatives 2 through 5 propose numerical fish tissue objectives to explain the narrative objective in the current Basin Plan and facilitate implementation of a water quality management strategy to reduce methylmercury levels in Delta fish.

3.1.2 Alternative 2. Fish Tissue Objective of 0.58 mg/kg Methylmercury in Large TL4 Fish

Alternative 2 contains one fish tissue objective (average methylmercury concentration): **0.58 mg methylmercury/kg muscle tissue, wet weight, for large TL4 fish** (legal size if designated by CDFG, otherwise 150-500 mm total length). The large fish tissue objective is based on the following scenario:

- People eat 17.5 grams/day of freshwater/estuarine (local Delta) fish (one fish meal every two weeks) and 12.46 g/day of marine (commercial) fish (0.4 fish meals per week; USEPA, 2000b).[4] A national survey found that 90% of the nation's population eats 17.5 g/day or less of freshwater (local) fish.
- Adult body weight is 70 kg (about 154 pounds).
- Fish or shellfish eaten are from a variety of trophic levels (TL2, TL3, and TL4, with consumption rates of 3.8, 8.0, and 5.7 g/day, respectively).
- The USEPA reference dose (RfD) for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.

As noted in Table 4.5 of the TMDL Report, mercury concentrations in TL2 and TL3 fish that correspond to the TL4 fish objective are 0.04 and 0.20 mg/kg, respectively. By meeting the TL4 fish objective, these concentrations will be met as well.

Alternative 2 uses the same methods and assumptions that the USEPA used in developing its recommended methylmercury criterion to protect human health (USEPA, 2001). The USEPA recommends an ambient water quality criterion of 0.3 mg/kg methylmercury in fish tissue, on a wet weight basis,[5] which represents the concentration in fish tissue that should not be exceeded based on a total consumption of locally caught fish of 17.5 g/day. The USEPA criterion, like Alternative 2, assumes that people will eat a mixture of locally caught freshwater or estuarine fish from trophic levels 2, 3, and 4 in the proportions described above.

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[4] One meal of fish for an adult human is assumed to be eight ounces of uncooked fish or shellfish (6 ounces cooked). The consumption rate of 17.5 g/day is equivalent to one eight-ounce meal per 2-week period, or four ounces per week (2.3 meals/month).

[5] USEPA's criterion of 0.3 was rounded to one significant digit from 0.288 mg/kg. The fish tissue objective alternatives calculations were based on a methylmercury in fish tissue concentration of 0.29 mg/kg to incorporate two significant digits. Detailed calculations are included in Appendix B and in Chapter 4 in the TMDL Report.

Alternative 2 is not protective of people eating mainly TL4 fish (such as bass and catfish) and also is not protective of several fish-eating wildlife species, including bald eagle, osprey, river otter, grebe, common merganser, and least tern (as shown in Table 4.3 of the TMDL Report). However, this alternative would be protective of mink, double-crested cormorant, belted kingfisher, and western snowy plover.

Therefore, Alternative 2 is protective of (a) people who eat a moderate amount of fish from different trophic levels (TL2, 3, and 4), and (b) some sensitive fish-eating wildlife.

3.1.3 Alternative 3. Fish Tissue Objectives of 0.29 mg/kg Methylmercury in Large TL4 Fish and 0.03 mg/kg in Small TL2/3 Fish

Alternative 3 contains two fish tissue objectives (average methylmercury concentration): **0.29 mg methylmercury/kg muscle tissue, wet weight, for large TL4 fish** (legal size if designated by CDFG, otherwise 150-500 mm total length) and **0.03 mg methylmercury/kg whole fish, wet weight, for small TL2 and TL3 fish** (less than 50 mm total length).

USEPA's 2001 Water Quality Criterion report allows for using site-specific information to set a local methylmercury criterion. The large fish tissue objective is based on the following scenario, which makes use of site-specific information:

- Some of the same conditions as Alternative 2 (USEPA default), that is:
  - People eat 17.5 g/day of freshwater/estuarine (local Delta) fish and 12.5 g/day of marine (commercial) fish.
  - Adult body weight is 70 kg (about 154 pounds).
  - The USEPA RfD for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.
- One change from the conditions in Alternative 2, that is, local Delta anglers prefer to eat primarily TL4 fish (not a mixture of TL 2, 3, and 4 fish), as evidenced by CDFG creel surveys (CDFG, 2000-2001), anecdotal information by CDFG staff (Schroyer, 2003), and other recent local surveys (see Section 4.6.3 in the TMDL Report).

Delta creel surveys show that anglers may target an almost even mix of TL3 (American shad, salmon, sunfish, and splittail) and TL4 fish (catfish and striped bass) in the Sacramento and Mokelumne Rivers subareas of the Delta, and primarily TL4 species in other areas of the Delta. Local anglers take home fewer TL2 species, such as clams, shrimp, and shimofuri goby, than indicated in the national dietary used in the USEPA methylmercury criterion and Alternative 2.

In several small surveys in the Delta, the California Department of Public Health found that while striped bass (a TL4 species) is frequently sought, people who regularly eat Delta fish do so from both trophic levels 3 and 4 (CDHS, 2004-2006; Silver *et al.*, 2007; Ujihara, 2006); see Section 4.6.3 in the TMDL Report). TL3 species such as bluegill are available year-round. Popular fish such as salmon and shad are available seasonally.

In addition to the large fish objective, Alternative 3 includes a small fish objective for TL2 and TL3 fish to protect wildlife that eat small fish. The objective for large TL4 fish is expected to reduce methylmercury in smaller fish sufficient to protect wildlife because methylmercury

concentrations in large TL4 fish show statistically significant, positive relationships with concentrations in smaller fish and in fish in different trophic levels. Alternative 3 includes an objective of 0.03 mg/kg methylmercury in whole, TL2 and TL3 fish less than 50 mm in length so that fish monitoring may verify that small fish mercury levels decrease to protective levels as large fish mercury levels decrease. This objective represents the safe level for prey eaten by the California least tern, a federally endangered species. This small fish objective also protects other wildlife consuming small fish in the Delta, including herons, rails, egrets, western snowy plovers, and other species of concern.

Therefore, Alternative 3 is protective of (a) people who eat a moderate amount of fish that are primarily large TL4 species, and (b) all sensitive fish-eating wildlife.

3.1.4 Alternative 4. Fish Tissue Objectives of 0.24 mg/kg Methylmercury in Large TL4 Fish, 0.08 mg/kg in Large TL3 Fish and 0.03 mg/kg in Small TL2/3 Fish

Alternative 4 contains three fish tissue objectives (average methylmercury concentration). For large fish, the objectives are **0.08 and 0.24 mg methylmercury/ kg, wet weight, in muscle tissue of large TL3 and 4 fish**, respectively (legal size if designated by CDFG, otherwise 150-500 mm total length). These objectives are protective of (a) people eating 32 g/day (eight ounces, uncooked fish per week) of commonly eaten, legal size fish, and (b) all wildlife species that eat large fish. For small fish, the objective is **0.03 mg methylmercury/ kg, wet weight, in whole TL2 and TL3 fish less than 50 mm** in total length. This objective is protective of wildlife species that eat small fish.

These large fish tissue objectives are based on the following scenario:

- Some of the same conditions as Alternative 2 (USEPA default), that is:
  - Adult body weight is 70 kg (about 154 pounds).
  - The USEPA RfD for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.
- Two changes from the conditions in Alternative 2, that is:
  - People eat more local fish, at a rate of 32 g/day (one fish meal per week).
  - People eat a 50/50 combination of TL3 and 4 fish, based on CDFG creel surveys in the Sacramento River and Mokelumne subareas of the Delta and CDPH angler surveys of Delta subpopulations.

The higher consumption rate is based on a detailed angler consumption survey for San Francisco Bay that was conducted in 1998 and 1999 (CDHS & SFEI, 2001). The consumption rates for the 95th percentile of anglers that were “consumers” (ate Bay fish at least once prior to the interview) was 32 g/day (about one eight-ounce meal per week). San Francisco Bay Water Board staff used this consumption rate to develop the water quality objective for mercury in Bay fish, which was approved by the San Francisco Bay and State Water Boards (see Section 6.2.11 in Chapter 6). One meal per week is also used by OEHHA in development of fish consumption advisories (OEHHA, 2004; 2005).

Like Alternative 2, Alternative 3 includes a small fish objective of 0.03 mg/kg methylmercury in whole TL2 and TL3 fish to ensure that wildlife species that eat small fish are protected, even

though the objective for large TL4 fish is expected to reduce methylmercury in smaller fish sufficient to protect wildlife.

Therefore, Alternative 4 is protective of (a) people who eat a relatively high amount of fish that are an even mixture of TL3 and TL4 species, and (b) all sensitive fish-eating wildlife.

3.1.5 Alternative 5. Fish Tissue Objective of 0.05 mg/kg Methylmercury in Large TL4 Fish

Alternative 5 contains one fish tissue objective (average methylmercury concentration): **0.05 mg methylmercury/kg muscle tissue, wet weight, for large TL4 fish** (legal size if designated by CDFG, otherwise 150-500 mm total length). This fish tissue objective is based on the following scenario:

- Some of the same conditions as Alternative 2 (USEPA default), that is:
  - Adult body weight is 70 kg (about 154 pounds).
  - The USEPA RfD for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.
- Two changes from the conditions in Alternative 2, that is:
  - Some people are subsistence consumers; because of tradition or need, these people have high consumption rates of locally caught fish, represented by a rate of 142.4 g/day (four to five fish meals per week). This rate is the 99th percentile consumption rate identified in a national food intake survey and recommended by USEPA for subsistence anglers and their families. These subsistence anglers are expected to eat mainly TL4 species like catfish and bass.
  - The calculations assume that methylmercury intake is from only Delta fish and that none is from commercial fish.

Alternative 5 does not include a small fish objective because the large TL4 fish objective (0.05 mg/kg) is so close to the safe level for the smallest fish (0.03 mg/kg). Additionally, the large TL4 fish objective is substantially lower than necessary to protect wildlife consuming large TL3 and TL4 fish (see Table 4.9 in the TMDL Report).

Therefore, Alternative 5 is protective of (a) people who eat a very high amount of TL4 fish species, and (b) all sensitive fish-eating wildlife.

3.2 Evaluation of Alternatives

Section 13241 of the Porter-Cologne Water Quality Act identifies six factors that must be addressed when evaluating a fish tissue objective. Factors to be considered are:

- Past, present, and probable future beneficial uses of water;
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;

- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water.

The alternatives for fish tissue objectives are evaluated with respect to these factors in the following six sections. The alternatives are evaluated with respect to applicable State and Federal policies in Chapter 6.

3.2.1 Beneficial Uses

Several beneficial uses of Delta waters are impaired by mercury: consumption of fish and shellfish by people (REC-1, COMM), wildlife habitat (WILD), and municipal and domestic supply (MUN). The proposed fish tissue objectives and implementation plan are intended to restore these beneficial uses.

Under Alternative 1, beneficial uses are protected by the narrative toxicity objective of the Basin Plan. However, evaluating the success of methylmercury reduction efforts (as part of the implementation plan) will be easier using numeric fish tissue objectives such as those proposed by Alternatives 2 through 5.

Alternatives 2 through 5 protect the existing (already identified in the Basin Plan) REC-1 and MUN beneficial uses and the proposed COMM beneficial use. Alternative 2 is not fully protective of the WILD beneficial use because the alternative exceeds the safe methylmercury levels for some wildlife species. Alternatives 3 through 5 fully protect the WILD beneficial use. Alternative 5 provides the greatest protection to people who eat Delta fish.

3.2.2 Environmental Characteristics of the Hydrographic Unit

Delta water is used for drinking water, irrigation, contact recreation, stock watering, commercial/sport fishing, and habitat for warm- and cold-water aquatic species. In addition, the Delta provides a significant fishery and habitat for terrestrial wildlife. Environmental characteristics and existing conditions of the Delta and tributaries are discussed in more detail in Chapters 1 and 2, respectively.

All proposed alternatives would affect environmental characteristics of the hydrologic unit by improving water quality conditions of the Delta and its tributaries to varying degrees. Improvements likely to be achieved by each alternative (through different numeric fish tissue objectives for methylmercury) are described in the next section.

3.2.3 Water Quality Conditions That Could Reasonably Be Achieved

Alternatives and Consumption Rates They Would Allow

Alternative 1 (No Action) contains no fish tissue objective for the Delta, but defaults to the Basin Plan's existing narrative toxicity objective, which is translated into a numerical objective (based on the USEPA CTR criterion) of 50 ng/l total mercury in the water column. However,

calculations show that a lower CTR criterion is needed to protect people and sensitive wildlife species that eat Delta fish. The CTR criterion was derived using similar factors as the fish tissue alternatives, with an additional factor to relate fish tissue methylmercury concentrations to water total mercury concentrations. This additional factor, termed the practical bioconcentration factor (BCF), is the ratio of mercury concentrations in fish and water. The BCF used for the CTR criterion is 7,342.6 (USEPA, 2000a). In comparison, the BCFs for large TL4 fish and ambient total mercury in the Delta vary by subarea and range between 18,000 and 170,000, and the BCFs for large TL3 fish and ambient total mercury in the Delta range between 6,300 and 53,000. The presence of higher BCFs in the Delta, compared to the CTR's BCF, indicate that a total mercury concentration lower than the CTR criterion would be needed to protect people and wildlife species that eat Delta fish. The final Great Lakes Water Quality Guidance developed bioaccumulation factors (BAFs) for TL3 and TL4 fish of the Great Lakes Basin by multiplying watershed-specific BCFs by a food-chain multiplier. Respectively, the BAFs for mercury for TL3 and TL4 fish were 27,900 and 140,000, which are comparable to the TL3 and TL4 BCFs calculated for the Delta, indicating that the BCFs for the Delta are not anomalous.

Alternative 2 has a fish tissue objective that allows people to safely eat a moderate amount of Delta fish from a variety of trophic levels but does not fully protect all sensitive fish-eating wildlife. Under Alternative 2, people safely may eat up to 17.5 g/day of local fish (one eight-ounce meal every two weeks), if they eat a mixture of TL2 (21.7%), TL3 (45.7%), and TL4 (32.6%) fish. Alternative 2, however, could exceed the safe intake levels recommended by the USFWS for bald eagle and least tern.

Alternative 3 has fish tissue objectives that allow people to safely eat a moderate amount of Delta TL4 fish and also fully protects all sensitive fish-eating wildlife. Under Alternative 3, people safely may eat up to 17.5 g/day of local TL4 fish such as bass and catfish. Alternative 3 is more protective of people than Alternative 2 because, by protecting people who eat more of the Delta fish that are highest in methylmercury (TL4 fish), the fish tissue objective is lower in Alternative 3 than in Alternative 2.

Alternative 4 has fish tissue objectives that allow people to safely eat a relatively high amount of Delta TL3 and TL4 fish and also fully protects all sensitive fish-eating wildlife. Under Alternative 4, people may safely eat up to 32 g/day (one eight-ounce meal week) of local fish, if they eat an even mixture of TL3 and TL4 fish. Alternative 4 is more protective of people than Alternative 3 because, by protecting people who eat more Delta fish, the fish tissue objective is lower in Alternative 4 than in Alternative 3.

Alternative 5 has a fish tissue objective that allows people to safely eat a very high amount of Delta TL4 fish and also fully protects all sensitive fish-eating wildlife. Under Alternative 5, people may safely eat up to 142.4 g/day (four to five meals per week) of local TL4 fish. Alternative 5 is more protective of people than Alternative 4 because, by protecting people who eat the most Delta fish (due to tradition or need), the fish tissue objective is lower than in Alternative 5 than in Alternative 4. Accordingly, Alternative 5 has the lowest fish tissue objective of any alternative.

Alternatives Compared to Current Conditions

Currently, Alternatives 2 through 5 have varying levels of attainment of fish tissue objectives. Alternative 2 currently is attained in seven of eight subareas of the Delta, while Alternative 3 currently is attained in only one subarea (Central Delta subarea). Alternative 4 is close to attainment in the Central Delta subarea, but not in other subareas. Alternative 5 is not attained in any subareas of the Delta.

The level of reduction required by each alternative depends on the subarea. For example, to attain Alternative 2, methylmercury in large TL4 fish must decrease by 43% in the Mokelumne/Cosumnes subarea while no reductions are needed in other subareas. To attain Alternative 3 and 4, methylmercury in fish must decrease from little to none in the Central Delta subarea, but must decrease by greater than 70% in the Mokelumne/Cosumnes subarea. To attain Alternative 5, methylmercury in large TL4 fish must decrease by 81% to 95% in all subareas of the Delta.

Alternatives Compared to Regional Mercury Levels and Their Potential Attainability

In a recent study, the USEPA and Oregon State University collected and analyzed 2,707 large TL3 and 4 fish from 626 streams and river segments in the western United States, including California, using a probability design (Peterson *et al.*, 2007). The purpose of the study was to assess the distribution of mercury in fish across the region. Central Valley Water Board staff evaluated the study results in terms of the existing fish mercury levels in the Delta and alternative fish tissue objectives (Foe, 2007). Only about 1 to 3% of the waterways evaluated by the study had fish mercury concentrations higher than those observed in the Mokelumne/Cosumnes subarea of the Delta. Likewise, fish mercury concentrations in the Sacramento, San Joaquin, and Yolo Bypass subareas were in the top 20 to 25% of fish mercury concentrations observed throughout the western United States. This confirms that Delta fish have elevated concentrations in comparison to regional background levels and suggests that the Delta and its tributary watersheds contain mercury sources in addition to atmospheric deposition, e.g., abandoned mines and sites where the mercury is efficiently converted to methylmercury that bioaccumulates in the aquatic food web (Foe, 2007).

Of the sampled waterways in the western United States, none supported a fish population with mercury concentrations as low as Alternative 5 (0.05 mg/kg in large TL4 fish) (Peterson *et al.*, 2007; Foe, 2007). Therefore, Alternative 5 may not be attainable. In contrast, about 30% to 40% of the sampled waterways supported a fish population with mercury concentrations lower than Alternatives 3 and 4, suggesting that these alternatives may be attainable with implementation of a vigorous control program.

Alternatives and Effectiveness of Their Implementation Programs

As described in the TMDL Report (Chapters 3 and 5), the problem with methylmercury in Delta fish can be defined as biotic exposure to methylmercury. Therefore, decreasing biotic exposure to methylmercury is the ultimate goal of the Delta methylmercury TMDL implementation program, with methyl and total mercury source control actions focused on reducing methylmercury levels in ambient Delta waters. The implementation program for Alternative 2

requires source controls only for the Mokelumne/Cosumnes River subarea, thus would not measurably improve conditions in the rest of the Delta. The implementation program for Alternatives 3 through 5 also would focus on source controls but varies regarding (a) where source controls are required, (b) the number of individual sources required to characterize and control their source inputs (methyl and total mercury), and/or (c) the percent reductions required for source inputs.

Progress toward attaining Alternative 5 will be difficult to track. This is because Alternative 5 (0.05 mg/kg in large TL4 fish) is substantially below existing conditions, thus making it difficult to accurately extrapolate from methylmercury in fish (fish tissue objective) to corresponding methylmercury in water (aqueous methylmercury concentration). Such extrapolation for Alternative 5 produces a concentration of 0.028 ng/l methylmercury in water, which is below the current minimum reporting level for laboratory analyses for methylmercury. (Minimum reporting levels are equivalent to the lowest calibration standard for methylmercury, which is currently 0.05 ng/l.) Though aqueous methylmercury concentrations below the minimum reporting level can be detected, they cannot be quantified accurately; thus, Alternative 5 progress will be difficult to quantify and track. In contrast, Alterative 4 (0.24 mg/kg in large TL4 fish) corresponds to 0.066 ng/l methylmercury in water, which is above the minimum reporting level of 0.05 ng/l and thus can be quantified accurately.

Time To Reach Attainment

In general, the lower the fish tissue objective, the greater the source reductions needed to attain the objective and the greater the time expected to reach attainment. Alternative 1 (No Action), by definition, already is attained. Alternative 2 (0.58 mg/kg in large TL4 fish) currently is attained in seven of eight subareas of the Delta and requires an average fish mercury reduction of 43% in the Mokelumne/Cosumnes subarea. In contrast, Alternative 5 (0.05 mg/kg in large TL4 fish) requires fish mercury reductions of 81% to 95% in all subareas of the Delta.

Concentrations of methylmercury in water and fish are expected to decrease as sediment mercury concentrations decline due to total mercury source control actions. Mercury control programs in other states and countries demonstrated significant reductions in fish methylmercury concentrations after source control, but decades later the fish mercury levels were still higher than at uncontaminated, comparison sites.[6] In these mercury control programs, efforts were directed solely at total mercury sources and not at a combination of total mercury and methylmercury sources. A total mercury-focused control program would likely attain Alternative 2 because Alternative 2 requires a comparatively modest reduction in fish mercury levels in only one Delta subarea (Mokelumne/Cosumnes subarea) that is supplied by a relatively small watershed within the Sierra Foothills (compared to the watershed that supplies the Sacramento, Yolo Bypass, San Joaquin subareas; see Figure 6.1 in the TMDL Report).

Targeting methylmercury sources in addition to total mercury sources – by reducing methylmercury discharges or curtailing the methylation process – is expected to more rapidly

[6] See the review of mercury cleanup projects in Chapter 3 of the TMDL Report.

reduce methylmercury concentrations in fish and enable full compliance with Alternatives 3 and 4. Under an implementation plan to reduce methyl and total mercury sources, measurable decreases in fish methylmercury concentrations are expected to occur within approximately five to ten years (two to three fish life cycles) after control actions are implemented and allocations for Delta/Yolo Bypass sources are achieved. Staff expects additional decreases as upstream mercury control programs are developed and implemented to achieve the tributary allocations. However, those decreases would be followed by a long, gradual decline because natural erosion (a slow process) may be needed to wash out legacy mercury in the Delta's tributary channels (see Chapter 4). Thus, actual attainment of Alternatives 3 and 4 could take more than a hundred years, assuming that legacy and new inputs of mercury are significantly reduced. As noted earlier, Alternative 5 may not be attainable because its fish tissue objective is below regional background fish mercury levels observed in the western United States.

3.2.4 Economic Considerations

Cost of Implementation

Depending on the alternative, anticipated costs of implementation include some or all of the following activities: public education, fish tissue monitoring, construction, and maintenance. Alternative 1 involves only public education, while Alternatives 2 through 5 involve all four activities. The costs for education –about $390,000 per year – are relatively small, compared to costs for monitoring, construction, and maintenance (see Appendix C).

Alternative 1 is the least expensive of the alternatives, because Alternative 1 involves only public education. Alternative 2 is the next least expensive because control programs are needed in only one subarea. However, these alternatives do not sufficiently protect people or sensitive wildlife or both.

Alternatives 3 through 5 have essentially the same cost for Phases 1 and 2 of the control program, despite their different fish tissue objectives, because these alternatives require control programs throughout the entire Delta region. (The Alternative 3 objective currently is met in only one subarea of the Delta, and the Alternatives 4 and 5 objectives currently are not met in any subarea.) Costs associated with the methylmercury characterization and control studies may range from about $1.9 million to $6.4 million. Annual costs associated with monitoring activities may range from about $260,000/yr to $300,000/yr. Annual costs associated with total mercury feasibility studies and reduction actions beyond those needed for existing upstream TMDL, Title 27, or NPDES requirements may range from about $4.7 million to $$10.4 million. Annual costs for Phase 2 methylmercury reduction actions may range from about $1.8 million/yr to $10.6 million/yr. Costs will be less if an alternative with higher fish tissue objectives is selected because higher objectives take less time to be attained, thereby reducing long-term monitoring and public outreach and education costs.

Importance of Delta Fishery

The Central Valley Water Board is not legally required to estimate the value of resources as part of the economic considerations. However, because information is available on the value of the fishery and the potential costs of mercury intake, this information is summarized below.

The Delta fishery is a valuable resource. In 1994, the Delta Protection Commission estimated the value of recreational activities, including fishing, for the local economy. Anglers on average spent an estimated $186 million inside the Delta and $206 million outside of the Delta, for sport-fishing activities in the Delta (Goldman *et al.,* 1998). The worth of Delta fish as a food source, particularly for people who eat local fish because of custom or to supplement their diet, has not been calculated but is likely substantial.

OEHHA issued an interim fish consumption advisory for the Delta in 1994 and released a draft advisory for the south Delta in March 2007 that addresses a variety of fish and shellfish species. Recent publicity about consumption advisories for the Delta may decrease angling in the near term, but the use of Delta fish as a food resource could increase as methylmercury levels decline, which would benefit the Delta economy.

Under existing conditions, consumption of Delta fish more than one or two times per month may cause adverse health effects. Mercury is a toxicant that can have lasting effects on neurological development and abilities of persons exposed *in utero* and as children. People exposed to methylmercury through consumption of fish showed deficits in memory, attention, language, fine motor control, and visual-spatial perception that can result in lowered intelligence (NRC, 2000; Trasande *et al.*, 2005).

Lower intelligence causes a decrease in income that persists over the lifetimes of affected persons. To estimate the loss in earnings to children born in one year and exposed to mercury in Delta fish, staff used national survey data of methylmercury concentrations in blood of women of childbearing age (Mahaffey *et al.*, 2004), the income loss calculation of Trasande and colleagues (2005), and United States census data on population and birth rates in six Delta counties in 2000.[7] In year 2000 dollars, the calculated loss in income for all Delta residents entering the workforce in a single year is $156 million,[8] but could range from $41 to 250 million[9] (best-case to worst-case scenario).

[7] U.S. census information is available at: http://quickfacts.census.gov/qfd/states/.

[8] Assumptions: 10% of mothers have methylmercury levels in blood that result in decreased IQ of their children; the decreases in IQ cause certain percentage decrease in expected income over lifetime.

[9] Trasande and colleagues (2005) varied the modeling of the dose-effect relationship, the ratio of methylmercury in maternal to fetal blood, and the lowest methylmercury concentration at which impairments were observed in children. The low estimate assumes the combination of variables that produce the least severe effect. The high estimate is the "worst case" combination of variables. All estimates provide cost due to anthropogenic sources of mercury, based on understanding that about 70% of mercury worldwide comes from anthropogenic sources.

3.2.5 Need for Housing

None of the alternatives restricts the development of housing in the Delta. Additionally, the alternatives are consistent with existing requirements for new urban development, including the municipal separate storm sewer system (MS4[10]) permitting program.

3.2.6 Need to Develop and Use Recycled Water

None of the alternatives restricts the development or use of recycled water. The alternatives, therefore, are consistent with the need to develop and use recycled water.

3.3 Recommended Alternative

Staff recommends the adoption of Alternative 4. Alternative 4 establishes Delta objectives of 0.24 and 0.08 mg/kg methylmercury in wet weight fish muscle tissue, as the average concentration in large fish of trophic levels (TL) 4 and 3, respectively, and 0.03 mg/kg methylmercury, wet weight, in small whole TL2 and 3 fish less than 50 mm total length. The objectives for large fish protect of people and sensitive wildlife (including bald eagle, otter, osprey, and peregrine falcon) that eat large Delta fish, allowing people to safely eat 32 g/day of an even mixture of large TL3 and TL4 fish from the Delta and 12.5 g/day of commercial fish. The objective for small fish protects the California least tern (a federally endangered species) and other wildlife (including herons and rails) that eat small Delta fish or aquatic invertebrates.

Alternative 4 is recommended for the following reasons:

- It fully protects wildlife species, including threatened and endangered species as required by the Endangered Species Act.
- It reasonably protects people who eat Delta fish by safely allowing the consumption of one eight-ounce meal per week of Delta fish, a consumption rate greater than the USEPA default rate used in Alternatives 2 and 3. These objectives are therefore more protective of people who by custom, need, or enjoyment, more frequently eat Delta fish.
- It incorporates local consumption patterns, which show that Delta anglers commonly target fish like salmon (TL3) and striped bass (TL4).
- It is consistent with the fish tissue objectives approved by the State Water Board for San Francisco Bay (SFBRWQCB, 2006; SWRCB, 2007)). Like the Alternative 4 large fish objectives, the methylmercury objective recommended for the Bay is based on protecting people who eat 32 g/day of local fish. Alternative 4 takes into consideration that people, fish-eating wildlife and their prey (e.g., anadromous species) travel between the Delta and San Francisco Bay.

[10] A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances that include roads with drainage systems, municipal streets, alleys, catch basins, curbs, gutters, ditches, manmade channels, or storm drains, owned by a State, city, county, town or other public body. MS4s are designed and used for collecting or conveying storm water and do not include combined sewer systems or parts of a publicly owned treatment works. MS4s discharge to waters of the United States. The Municipal Storm Water Permitting Program regulates storm water discharges from MS4s.

Alternative 1 (No Action; default to the existing narrative toxicity objective) is not recommended because the default numerical criterion (USEPA's CTR criterion of 50 ng/l total mercury in the water column) does not sufficiently protect people and threatened and endangered species that eat Delta fish.

Alternative 2 is not recommended because it does not reflect local consumption patterns or protect all fish-eating wildlife. The Alternative 2 objective of 0.58 mg/kg methylmercury in large TL4 fish is too high to protect bald eagle, osprey, river otter, western grebe, and other sensitive wildlife, as determined by the USFWS risk assessment (2004).

Alternative 3 is not recommended because it does not reflect local consumption patterns. Interviews and surveys show that many local people, particularly Southeast Asians and African Americans, eat more than 17.5 g/day (one 8-ounce meal every two weeks) of freshwater/estuarine fish (CDHS, 2004; Ujihara, 2006; Silver *et al.*, 2007). Therefore, Alternative 3 may not be sufficiently protective of people who eat Delta fish.

Alternative 5 is not recommended because it may not be achievable or reliably measured (in terms of the fish tissue objective's corresponding aqueous methylmercury concentration).

Staff will reevaluate the Delta fish tissue objectives during implementation, as more information is learned about local consumption patterns and more technology is developed. An expanded risk management program should be implemented to protect people with the highest consumption rates of Delta fish even before consumption studies are conducted or methylmercury reductions are achieved.

3.4 Recommended Alternative Applied to the Basin Plan

The recommended alternative (Alternative 4), if adopted into the Basin Plan, would establish:

- Delta-specific numerical fish tissue objectives for methylmercury in large TL3 fish, large TL4 fish, and small TL2/3 fish in the Delta; and
- A monitoring program that specifies fish species and sizes within each target trophic level to facilitate evaluating compliance with the fish tissue objectives.

Chapter 5 in this report describes staff recommendations for a monitoring program. The Central Valley Water Board will be the lead agency in developing or reviewing detailed monitoring plans to evaluate compliance with the proposed fish tissue objectives.

4 PROGRAM OF IMPLEMENTATION

The proposed water quality objectives for methylmercury in Delta fish (fish tissue objectives) are exceeded throughout much of the Delta. Per the Porter-Cologne Water Quality Act Section 13050(j)(3), the proposed Basin Plan amendments must include an implementation program for the TMDL to bring the Delta into compliance with the proposed objectives to protect beneficial uses. Water Code Section 13242 prescribes the contents of an implementation plan, which include: 1) a description of the actions necessary to achieve the water quality objectives; 2) a time schedule; and 3) a monitoring and surveillance program.

This chapter evaluates implementation alternatives and recommends actions and timelines to reduce methyl and total mercury sources. The chapter is divided into five sections:

- Section 4.1 describes methyl and inorganic mercury sources to the Delta, the linkage between methylmercury in water and fish tissue, and the ambient methylmercury reductions needed to achieve the proposed fish tissue objectives.
- Section 4.2 reviews the eleven main considerations for the TMDL implementation program, describes options for addressing each consideration, and formulates three implementation alternatives from different combinations of the options.
- Section 4.3 describes potential regulatory actions and reasonably foreseeable methods of compliance for each alternative. The Central Valley Water Board will not specify particular practices or technologies. Reasonably foreseeable methods of compliance are reviewed so that the potential environmental effects, costs, ability to achieve the proposed fish tissue objectives, and overall feasibility of each alternative can be evaluated.
- Section 4.4 evaluates each alternative for potential environmental effects, costs, ability to attain water quality objectives, feasibility, and consistency with Federal and State regulations and policies. Detailed reviews of existing Federal and State regulations and policies, potential environmental effects, and cost considerations are in Chapters 6 and 7 and Appendix C, respectively.
- Section 4.5 summarizes the recommended implementation alternative.

The proposed Basin Plan amendments (after the Executive Summary) reflect the recommended implementation alternative and include an implementation plan. The implementation plan (a.k.a. the Delta Mercury Control Program) describes the actions necessary to achieve proposed fish tissue objectives, the actions the Central Valley Water Board will take, a time schedule, and a monitoring and surveillance program. The proposed amendments also include recommendations to the State Water Board and other agencies regarding actions for which the Central Valley Water Board does not have direct authority.

The implementation plan must ensure that all applicable water quality criteria will be attained and maintained. The applicable water quality criteria consist of:

1. The proposed Delta-specific methylmercury fish tissue objectives for the protection of wildlife and human health (Chapter 3).
2. The five-year average total mercury load reduction of 110 kg/yr required within 20 years by the San Francisco Bay mercury TMDL implementation program for Central Valley outflows to the Bay (SFBRWQCB, 2006; SWRCB, 2007).

3. The California Toxics Rule total mercury water column criterion for the protection of human health (50 μg/l total recoverable mercury; USEPA, 2000a).

The implementation plan includes actions necessary to reduce methylmercury inputs to the Delta to achieve the fish tissue objectives. The TMDL methylmercury allocations are in the form of methylmercury loads in unfiltered water discharged by point and nonpoint sources to the Delta. The allocations are specifically correlated with and set to attain and maintain the proposed fish tissue objectives. In addition, the proposed implementation actions are designed to reduce the amount of *total* mercury entering the Delta to ensure attainment and maintenance of both the San Francisco Bay TMDL's allocation for total mercury loading and the CTR total recoverable water column criterion. Reducing total mercury inputs will reduce the amount of mercury available for methylation in the Delta's aquatic environment and therefore further reduce methylmercury in ambient Delta waters.

Tables A through G in the proposed Basin Plan amendments list the recommended methylmercury load and waste load allocations for nonpoint and point sources within and tributary inputs to the Delta and Yolo Bypass, as well as interim (Phase 1) methylmercury concentration limits for point sources in the Delta and its tributary watersheds. A detailed description of the allocation calculation methods is in Chapter 8 of the TMDL Report. The strategy that directs how the allocations and Phase 1 limits are determined reflects the recommended implementation alternative summarized in Section 4.5 of this chapter.

4.1 Methyl & Total Mercury Sources & Necessary Reductions

This section provides a brief description of methyl and inorganic mercury sources, the linkage between methylmercury in water and fish tissue, and ambient methylmercury reductions needed to meet the proposed water quality objective. The TMDL Report (Appendix A of this report) contains detailed discussions of each of these topics.

4.1.1 Methyl and Inorganic Mercury Sources

Sources of inorganic mercury in the Delta include tributary inflows from upstream watersheds, atmospheric deposition, urban runoff, dredging activities, and municipal and industrial wastewater. Sources of inorganic mercury in the watersheds upstream of the Delta (a.k.a. "the Delta's tributary watersheds") include gold and mercury mine sites, legacy mercury in the stream channel sediments, geothermal springs, atmospheric deposition, urban runoff, and municipal and industrial wastewater. Figure 4.1 illustrates average annual total mercury loading to the Delta during water years[11] (WY) 1984 through 2003, a period that includes a mix of wet and dry years statistically similar to conditions in the Sacramento Basin over the last 100 years. About 98% of identified total mercury loading to the Delta comes from tributary inputs; within-Delta sources are a very small component of overall loading. The Sacramento Basin

[11] A "water year" (WY) is defined as the period between 1 October and 30 September of the following year; for example, WY2001 is the period between 1 October 2000 and 30 September 2001. Water year types in California are classified according to the natural water production of the major basins. See Appendix E in the TMDL Report for more information about water year classifications.

(Sacramento River + Yolo Bypass) contributed almost 90% of total mercury fluxing through the Delta. Of the watersheds in the Sacramento Basin, the Cache Creek, Feather River, American River and Putah Creek watersheds had both relatively large mercury loadings and high mercury concentrations in suspended sediment, which makes those watersheds likely candidates for total mercury load reduction programs (see Section 7.1.1 in the TMDL Report).

The San Francisco Bay mercury TMDL implementation program assigned the Central Valley a five-year average mercury load allocation of 330 kg/yr or a decrease of 110 kg/yr. This represents about a 28% decrease in the 20-year average annual loading from Delta tributaries and would enable Delta waters to maintain compliance with the CTR criterion of 50 ng/l (see Section 7.4 in the TMDL Report). Staff has estimated that, if the reduction of inorganic mercury in sediment were the only method used to reduce methylmercury in Delta water and fish, mercury loading to the Delta would need to be reduced by much more than 140 kg/yr (see Section 8.2 in the TMDL Report).

Sources of methylmercury in Delta waters include tributary inputs from upstream watersheds and within-Delta sources such as methylmercury production in wetland and open water habitat sediments, municipal and industrial wastewater, agricultural drainage, and urban runoff. Figure 4.2 illustrates the Delta's average annual methylmercury inputs for WY2000 to 2003, a relatively dry period that encompasses the available methylmercury information. Methylmercury inputs from wetland and open water sediments and tributary watersheds accounts for about 30 and 60%, respectively, of methylmercury inputs to the Delta.

As illustrated in Figure 1.1 in Chapter 1 and described in more detail in the TMDL Report, the methylmercury linkage and source analyses divide the Delta into subareas based on the hydrologic characteristics and mixing of the source waters. Figure 4.3 shows the contribution of each source category's estimated methylmercury loading to each subarea. A separate methylmercury allocation system is required for each subarea because of substantially different levels of fish mercury impairment and substantially different types and amounts of methylmercury inputs to each subarea. For example, wetland and open-water habitat within the Yolo Bypass may contribute almost as much methylmercury to the subarea as its tributaries, in contrast to the Sacramento and San Joaquin subareas, which receive substantially more annual methylmercury loading from their tributaries.

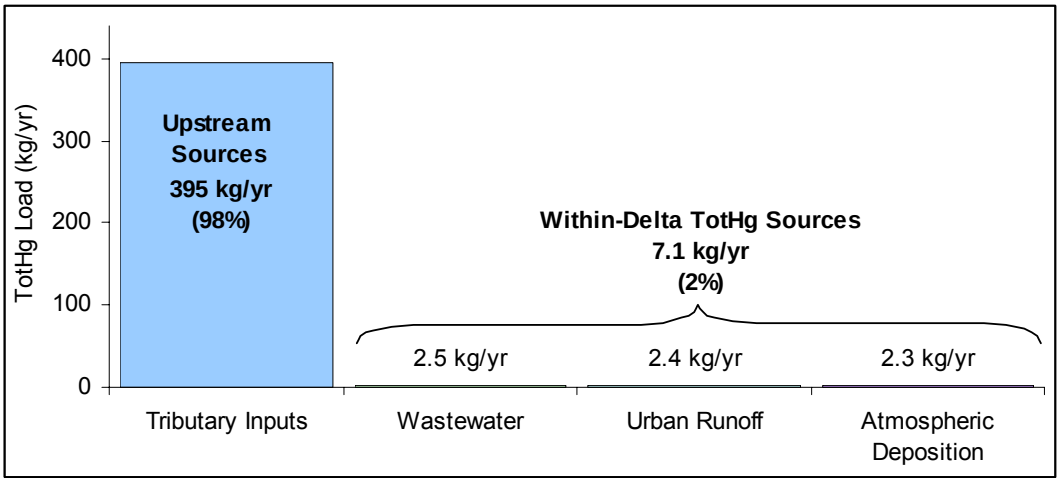

Figure 4.1: Twenty-year Average Annual Total Mercury Inputs to the Delta

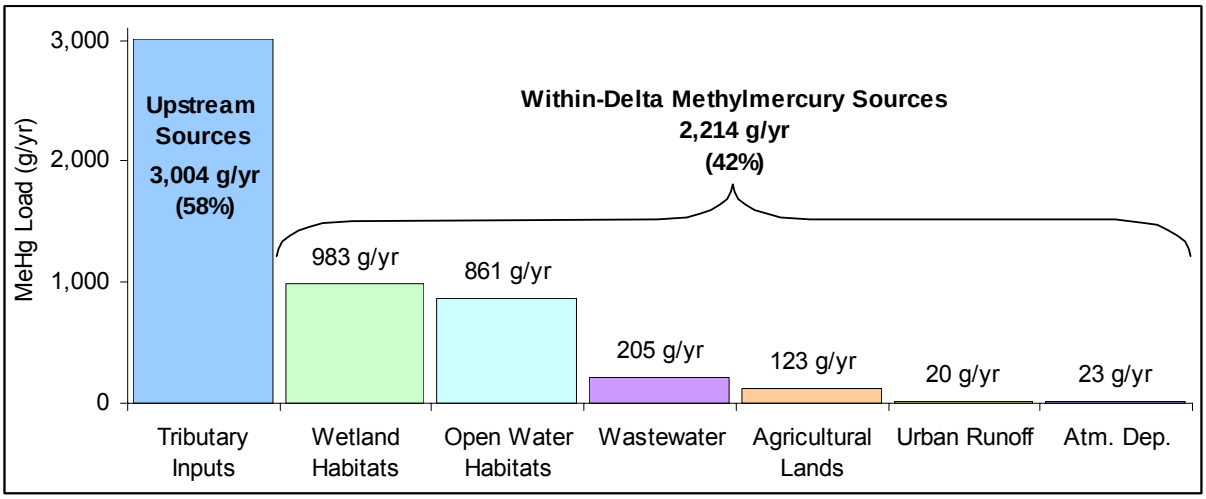

Figure 4.2: Average Annual Methylmercury Inputs to the Delta during WY2000 to 2003

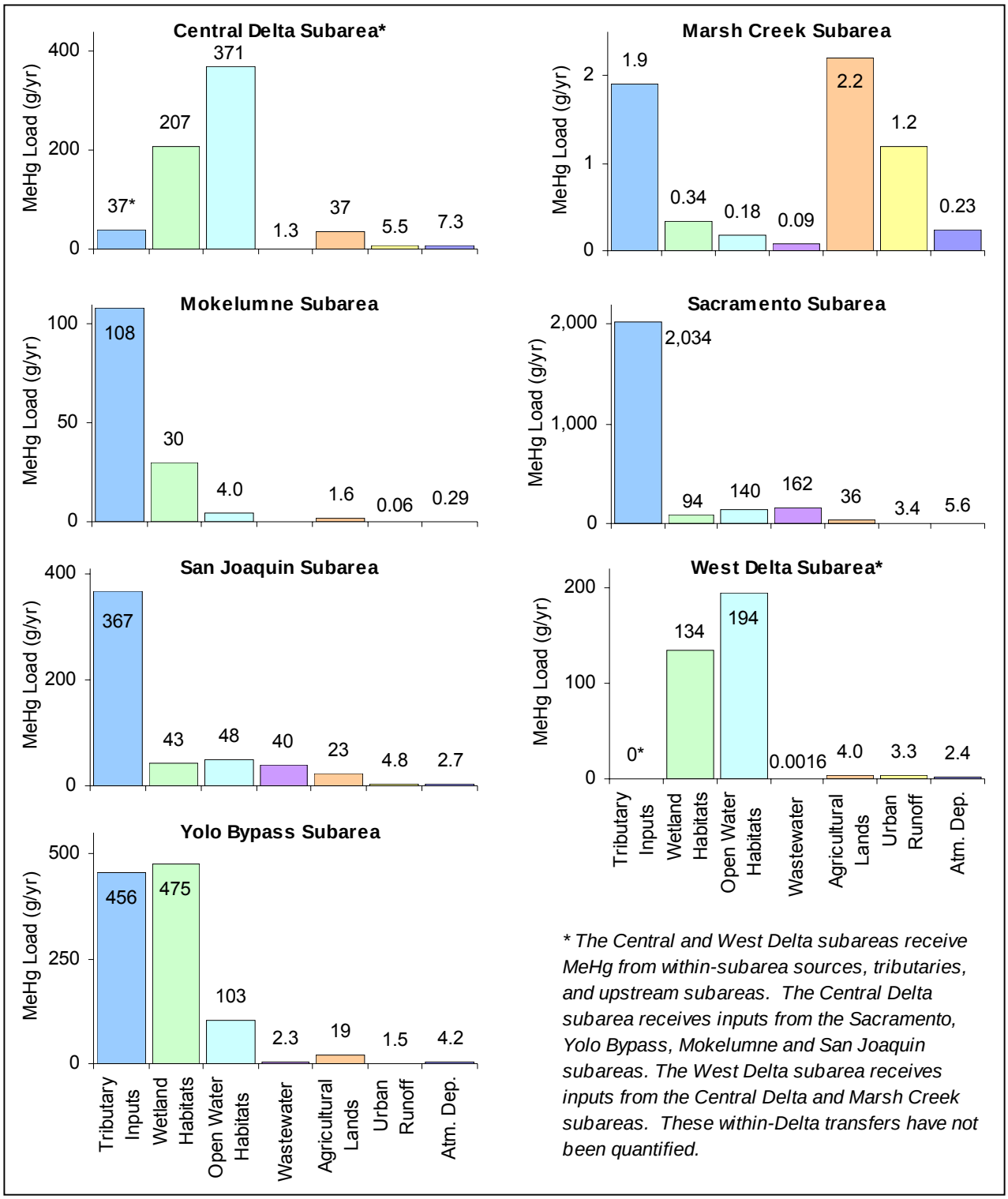

Figure 4.3: Average Annual Methylmercury Inputs to the Delta Subareas during WY2000 to 2003

4.1.2 Linkage Between Methylmercury in Water and Fish Tissue

As described in the previous chapter, staff recommends three fish tissue objectives: 0.24 mg/kg (wet weight) in muscle tissue of large[12] TL4 fish such as bass and catfish; 0.08 mg/kg (wet weight) in muscle tissue of large TL3 fish such as carp and salmon; and 0.03 mg/kg (wet weight) in whole TL2 and 3 fish less than 50 mm in length. The TMDL links methylmercury concentrations in fish to methylmercury concentrations in water to determine an acceptable ambient methylmercury concentration that could then be used to determine methylmercury source reductions necessary to achieve the fish tissue objectives.

Chapter 5 (Linkage Analysis) in the TMDL Report describes in detail the relationships between methylmercury in ambient water and largemouth bass in the Delta. Largemouth bass was selected for the linkage analysis for several reasons:

- Largemouth bass was the only species systematically collected near many of the aqueous methylmercury sampling locations used to develop the TMDL source and linkage analyses.
- Largemouth bass are abundant, are widely distributed throughout the Delta, and stay at one location (Davis *et al.,* 2003), making them useful bioindicators of spatial variation in mercury accumulation in the aquatic food chain.
- Spatial trends in standard 350-mm largemouth bass mercury concentrations across the Delta are representative of spatial trends in mercury levels in other Delta fish species (see Sections 4.7 and 4.8 in the TMDL Report).

As detailed in Section 4.8 of the TMDL Report, it was possible to describe the proposed fish tissue objectives for large TL3 and 4 fish and small TL2/3 fish in terms of the equivalent methylmercury concentration in standard 350-mm largemouth bass. As shown in Figure 4.4:

- A methylmercury concentration of 0.28 mg/kg in 350-mm largemouth bass is equivalent to the fish tissue of 0.24 mg/kg for large TL4 fish.
- A methylmercury concentration of 0.24 mg/kg in 350 mm largemouth bass is equivalent to the fish tissue of 0.08 mg/kg for TL3 fish.
- A methylmercury concentration of 0.42 mg/kg in 350 mm largemouth bass is equivalent to the fish tissue of 0.03 mg/kg for small fish.

Of the three concentrations above, the most protective is the second one: a methylmercury concentration of 0.24 mg/kg in bass predicted to correspond with the TL3 fish tissue objective. This concentration of 0.24 mg/kg in bass protects both human and wildlife consumers of higher and lower trophic level fish in the Delta because the concentration is the lowest of the bass values predicted for the three fish tissue objectives. As a result, a methylmercury concentration of 0.24 mg/kg in 350 mm largemouth bass is proposed as the recommended implementation goal for largemouth bass throughout the rest of this report.

[12] Large fish are defined as 150-500 mm total length or legal catch length if designated by CDFG.

Statistically significant, positive correlations have been found between methylmercury in unfiltered ambient water and methylmercury in largemouth bass. The relationship between methylmercury concentrations in ambient water and standard 350-mm largemouth bass sampled in the Delta is illustrated in Figure 4.5. Substitution of the recommended implementation goal of 0.24 mg/kg methylmercury for largemouth bass into the equation developed by this regression results in a predicted safe ambient water methylmercury concentration of 0.066 ng/l. Staff recommends the incorporation of an explicit margin of safety of about 10% to develop the recommended **implementation goal for unfiltered ambient water of 0.06 ng/l methylmercury**. This goal describes the assimilative capacity of Delta waters in terms of concentration and would be applied as an annual average methylmercury concentration.

It is anticipated that, as the average concentration of methylmercury in ambient water in each Delta subarea decreases to the implementation goal, the fish tissue objectives will be attained. The implementation goal for methylmercury in ambient water is intended to be used to determine the amount of methylmercury source reduction needed to achieve the proposed fish tissue objectives and to track progress in meeting the objectives.

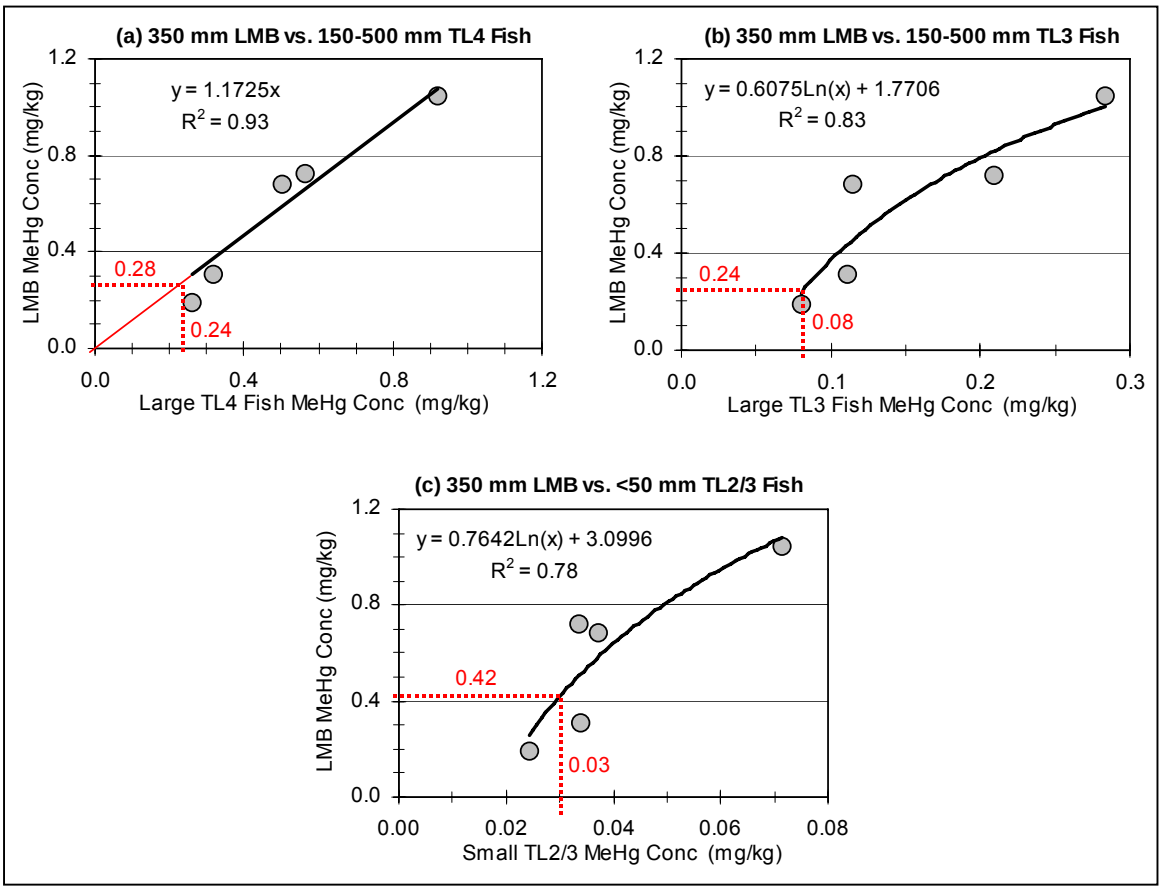

Figure 4.4: Comparison of Methylmercury Concentrations in Standard 350-mm Largemouth Bass (LMB) Caught in September/October 2000 and Composites of Fish Sampled between 1998 and 2001 from (a) 150-500 mm Trophic Level 4 Fish, (b) 150-500 mm Trophic Level 3 Fish, and (c) <50 mm Trophic Level 2/3 Fish

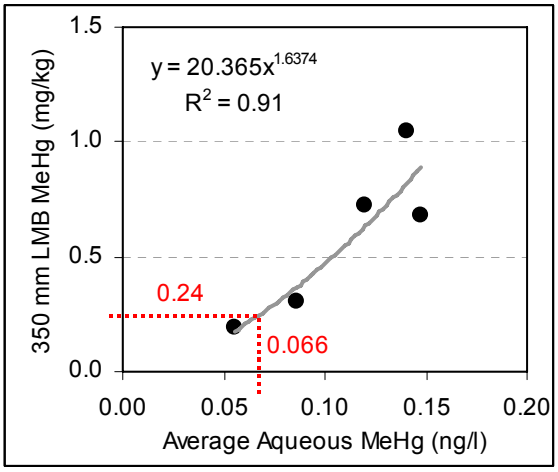

Figure 4.5: Relationship between Methylmercury Levels in Standard 350-mm Largemouth Bass Caught in September/October 2000 and Average Unfiltered Ambient Water Sampled in March-October 2000

4.1.3 Ambient Methylmercury Reductions Needed

Methylmercury source load reductions were calculated in terms of the existing assimilative capacity of the different Delta subareas. The existing average methylmercury concentration of ambient water in each Delta subarea was compared to the implementation goal (Table 4.1) to determine the amount of reduction needed to achieve the proposed fish tissue objectives in each subarea, expressed as a percent of the existing concentration. The percent reductions range from 0 to 78% for different subareas, due to varying levels of impairment in, and different sources to, each subarea. Accordingly, a separate methylmercury allocation system was developed for each Delta subarea. For example, the sum of all within-subarea and tributary inputs to the West Delta subarea should be reduced by 28%, while the sum of all inputs to the Yolo Bypass subarea should be reduced by 78%.

As noted in Table 4.1, the average methylmercury concentration of ambient water in the Central Delta subarea complies with the proposed implementation goal. Also, as show in Table 2.2, five of six trophic level food group safe mercury levels are met in the Central Delta subarea. The average mercury concentration of large TL4 fish in the Central Delta (0.26 mg/kg) is slightly higher than the proposed objective of 0.24 mg/kg for large TL4 fish. Because Central Delta water quality is dominated by inflows from upstream Delta subareas that require ambient methylmercury reductions ranging from 44 to 78% (Table 4.1), Central Delta TL4 fish tissue mercury concentrations are expected to decrease to safe levels when actions are implemented to reduce up-basin aqueous and fish methylmercury levels.

Alternatives are described in the following sections regarding how to allocate reductions to source categories and individual responsible parties for methyl and inorganic mercury inputs to the Delta and its tributary watersheds.

Table 4.1: Percent Reductions Needed to Meet the Proposed Implementation Goal of 0.06 ng/l for Methylmercury in Ambient Water.

	Delta Subareas						
	Central Delta	Marsh Creek	Mokelumne River	Sacramento River	San Joaquin River	West Delta	Yolo Bypass
Average Annual Aqueous MeHg Concentrations (ng/l)	0.060	0.224	0.166	0.108	0.160	0.083	0.273
Percent Reduction Needed to Meet the Proposed MeHg Goal	0%	73%	64%	44%	63%	28%	78%

4.2 Implementation Alternatives

An almost infinite number of implementation alternatives are possible. Therefore, staff identified primary considerations and options to help develop implementation alternatives. This section describes the evaluation criteria, considerations, and options that form the basis of the implementation alternatives that are further evaluated in Sections 4.3 and 4.4.

Evaluation criteria include: likelihood of success; equitability; time needed to observe improvements; the degree to which a given option or alternative can respond or adapt to new data and information; and consistency with State and Federal laws and policies. These criteria are considered throughout the evaluation of the various options and alternatives.

4.2.1 Primary Considerations & Options

Eleven primary considerations specific to this TMDL and implementation program were identified. This section explains these considerations and identifies options for how to address each of them. Each option is preliminarily screened against the evaluation criteria defined in the previous section. If one or more preferred options for addressing a particular consideration are not selected as part of this preliminary screening, then all the options for that particular consideration are carried forward for further evaluation as part of a comprehensive alternative in Section 4.2.2.

Consideration #1: Public Education & Outreach

Recent comprehensive fish monitoring in the Delta found that commonly consumed sport fish (largemouth bass, striped bass, Sacramento pike minnow, channel catfish and white catfish) routinely have tissue concentrations greater than the USEPA criterion of 0.3 mg/kg for protection of human health (Davis *et al.*, 2003) and the proposed fish tissue objectives. Some samples exceed 1.0 mg/kg (wet weight).

Until the fish tissue objectives are attained, the public should continually be informed about safe fish consumption levels. Fish mercury advisories for the Bay-Delta region were released in the 1970s and 1990s for striped bass, sturgeon and shark, and a draft health advisory for a variety of fish and shellfish, including largemouth bass and catfish, was released in March 2007 for the South Delta and San Joaquin River. While a fish advisory will be read by some, it may not

reach parts of the population at risk of consuming locally-caught fish. Sensitive groups of consumers, such as pregnant women and children, may not catch fish themselves and are less likely to receive the advisory information. For example, a recent fish consumption and advisory awareness survey of low-income women at a WIC[13] clinic in Stockton (Silver *et al.*, 2007) indicated that of the 500 survey participants:

- 32% consumed sport fish;
- 29% consumed a combination of commercial and sport fish that exceeded the USFDA/USEPA national advisory limit;[14] and
- Women who demonstrated advisory awareness and knowledge of health-protective behaviors ate less fish overall.

Because fishing is popular in the Delta, a public education program is extremely important. Creel surveys estimate that anglers spend over two million hours per year fishing on the Sacramento River alone (CDFG, 2000-2001; Shilling, 2003). In addition, bass and catfish may be the primary fish kept by anglers throughout much of the Delta (Appendix C in the TMDL Report, Figure C.1). Yet there is low awareness among anglers about fish contamination issues, indicating a need for an expanded and sustained public education and outreach program.

Consideration #1 has two options:

- Option 1(a): Incorporate additional public and education programs.
- Option 1(b): Do not incorporate additional public and education programs.

Central Valley Water Board staff recommends an expanded public education and outreach program (Option 1(a)). Staff recommends that the program coordinate efforts between the State and Regional Water Boards, Office of Environmental Health Hazard Assessment (OEHHA), California Department of Public Health (CDPH), local county health departments, and dischargers to:

- Evaluate new fish contamination information collected in the Delta and determine whether the present fish advisory for striped bass should be extended to other game fish and shellfish throughout the Delta.
- Provide additional outreach and education regarding the risks of consuming fish containing mercury, emphasizing portions of the population at risk, such as pregnant women and children, and instructing people about the sizes and species of fish that may be harmful to consume while highlighting that other less contaminated varieties are an excellent source of protein.
- Conduct regular fish tissue monitoring. Results would be reported to the Central Valley Water Board and to the public.

[13] Special Supplemental Nutrition program for Women, Infants, and Children (WIC).

[14] The USFDA and USEPA recommend that sensitive populations (i.e., women of childbearing age, pregnant and breastfeeding women and children) completely avoid consuming high-mercury fish (e.g., shark, swordfish, king mackerel, and tilefish) and limit consumption of other commercial fish (12 oz/week, or 48.6 g/day) and sport-caught fish (6 oz/week, or 24.3 g/day) (USFDA and USEPA, 2004).

Section 4.3.1 provides a more detailed recommendation for a public education and outreach program. A public education component accompanies all of the implementation alternatives discussed in Section 4.2.2, even the "no action" alternative. If the "no action" alternative were adopted, there would be an even greater need for a long-term public outreach program.

Consideration #2: Address Both Methyl & Total Mercury Sources

A direct, positive correlation has been observed between methylmercury concentrations in water and fish tissue in the Delta and elsewhere (refer to Chapter 5 of the TMDL Report). This indicates that aqueous methylmercury concentrations are a major factor influencing methylmercury bioaccumulation in fish. Therefore, reducing aqueous concentrations should reduce tissue levels and decrease the hazard of consuming fish with elevated mercury concentrations.

The Cache Creek, Bear Creek and Harley Gulch TMDLs and their implementation program were the first to focus source reduction efforts on both methyl and total mercury sources (Cooke and Morris, 2005). Other TMDL efforts in California and the United States have focused only on total mercury source reductions. The amount and kind of inorganic mercury present in the sediment are potentially controllable factors important in net methylmercury production. Therefore there are three options to consider:

- Option 2(a): Incorporate total mercury source controls only.
- Option 2(b): Incorporate both methyl and total mercury source controls.
- Option 2(c): Incorporate methylmercury source controls only.

Millions of kilograms of mercury were released to waterways by historic mining in the Coastal Range and Sierra Nevada. Much remains in Central Valley channels (see Chapter 7 of the TMDL Report) and may be untreatable due to environmental and economic factors, thereby necessitating reliance on natural erosion as a reduction strategy. Natural erosional processes may take centuries to wash mercury from waterways; incorporating methylmercury source controls may reduce the time needed to observe fish tissue improvements from centuries to decades. In addition, if methylmercury sources were not addressed, the mercury impairment likely would become worse as additional wetland restoration, water impoundment, and wastewater treatment plant projects are completed in the Delta and its tributary watersheds. Also, incorporating methylmercury source controls in addition to total mercury source controls may be a more equitable way to address the impairment.

Alternatively, focusing exclusively on methylmercury sources could delay a potentially substantial method of reducing methylmercury production in the Delta. Total mercury loading to areas that methylate mercury should be reduced. Some upstream watersheds that are large sources of mercury-contaminated sediment to the Delta may not themselves be large sources of methylmercury to the Delta. As noted earlier, the Feather River and Cache Creek watersheds, among others, export large volumes of highly contaminated sediment. As described in Chapter 3 of the TMDL Report, the amount of inorganic mercury present in the sediment is a factor important in net methylmercury production. In addition, the TMDL implementation program for the Delta must enable compliance with the San Francisco Bay TMDL's total mercury allocation for the Central Valley (a five-year average total mercury load reduction of

110 kg/yr within 20 years) and the USEPA's CTR criterion of 50 ng/l for total mercury in the water column.

Based on this evaluation, Option 2(b) is the preferred option and will be incorporated into the alternatives analysis in Section 4.2.2. Options 2(a) and 2(c) will receive no further consideration.

Consideration #3: Phased Approach

Consideration must be given to whether enough is known about the methylmercury sources – particularly nonpoint sources – and the control of both point and nonpoint sources such that reasonable and effective allocations can be rationalized. Little published information is available to describe methylmercury levels in discharges from individual sources within the wetlands and agricultural source categories.

However, some local methylmercury information is available. For example, results from 67 municipal WWTPs in the Central Valley (Bosworth *et al.*, 2008) indicate that:

- 18 facilities have average effluent methylmercury levels that approach or are less than analytical method detection limits (e.g., less than 0.03 ng/l) and 28 facilities have effluent methylmercury levels equal to or less than the proposed implementation goal (0.06 ng/l) for ambient water. This indicates that it is possible for WWTPs to have effluent methylmercury concentrations lower than the proposed implementation goal.
- 19 facilities have effluent exceeding 0.2 ng/l methylmercury and 8 facilities have effluent exceeding 1 ng/l methylmercury. This demonstrates that methylmercury in effluent is variable between WWTPs.
- Eleven of the 12 facilities with the highest effluent methylmercury made use of some type of pond system for treatment; none of the facilities with effluent methylmercury less than 0.2 ng/l made use of pond systems. This indicates that the type of treatment process may affect effluent methylmercury levels.
- One WWTP had effluent methylmercury data for 2001-2007; the data illustrate a marked decrease in effluent methylmercury and total mercury concentrations with time. Although the reason for the decline in methylmercury concentration has not been determined, the decline indicates that it is possible for a given WWTP's effluent methylmercury to decrease.

Also, ongoing CalFed studies evaluating wetlands in the Delta, Suisun Bay, Cache Creek watershed, and Mud and Salt Sloughs in the upper San Joaquin River watershed have found a similar pattern: some wetlands discharge higher methylmercury levels than others (see Chapter 3 of the TMDL Report). This pattern in WWTP and wetland discharge methylmercury levels implies that technologies or management practices may be able to reduce methylmercury production from some sources. However, more studies are needed to identify the causes of these differences and to develop effective and economically feasible technologies and management practices to control methylmercury.

Based on uncertainties about the various sources, consideration needs to be given to if, and how quickly, to proceed with the TMDL and implementation program. Therefore, Consideration #3 has the following options:

- Option 3(a): Postpone including an implementation program until ongoing CalFed and other studies are completed and more methylmercury information is available. Other considerations related to methylmercury control (Considerations #4, 5, 7, 8, 9 and 10) still would be relevant; however, their timing would be delayed.
- Option 3(b): Develop an implementation program based on current understanding of factors that contribute to methylmercury in the Delta.
- Option 3(c): Proceed with an implementation program, but allow CalFed and other studies to be completed before dischargers must take actions to achieve their allocations. In Phase 1, incorporate a methylmercury study period. The Phase 1 studies' design and implementation would be guided by allocations adopted by the amendments, along with new results from CalFed studies. In Phase 2, implement methylmercury control actions based on studies completed before and during Phase 1. At the end of Phase 2, the Central Valley Water Board could consider a discharge prohibition if sufficient progress is not made in the methylmercury studies and control actions. During Phases 1 and 2, staff would continue to develop TMDLs to address upstream impairments. In Phase 3, continue maintenance of control actions implemented during Phases 1 and 2. Continued maintenance of control actions, along with natural erosion processes that remove total mercury deposited in creek beds and banks that could not otherwise be remediated, ultimately would lead to achievement of the fish tissue objectives throughout the Delta.

To be consistent with the Clean Water Act and Porter-Cologne Act, a TMDL and implementation program must be prepared because the Delta has unsafe levels of mercury in fish. The consideration, therefore, is whether or how far to proceed at this time based on the best available science regarding impairment causes and potential solutions. It is possible to be consistent with laws and policies if the best available science is at an appropriate level of development to support a particular option. The available science is adequate to establish individual allocations for NPDES-permitted point sources in the Delta, and general (subarea) methylmercury allocations for nonpoint sources, which will guide methylmercury characterization and control studies in a phased TMDL implementation program. However, the current uncertainty about the characterization and control of aqueous methylmercury makes it difficult to implement control actions for all point and nonpoint sources of methylmercury at this time. Therefore, Option 3(c) is the preferred option and will be incorporated into the alternatives analysis in Section 4.2.2.

Consideration #4: Mercury Offset Program

Participation in an offset program may be less costly for some responsible parties than implementing on-site controls to decrease their methylmercury discharges. In addition, an offset program may be required if the proposed Phase 1 methylmercury characterization and control studies indicate that on-site controls are not technically or economically feasible for some responsible parties. With an offset program, responsible parties could implement feasible off-site methylmercury and/or total mercury source controls *in lieu* of making infeasible on-site methylmercury controls. If an effective offset program is not developed, then permitted activities

may need to meet their methylmercury allocations on-site (e.g., at the end of their pipes), which could prove costly while achieving limited environmental benefit.

Several options are available for a methylmercury and total mercury offset program:

- Option 4(a): Do not develop an offset program.
- Option 4(b): Develop an offset program based on currently available information.
- Option 4(c): Allow voluntary pilot offset projects during Phase 1, and develop an offset program to implement during Phase 2. The Phase 2 offset program would be guided by results of the proposed Phase 1 methylmercury characterization and control studies (see Consideration #3) and pilot offset projects.

An offset program enables equitable distribution of responsibility to parties responsible for existing and future sources of methylmercury and total mercury inputs to the Delta. If no technically valid and legally defensible offset program can be developed, and if some individual dischargers have no feasible method to achieve their allocations through on-site controls, then the Central Valley Water Board would need to adjust allocations to require greater reductions from the dischargers for which methylmercury controls are feasible, which would be an inequitable distribution of responsibility.

Option 4(a) is inherently in Alternative 1, the "no action" alternative. Inadequate information is currently available to successfully implement a technically valid and legally defensible offset program; hence, Option 4(b) is not forwarded. Staff recommends that an offset program not be developed until the proposed Phase 1 methylmercury characterization and control studies are completed. Hence, only Option 4(c) is forwarded for more evaluation.

Considerations #5 through #9: Apportioning Source Control Responsibility for Existing Sources

Considerations #5 through #9 address questions critical to apportioning responsibility for studying, controlling, and reducing the variety of existing methyl and total mercury sources:

- Should the implementation plan focus only on existing within-Delta methyl and total mercury sources, or should the implementation also address existing upstream sources?
- Should load reduction efforts focus on methyl and total mercury source categories that contribute the most loading, or should reduction efforts be required of all sources?
- Should load reduction efforts focus on individual methylmercury sources within each source category that have discharges with high methylmercury concentrations or loads or should all individual sources be reduced?
- Should all parties responsible for methylmercury and total mercury discharges be required to complete methylmercury characterization and control studies?

The following paragraphs outline options that address each of these questions.

Consideration #5: Address Upstream Sources or Only Within-Delta Sources. There are numerous point and nonpoint sources of methyl and total mercury just outside the legal Delta boundary in the Delta's tributary watersheds. The Delta implementation plan could include methylmercury allocations and total mercury reduction actions only for within-Delta sources, or it

could expand to include methylmercury allocations and total mercury reduction actions for upstream sources. As a result, there are several options for the geographic scope:

- Option 5(a): Establish methylmercury allocations and total mercury reduction requirements only for within-Delta sources, and address upstream sources that contribute to the tributary inputs in future Basin Plan amendments (e.g., for TMDL programs for the upstream 303(d)-listed waterways).
- Option 5(b): Establish methylmercury allocations and total mercury reduction requirements for within-Delta sources (as in Option 5(a)) and the Yolo Bypass north of the legal Delta boundary (Figure 4.6).
- Option 5(c): Establish methylmercury allocations for all methylmercury sources and total mercury reduction requirements for all total mercury sources, in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams. [15]

It would be more efficient to evaluate and implement controls on both within-Delta and upstream sources as part of the Delta implementation plan, to the extent justified by available information. This is because more than 97% of total mercury loading and about 60% of methylmercury loading comes from tributary inputs. Therefore, achievement of the proposed fish tissue objectives in the Delta will rely on reducing upstream sources as well as within-Delta sources. In addition, there is a need for a control program consistent in addressing NPDES permits within and adjacent to the Delta. For example, applying different regulations to a given MS4 service area split by the legal Delta boundary would be more difficult to implement.

Dams on the major tributaries act as controls on water volumes and total mercury loading from the upper watersheds. Total mercury discharged downstream of dams eventually will be transported to the Delta. Hence, both Options 5(b) and 5(c) would require that the Delta implementation program address total mercury sources downstream of major dams, but not sources upstream of major dams.

Less is known about the transport and subsequent conservation of methylmercury discharged by sources in the tributary watersheds. For example, methylmercury in waters discharged by Shasta Dam about 250 miles upstream of the Delta may undergo several transformations in the waters' week-long journey to the Delta. However, available information indicates that the Yolo Bypass is a substantial source of both total mercury and methylmercury to the Delta. As a result of these factors, only Option 5(b) is carried into the alternatives evaluation.

[15] Major reservoirs and lakes in the Sacramento Basin include Shasta, Whiskeytown, Oroville, Englebright, Camp Far West, Folsom, and Black Butte, Indian Valley, Clear Lake and Lake Berryessa. Major reservoirs and lakes in the San Joaquin Basin include Camanche, New Hogan, New Melones/Tulloch, Don Pedro, McClure, Burns, Bear, Owens, Eastman, Hensley, Millerton and Marsh Creek.

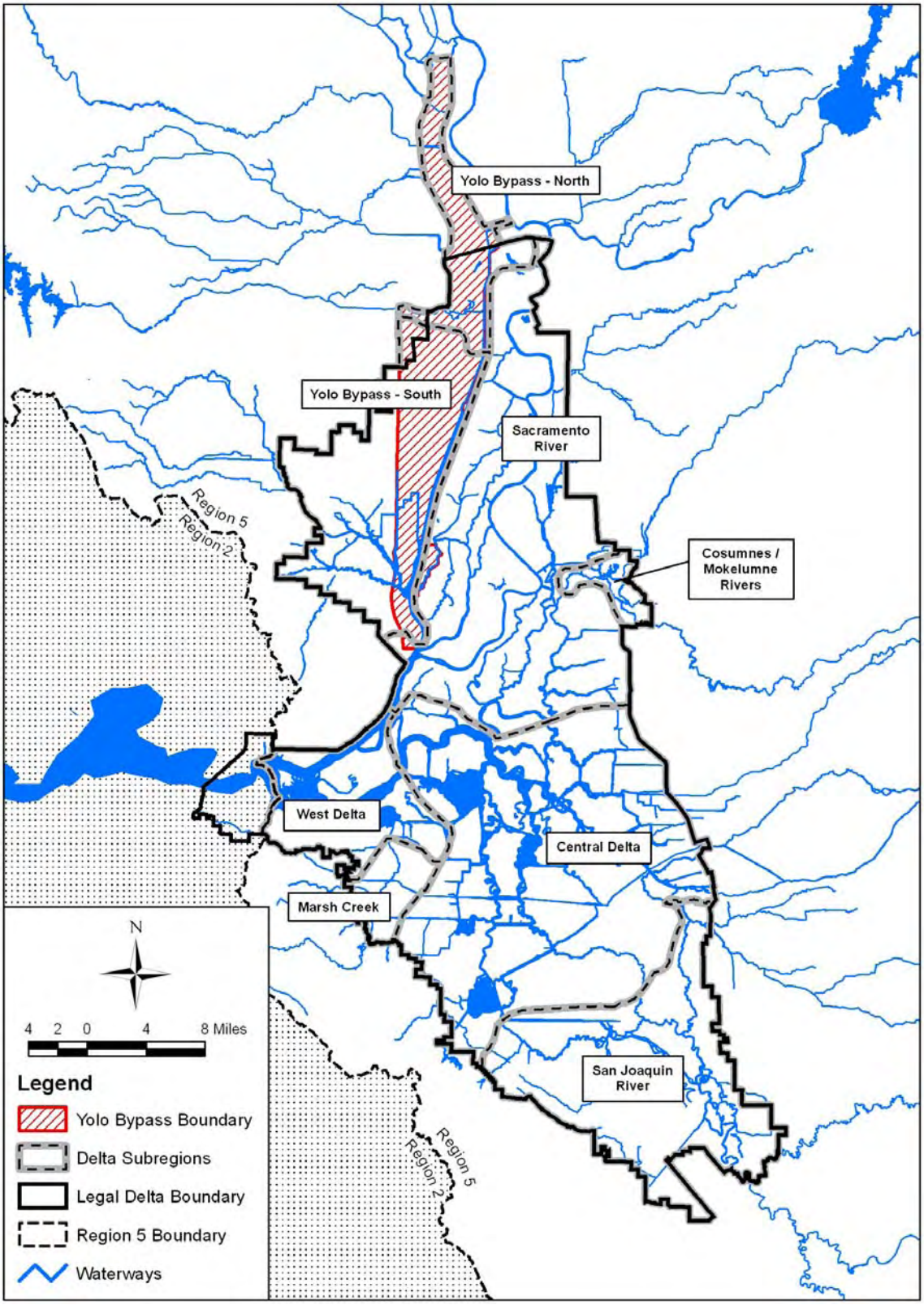

Figure 4.6: Legal Delta Boundary and Yolo Bypass

Consideration #6: Responsibility Apportioned to Total Mercury Source Categories.
About 30% of the methylmercury in the Delta is produced locally in sediment (Figure 4.2). Methylmercury production is a positive linear function of the inorganic mercury content of sediment; inorganic mercury load reductions elsewhere have resulted in decreases in fish tissue methylmercury concentrations (see Chapter 3 in the TMDL Report). Existing inorganic mercury (a.k.a. "total mercury") sources include tributary inputs, municipal and industrial wastewater treatment plants, urban runoff, and air emissions. As noted earlier, the Cache Creek, Feather River, American River and Putah Creek watersheds in the Sacramento Basin export the largest volumes of highly contaminated sediment.

The San Francisco Bay mercury TMDL implementation program assigned the Central Valley a five-year average total mercury load allocation of 330 kg/yr or a decrease of 110 kg/yr. This represents about a 31% decrease in the 20-year average annual loading from Sacramento Basin tributaries and would enable Delta waters to maintain compliance with the CTR criterion of 50 ng/l (see Section 7.4 in the TMDL Report). A 110 kg/yr reduction in total mercury from the Sacramento Basin is a reasonable goal for the first phase of the Delta TMDL implementation program; staff estimated that substantially more than 110 kg/yr would need to be reduced if the method used to reduce methylmercury in Delta water and fish was to reduce only inorganic mercury in sediment (see Section 8.2 in the TMDL Report). Therefore, to be effective, the Delta implementation program must do more than just reduce inorganic mercury levels in sediment.

Two options are possible for apportioning responsibility for total mercury source control to the different categories (i.e. tributary inputs, municipal and industrial wastewater treatment plants, urban runoff, and air emissions) of point and nonpoint sources:

- Option 6(a): Focus total mercury load reduction on nonpoint sources in tributary watersheds exporting the most mercury-contaminated sediment to reduce overall total mercury loading to the Delta by 110 kg/yr. Do not require reductions from other point and nonpoint sources in the Delta and tributary watersheds, except as needed to address new or expanded sources of total mercury (e.g., municipal WWTP and MS4 discharges; see Consideration #11).
- Option 6(b): Reduce all total mercury source categories and individual discharges within each category equally by the amount needed to reduce overall total mercury loading to the Delta by 110 kg/yr.

The San Francisco Bay mercury TMDL implementation program requires load reductions from both point and nonpoint total mercury sources (San Francisco Bay Water Board, 2006). Also, in general, load reduction from point sources (not nonpoint sources) is the most likely to succeed within a timely period. Even so, focusing control efforts on point sources is not an effective strategy for mercury in the Delta, as explained below.

Although Option 6(b) is the most equitable, Option 6(a) is the most effective because almost all total mercury loading to the Delta comes from nonpoint sources in tributary watersheds. Point sources (NPDES WWTPs and MS4s) within the Delta contribute only about 2% of the total mercury load to the Delta, and point sources upstream of the Delta are expected to contribute a similar small percentage. As a result, focusing on NPDES WWTPs and MS4s in and upstream of the Delta/Yolo Bypass would be costly while achieving limited environmental benefit regarding mercury. Instead, focusing on upstream nonpoint sources is more likely to succeed in

measurably reducing Delta fish mercury levels within a reasonable time. Therefore, only Option 6(a) is carried into the alternatives evaluation.

Consideration #7: Responsibility Apportioned to Methylmercury Source Categories. Existing methylmercury sources include: tributary inputs; municipal and industrial wastewater treatment plants; MS4s; agriculture; atmospheric deposition; and methylmercury flux from wetland and open-water sediments. Water management activities such as reservoir releases, salinity control (with the resulting effects on sulfate concentrations), flood conveyance, and dredging influence methylmercury inputs to the Delta resulting from methylmercury production in open-water and wetland sediments (see Chapter 3 in the TMDL Report). Changes in such water management activities also have the potential to increase or decrease ambient methylmercury levels in the Delta.

As noted under Consideration #3, staff proposes that only Option 3(c) be forwarded to the alternatives analysis. In part, Option 3(c) states:

> "Proceed with an implementation program, but allow CalFed and other studies to be completed before dischargers must take actions to achieve their allocations. In Phase 1, incorporate a methylmercury study period. The Phase 1 studies' design and implementation would be guided by allocations adopted by this amendment, along with new results from CalFed studies. In Phase 2, implement methylmercury control actions based on study results completed before and during Phase 1."

Therefore, allocations proposed in this report should guide methylmercury characterization and control studies in Phase 1; important factors guiding study design should include the type (methylmercury source categories) and amount (magnitude of source reductions) of the allocations. Compliance with the allocations and associated control actions would not be required until Phase 2, after the study results are evaluated and the allocations are adjusted as needed.

Designating methylmercury allocations is a critical component of the implementation program because it identifies the entities that could be responsible for ensuring that allocations are achieved, either through on-site actions or offset projects. In addition, allocations are a legally required component of a TMDL program. An allocation strategy can address feasibility, institutional constraints, cost-effectiveness, and equity. However, any allocation strategy ultimately must enable water quality objectives to be met.

There are several challenges in developing equitable and effective methylmercury allocations:

- Several source categories (e.g., agriculture, wetlands, and water management agencies) until recently have not been regulated by the Central Valley Water Board.
- The Central Valley Water Board has limited regulatory authority to require control of methylmercury impacts caused by atmospheric deposition and water management activities.
- TMDL regulations and guidance focus on controlling discharges of pollutants to address water quality impairments, and do not clearly address how to handle other contributing factors such as water management activities.

Using a TMDL to address methylmercury inputs from previously unregulated sources (agriculture, wetlands and water management activities) is consistent with laws and regulations as long as the implementation actions are within Central Valley Water Board jurisdiction (refer to Chapter 6). In fact, the Central Valley Water Board Watershed Policy (page IV-21.00 of the Basin Plan) supports focusing implementation actions on the most important problems and those sources contributing most significantly to those problems. For example, the dissolved oxygen TMDL for the Stockton Deep Water Ship Channel recently approved by the California Office of Administrative Law allocates equal responsibility to entities responsible for flow, channel geometry, and sources of oxygen-demanding substances for excesses of net oxygen demand and requires responsible entities to engage in studies of the causes (California Code of Regulations §3949.2). Therefore, the resulting consideration is how to account for the impacts of wetlands, agriculture, water management activities and atmospheric deposition in the designation of methylmercury allocations.

A variety of options are possible for designating methylmercury allocations by source category:

- Option 7(a): Designate methylmercury allocations only for source categories that have been traditionally regulated (e.g., point discharges from municipal and industrial wastewater treatment plants and MS4s). Do not develop allocations for wetland and agricultural methylmercury inputs, water management activities and atmospheric deposition. Methylmercury flux from sediment in open water and wetland habitats in the Delta – the largest within-Delta source of methylmercury (about 30%) – would be expected to gradually decline as total mercury control actions completed in the tributary watersheds and natural erosional processes result in reductions in sediment mercury concentrations in the Delta waterways. However, such declines would take place very slowly (hundreds of years to geologic time scale, depending on the extensiveness of mine remediation efforts and natural erosional processes). Even without methylmercury allocations for nonpoint sources, extensive characterization studies of nonpoint methylmercury sources still would need to take place to identify the specific wetlands and other nonpoint discharges that produce the most methylmercury in and upstream of the Delta and the specific sources of inorganic mercury that supply those methylmercury sources, leading to an expansion of the inorganic mercury control efforts described under Considerations #6 and #11. In addition, ambient methylmercury declines resulting from inorganic mercury reduction could be countered by:
    - Increases in wetland acreage and associated increases in methylmercury production resulting from proposed wetland restoration projects in the Delta, Yolo Bypass and tributary watersheds;
    - Changes in current water management activities (e.g., new flood conveyance or water storage projects, or changes in salinity control activities); and/or
    - Increases in atmospheric deposition.
- Option 7(b): Develop methylmercury allocations for all source categories. Incorporate reductions needed to achieve the fish tissue objectives in each Delta subarea into the allocations for the source categories that contribute the most methylmercury to the Delta (methylmercury generated in open water and wetland habitats). Set allocations for other source categories at existing methylmercury levels discharged by those sources. This option relies upon issuance of WDRs, utilization of 401-certification authority over future watershed projects, coordination with State Water Board authority over water rights, and

development of inter-agency agreements to address methylmercury resulting from water management activities and wetlands. This option also requires some combination of in situ methylmercury management practices and upstream total mercury source reduction to reduce methylmercury flux from Delta open-water and wetland habitats.

- Option 7(c): Develop methylmercury allocations for all source categories. Set allocations for the water management and atmospheric deposition source categories at existing levels, except in the Yolo Bypass and Marsh Creek subareas, where open-water methylmercury production needs to be reduced to achieve the proposed fish tissue objectives. The Central Valley Water Board would recommend that the State Water Board and other State and Federal agencies conduct studies to determine baseline conditions and potential management practices for nonpoint sources of methylmercury. New water management projects and projects that could result in additional atmospheric deposition of methylmercury completed during Phase 1 would be addressed by Consideration #10 for new sources of methylmercury. Incorporate reductions needed to achieve the proposed fish tissue objectives in each Delta subarea into the methylmercury allocations for the other source categories (e.g., discharges from municipal and industrial wastewater treatment plants, MS4s, agricultural lands and wetlands). This option relies upon issuance of NPDES permits and WDRs, utilization of 401-certification authority over future watershed projects, coordination with State Water Board authority over water rights, and development of inter-agency agreements. Methylmercury flux from open-water habitats is expected to decline gradually as total mercury control actions completed in the tributary watersheds and natural erosion reduces the mercury concentration of sediment deposited in the Delta waterways.
- Option 7(d): Develop methylmercury allocations for all source categories. Incorporate reductions needed to achieve the water quality objectives in each Delta subarea in all allocations. This option relies upon issuance of NPDES permits and WDRs, utilization of 401-certification authority over future watershed projects, coordination with SWRCB authority over water rights, and development of inter-agency agreements.
- Option 7(e): Develop methylmercury allocations for all methylmercury source categories based on an effluent limit equal to the proposed implementation goal (0.06 ng/l).

Nonpoint source categories comprise a much larger portion of methylmercury to some subareas of the Delta and Yolo Bypass than point source categories; as a result, Options 7(b) through 7(d) are more equitable than Option 7(a). Also, allocations for identified sources are a legally required component of a TMDL program; the Delta methylmercury TMDL would need to incorporate a margin of safety greater than 40% to address wetlands, agricultural areas and water management activities if they were not given specific allocations. In addition, Option 7(a) likely would not achieve fish tissue objectives for several generations, if ever, if wetland acreages increase or water management activities change without any consideration for potential impacts from associated methylmercury production.

However, each source category is comprised of a myriad of smaller individual sources, each with its own intrinsic value and financial constraints; hence, Option 7(b) could place disproportionate burden on individual entities within each nonpoint source category (e.g., wetland landowners and water management agencies). As noted earlier, allocation strategies must balance equitability, time to implement improvements, likelihood of success, and flexibility.

As with the total mercury source categories discussed under Consideration #6, it would be most equitable to establish allocations that include reductions for all methylmercury point and nonpoint source categories in the Delta and Yolo Bypass by equal percentages required to achieve the proposed fish tissue objectives in every Delta subarea.[16] The methylmercury source analysis described in the TMDL Report indicates that reducing or eliminating any one source is unlikely to control ambient methylmercury concentrations in the Delta. However, little is known about methylmercury control methods for either point or nonpoint sources or which methylmercury sources would be the most feasible to control.

As a result, the decision to establish allocations that incorporate reductions for some sources while allowing others to increase would be based solely on a subjective evaluation of which projects are more valuable to the citizens of California. Based on these factors, Options 7(a) and (b) are not carried into the alternatives evaluation.

Option 7(d) is more equitable than Option 7(c) because it directly accounts for methylmercury inputs from open water habitats and atmospheric deposition on existing conditions in the Delta, rather than placing the burden entirely on other sources. Option 7(d) also involves a greater flexibility and likelihood of success because more causes and potential solutions are considered. However, because of the complexity of open water and atmospheric methylmercury sources, and because the Central Valley Water Board has limited jurisdiction over these sources, there is great uncertainty about whether these sources can be addressed in a timely manner. Based on these contrasting issues, only Option 7(c) will be carried into the alternatives evaluation.

For equitability and cost effectiveness, Option 7(e) will not be carried into the alternatives evaluation *at this time.* Because dilution sources and methylmercury loss factors vary across the Delta, some Delta subareas are less impaired by methylmercury than others. As a result, requiring all sources to be reduced to the implementation goal may be overly onerous. However, this option may be re-considered at the end of Phase 1 based on the results of the proposed methylmercury control studies.

Consideration #8: Responsibility Apportioned to Individual Sources within Each Methylmercury Source Category. As described under Consideration #3, staff recommends that the implementation program incorporate a phased approach; methylmercury characterization and control studies would take place during Phase 1, and methylmercury control actions would take place during Phase 2. Although methylmercury control actions would not be required during Phase 1, methylmercury source allocations still must be designated for

[16] As described in Section 4.2.1, different amounts of source reduction are needed in the different Delta subareas because the existing fish tissue methylmercury levels in each Delta subarea are different. The average methylmercury concentrations in ambient water in the Central Delta already achieve the proposed implementation goal for methylmercury in ambient water (0.06 ng/l), while the peripheral subareas require percent reductions ranging from 28 to 78% to achieve the proposed implementation goal for methylmercury in ambient water and proposed fish tissue objectives (see Chapter 8 in the TMDL Report). Although different amounts of source reduction will be needed for each Delta subarea, the implementation program must have a consistent strategy for addressing the different source categories and individual discharges that contribute methylmercury to each Delta subarea.

individual sources to (a) guide the development of the characterization and control studies and (b) comply with Clean Water Act requirements.

Results from methylmercury monitoring by NPDES facilities in the Central Valley indicate that many facilities have average effluent methylmercury levels that approach or are less than the proposed implementation goal for unfiltered methylmercury in ambient Delta waters (0.06 ng/l), while other facilities have much higher methylmercury levels (see Chapter 6 and Appendix G in the TMDL Report and Bosworth *et al.*, 2008). This indicates that some discharges, though they contribute methylmercury loading to the Delta, may act as dilution because of their low methylmercury concentrations. Ongoing CalFed studies evaluating aqueous and fish methylmercury levels in wetlands in the Delta region have found a similar pattern: some wetlands have higher methylmercury levels than others (see Chapter 3 in the TMDL Report). It is expected that technologies or management practices able to reduce methylmercury production from some sources will be developed based on the understanding of such differences.

Staff recommends that individual sources that discharge to Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives and have discharge methylmercury concentrations above the proposed implementation goal (or above their intake water methylmercury) be assigned methylmercury allocations that incorporate reductions needed to accomplish the proposed goal in Delta waters. Because of the amount of their discharge relative to the receiving water and other factors, these sources may or may not individually result in a measurable increase in the methylmercury concentration of downstream Delta waters. However, the sum of such source loads results in measurable impairment in Delta fish.

Staff recommends that individual sources with discharges that act as dilution (e.g., have average discharge methylmercury concentrations below the proposed goal for methylmercury in ambient water of 0.06 ng/l or below their source water methylmercury concentration) be assigned allocations based on their existing discharge methylmercury concentrations. Conceptually, there is no need to limit the loading from sources that act as dilution, given the overall extent of impairment throughout the Delta. However, to enable the calculation of allocations required for other sources, load-based allocations must be calculated even for those sources that act as dilution (see Chapter 8 in the TMDL Report). As a result, staff recommends that sources that act as dilution have allocations based on discharge volumes that incorporate expected growth (refer to Consideration #10 and Section 4.3.2).

Discharge volumes from individual sources that do not act as dilution could be allowed to increase so long as their discharge loads do not increase above their allocated loads. For example, an increase in volume would necessitate a decrease in methylmercury concentration to maintain the load allocation so that the increased volume does not cause an increase in receiving water methylmercury concentration.[17]

[17] If an offset program is developed, another option could be for such a WWTP to compensate for increases in its load by completing offset projects upstream.

Two allocation options are available for individual sources that do not act as dilution and discharge to Delta subareas that exceed the proposed fish tissue objectives:

- Option 8(a): Designate allocations for relatively small methylmercury sources (e.g., WWTPs that discharge less than 1 mgd and MS4s that service less than 100,000 people[18]), and for larger sources that discharge to subareas of the Delta/Yolo Bypass in which the proposed fish tissue objectives are achieved, equal to their existing loads. Designate allocations for larger methylmercury sources that include load reductions necessary to achieve the fish tissue objectives in each Delta subarea.
- Option 8(b): Designate allocations that include methylmercury load reductions for all individual sources, rather than requiring only the larger sources to reduce their methylmercury discharges.

Both of these options are forwarded to the alternatives analysis.

Consideration #9: Responsibility for Studies. Source characterization and control studies require substantial effort and funds. Staff recommends that responsible parties conduct collaborative studies to save costs and increase the likelihood of useful results. In addition, if characterization study results indicate that a particular discharge type does not act as a methylmercury source,[19] staff recommends that the responsible parties for those discharges not be required to conduct control studies even if they discharge to a subarea of the Delta that requires methylmercury load reductions to achieve the fish tissue objectives. Options include:

- Option 9(a): Responsible parties for individual sources that meet the following criteria would be responsible for conducting studies:
  - Discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives;
  - Have relatively large volumes of discharge compared to other individual sources in each respective source category (e.g., MS4s that serve municipalities with greater than 100,000 people and WWTPs that discharge greater than 1 mgd); and
  - Have discharge methylmercury concentrations that exceed the proposed implementation goal (or exceed intake water methylmercury concentrations).
- The Central Valley Water Board's Irrigated Land Regulatory Program would implement the Delta methylmercury TMDL implementation program for irrigated agriculture and

[18] MS4 permits were issued in two phases. Under "Phase I", which started in 1990, the Regional Water Boards have adopted NPDES storm water permits for medium (serving between 100,000 and 250,000 people) and large (serving greater than 250,000 people) municipalities. Most of these permits are issued to a group of co-permittees encompassing an entire metropolitan area. These permits are reissued as the permits expire. As part of Phase II, the State Water Board adopted a General Permit for the discharge of storm water from small MS4s (WQ Order No. 2003-0005-DWQ, NPDES No. CAS000004) to provide permit coverage for smaller municipalities, including non-traditional small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes. Phases I and II of the Municipal Storm Water Permitting Program should not to be confused with Phases 1 and 2 of the Delta mercury program discussed in this document.

[19] For example, if the agricultural characterization studies indicate that discharges from agricultural areas with particular crop types or management practices do not act as a source of methylmercury to the Delta/Yolo Bypass (i.e., the return water has methylmercury loads equal to or less than the irrigation water methylmercury loads), the responsible parties for those areas would not be required to conduct further control studies.

managed wetlands; not every landowner would necessarily be responsible for conducting a study. Both large and small point and nonpoint dischargers in the Delta/Yolo Bypass may be required to implement feasible control technologies and management practices during Phase 2. Upstream dischargers may be required to implement feasible controls as part of Phase 2 of the Delta Mercury Control program or as part of upstream TMDL implementation programs.

- Option 9(b): Responsible parties for individual sources that meet the following criteria would be responsible for conducting studies:
    - Discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives or discharge to tributary waterways downstream of major dams that drain to those subareas;
    - Have direct evidence of methylmercury loading to surface water;
    - Have relatively large volumes of discharge compared to other individual sources in each respective source category (e.g., MS4s that serve municipalities with greater than 100,000 people and WWTPs that discharge greater than 1 mgd); and
    - Have discharge methylmercury concentrations that exceed the proposed implementation goal (or exceed intake water methylmercury concentrations), i.e., do not act as dilution.

- Currently no published, direct evidence of methylmercury loading from wetlands and agricultural areas in the tributary watersheds is available; the TMDL Report load estimates for these sources within the Delta are based on Delta-specific data. Hence, only landowner/management groups for agricultural and wetland areas in the Delta and Yolo Bypass would be responsible for conducting studies. The Central Valley Water Board's Irrigated Land Regulatory Program would implement the Delta methylmercury TMDL implementation program for irrigated agriculture and managed wetlands; not every landowner would necessarily be responsible for conducting a study. The Central Valley Water Board would determine if agricultural and wetland areas in the tributary watersheds contribute methylmercury loading to surface water. If found, then the Irrigated Land Regulatory Program would incorporate methylmercury monitoring for agricultural and wetland areas in the tributary watersheds and implement control studies. The State Water Board would be requested to fund or conduct studies to develop and evaluate management practices to reduce methylmercury discharges from nonpoint sources in the upstream watersheds. As described in Chapter 6 of the TMDL Report, direct evidence of methylmercury loading from urban areas and WWTPs in the tributary watersheds is available. Hence, MS4s that serve more than 100,000 people, and WWTPs that discharge greater than 1 mgd to the Delta or its tributaries and have effluent methylmercury concentrations greater than the proposed implementation goal for methylmercury in ambient water, would be responsible for conducting Phase 1 studies. Both large and small dischargers in the Delta/Yolo Bypass may be required to implement feasible control technologies and management practices during Phase 2. Upstream dischargers may be required to implement feasible controls as part of Phase 2 or as part of upstream TMDL implementation programs.
- Option 9(c): Responsible parties for all individual methylmercury sources – regardless of size – in the Delta and its tributary watersheds for which direct evidence of methylmercury loading is available would be responsible for conducting the studies.

- Option 9(d): Responsible parties for all individual methylmercury sources in the Delta and its tributary watersheds would be responsible for conducting the studies.

All methylmercury sources in the Delta with discharge concentrations above the proposed implementation goal for methylmercury in ambient water (or intake water methylmercury concentrations), regardless of size, contribute to the mercury impairment in the Delta. In addition, upstream sources contribute to upstream impairments as well as the Delta impairment; many major and minor tributaries are 303(d)-listed as mercury impaired and may contribute to Delta impairment. Upstream sources would eventually be required to conduct methylmercury control studies; hence, it would be more efficient and cost effective to coordinate studies between Delta and upstream sources. As a result, Options 9(a) and (b) are forwarded to the alternatives analysis.

It would be most equitable if responsible parties for all such individual sources were responsible for the studies. However, many small dischargers are more limited by financial and staffing constraints and therefore are unlikely to fund or coordinate methylmercury studies in a timely manner. As a result, Option 9(c) is not forwarded. It would not be equitable to require responsible parties for individual sources for which no direct evidence of methylmercury loading is available to be responsible for conducting studies; hence, Option 9(d) is not forwarded.

Considerations #10 & #11: New Sources of Methyl & Total Mercury

New methylmercury and total mercury sources are those that increase methylmercury or total mercury loading to the Delta/Yolo Bypass after the amendment adoption date. Anticipated population growth and regional water management changes could result in increases in methylmercury and total mercury loading. The California Department of Finance predicts that populations in the Delta/Yolo Bypass counties[20] will increase 76% to 213% by 2050, with an average increase of about 120% (CDOF, 2007). Increasing populations will result in increasing total mercury and methylmercury discharges from municipal wastewater treatment plants (WWTPs) and urban runoff.[21]

Considerations #10 and #11 address new and expanded sources of methylmercury and total mercury, respectively, based on information available in 2004 and 2005. New methyl and total mercury sources include both within-Delta sources and sources in the tributary watersheds that begin discharge after Basin Plan amendment adoption.

[20] The CDOF predicts the following population increases by 2050: Contra Costa County - 89%, Sacramento County - 76%, San Joaquin County - 213%, Solano County - 105%, and Yolo County - 93% (CDOF, 2007).

[21] Urbanization increases (a) volume and discharge velocity of runoff because of the increase in impervious surfaces, and (b) pollutant loading because impervious surfaces neither absorb water nor remove pollutants and urban development tends to create new anthropogenic mercury pollution sources

Consideration #10: New Sources of Methylmercury. New methylmercury sources could include, but are not limited to, wetland restoration projects; new or enlarged reservoirs; runoff from new urban development; changes in water and levee management practices; and new, expanded or modified NPDES-permitted facility discharges.

To prevent the mercury impairment from worsening in the Delta, staff recommends that the Delta TMDL implementation program ensure that methylmercury loads resulting from cumulative inputs of new or expanded projects, or changes to existing projects, be minimized. However, control methods have not yet been evaluated; therefore, such a recommendation could not be immediately implemented. By the end of Phase 1, the Central Valley Water Board will have reviewed the results from the proposed methylmercury characterization and control studies and considered effective methylmercury options and the appropriateness of methylmercury offset projects (see Considerations #3 and 4). As a result, the following four options were developed:

- Option 10(a): Develop methylmercury allocations for existing sources that would require additional reductions so that assimilative capacity can be reserved for new sources. Once that reserve is exhausted, new sources with discharge methylmercury concentrations greater than the implementation goal for methylmercury in ambient water (or their intake water methylmercury concentrations) would be required to submit a methylmercury control plan to the Central Valley Water Board to address that portion of their loading that could contribute to exceedances of the fish tissue objectives.
- Option 10(b): New sources with discharge methylmercury concentrations less than the implementation goal for methylmercury in ambient water (or agricultural, wetland, or other water management projects with outflow methylmercury concentrations equal to or less than intake water methylmercury concentrations) may be able to contribute methylmercury loading to the Delta without causing ambient methylmercury concentrations to exceed the proposed implementation goal. New wetland, agricultural and water management projects with outflow methylmercury concentrations greater than their intake water methylmercury concentrations, and other new sources (e.g., new or expanded NPDES-permitted facility or MS4 discharges) with discharge methylmercury concentrations greater than the implementation goal in the Delta or its tributary watersheds downstream of major dams, could cause ambient methylmercury levels in the Delta to exceed the implementation goal.[22] Such new sources that begin discharging during Phase 1 of the proposed TMDL implementation program would be considered in compliance with the Delta methylmercury TMDL implementation program if their responsible parties participate in the methylmercury characterization and control studies described under Consideration #3 and submit a methylmercury control plan to the Central Valley Water Board at the completion of the studies that indicates how their projects will minimize their methylmercury discharges. Responsible parties also could participate on a voluntary

[22] Because of the concentration and amount of their discharge relative to the receiving water and other factors, existing individual sources (e.g., a single facility outfall, MS4 outfall or wetland) may or may not result in a measurable increase in the methylmercury concentration of downstream Delta waters. However, the sum of such source results in measurable increases in fish mercury levels. The same is expected to be true of new methylmercury sources.

basis in approved pilot offset projects. Depending on the magnitude and discharge characteristics of new sources that begin during Phases 1 and 2, the allocations adopted for this amendment may need to be adjusted by another Basin Plan amendment at the beginning of or later in Phase 2 to accommodate any resulting increase in ambient methylmercury levels in the Delta.

- Option 10(c): In addition to minimizing new methylmercury inputs as described in Option 10(b), develop methylmercury allocations for existing sources that would require additional reductions so that assimilative capacity can be reserved for new sources. Once that reserve is exhausted, new sources with discharge methylmercury concentrations greater than the implementation goal (or their intake water methylmercury levels) would be required to submit a methylmercury control plan to the Central Valley Water Board to address that portion of their loading that could contribute to exceedances of the fish tissue objectives.
- Option 10(d): Delay the completion of new projects until the end of Phase 1, after the proposed characterization and control studies are completed, so that new projects can incorporate methylmercury controls.

Options 10(a) through 10(c) should incorporate Phase 1 methylmercury concentration limits set at existing (at the time of TMDL development) discharge methylmercury concentrations for large point sources that are expected to increase due to population growth. This would minimize the potential to worsen the methylmercury impairment in the Delta/Yolo Bypass while control studies and actions are implemented. The Phase 1 limits should be maintained during Phase 1 and in Phase 2 until point source discharges achieve their methylmercury waste load allocations or other effluent limits established for Phase 2.

As noted in Consideration #3, available information indicates that technologies or management practices may be able to reduce methylmercury discharges from some sources. However, more studies are needed. At this time it is not known which types of existing or future nonpoint sources would be the most feasible to control. As a result, the decision to reduce loads from some existing source categories while allowing new projects to increase methylmercury loading (Option 10(a)) would be based solely on a subjective evaluation of which projects are more valuable to the citizens of California. However, to delay new projects until the end of Phase 1 could prove costly, and could result in an unnecessary delay for projects that do not contribute to exceedances of the proposed fish tissue objectives and otherwise provide substantial benefits to the citizens and ecosystems of California (Option 10(d)).

Option 10(b) would require new sources to minimize their inputs, which is more equitable than Options 10(a) and 10(d), but could result in exceedances of the fish tissue objectives. Option 10(c) would require both minimizing new methylmercury inputs and reducing existing sources by an additional amount so that assimilative capacity can be reserved for new sources unable to maintain no net increase in methylmercury loading to the Delta and Yolo Bypass. This option, in combination with the explicit margin of safety incorporated in the aqueous implementation goal, is expected to have no measurable difference on the implementation strategies for existing sources required to make methylmercury reductions (compared to Option 10(b)) and is the least likely of the different options to result in exceedances of the proposed fish tissue objectives. Therefore, only Option 10(c) is forwarded to the alternatives analysis.

The Central Valley Water Board will evaluate additional options for new projects implemented during and after Phase 1 of the program, once Board members have assessed the results of the proposed Phase 1 characterization and control studies.

Consideration #11: New Sources of Total Mercury. Any new total mercury input to the Delta and its tributary watersheds has the potential to be methylated in the Delta, its tributaries, or the San Francisco Bay. In addition, the Delta mercury implementation program must decrease loading from the Delta to the San Francisco Bay to comply with the San Francisco Bay mercury TMDL implementation program's total mercury load allocation for Central Valley outflows to the Bay. Therefore, at a minimum, total mercury loading to the Delta must not increase.

However, population growth and regional water management changes could result in increases in total mercury loading. New total mercury sources may include, but are not limited to, runoff from urban development; changes in water and levee management practices that lead to increased erosion and/or transport of mercury; new, expanded or modified NPDES-permitted facility discharges; and increased atmospheric deposition from local and global emissions.

The source analysis in the TMDL Report indicates that almost all the total mercury loading to the Delta comes from tributary inputs. NPDES facilities and MS4s in the Delta contribute only about 2% of the total mercury load to the Delta, and upstream NPDES permitted discharges likely contribute an even smaller percentage to the tributary loads. Even so, the relative bioavailability of mercury in point source discharges and atmospheric deposition remains unknown; it is conceivable that discharges from these sources could be more bioavailable than other nonpoint sources and therefore could have a disproportionate effect on ambient methylmercury if such sources were to increase.

As a result, four options were developed to address new sources of total mercury:

- Option 11(a): Do not establish requirements for total mercury discharges from new or existing sources.
- Option 11(b): Develop total mercury load limits for all existing sources that incorporate reductions so that new sources could discharge without increasing the net total mercury loading to the Delta.
- Option 11(c): Require new urban development, WWTP, and water management projects that have the potential to increase total mercury loading to the Delta or Yolo Bypass to evaluate their potential effects and implement on-site projects to minimize any increase in total mercury loading. Also require existing point sources in the Delta source region that are expected to increase due to population growth to minimize their total mercury loading by requiring: (i) large NPDES facilities to implement mercury evaluation and minimization programs and maintain compliance with a USEPA approved pretreatment program, as applicable, and (ii) large NPDES MS4s to implement mercury-specific pollution prevention measures and best management practices (BMPs) to the maximum extent practicable to control total mercury discharges, and all MS4s to implement BMPs to the maximum extent practicable to control erosion and sediment discharges. Recommend that the State Water Board, California Air Resources Board, and USEPA develop an MOU to evaluate total mercury emissions in California and, if local emissions substantially contribute to mercury

loading to the Delta or its tributary watersheds, develop and implement a mercury control program for air emissions from existing and future facilities.

- Option 11(d): Require existing and new projects that have the potential to increase total mercury loading to the Delta or Yolo Bypass to evaluate their potential effects and implement on-site or offset control projects to ensure no net increase in total mercury loading.

As with Consideration #10 for new methylmercury sources, the decision to reduce loads from some existing total mercury sources while allowing some new projects to increase loading without limit would be based solely on a subjective evaluation of which projects are more valuable to the citizens of California. In addition, if no technically valid and legally defensible offset program can be developed, then it may not be possible for existing or new sources to ensure no net increase in total mercury loading. Therefore, Options 11(b) and 11(d) are not forwarded to the alternatives analysis.

4.2.2 Implementation Alternatives Considered

In this section, three alternatives are formulated from different combinations of the options described in Section 4.2.1 (Table 4.2). The progression of the alternatives generally represents increasing levels of effort to a greater number of responsible parties.

All implementation alternatives, including Alternative 1 (the "No Action" alternative), incorporate outreach to educate the public regarding the levels and types of fish consumption that may cause adverse health effects (Option 1(a) in Section 4.2.1). In addition, regular reporting to the Central Valley Water Board regarding progress toward meeting the proposed water quality objectives is proposed for all alternatives. Under each implementation alternative, the Central Valley Water Board will review progress toward meeting the water quality objectives. Staff will evaluate current scientific information regarding methyl and total mercury reductions to determine if changes are required for the implementation program, incorporating an adaptive management approach.

The first alternative, the "No Action" alternative, would require no active methyl or total mercury control actions. The other two alternatives require varying levels of control effort. As illustrated in Table 4.2, Alternatives 2 and 3 have several options in common:

- Option 2(b): Incorporate both methyl and total mercury source controls.
- Option 3(c): Proceed with an implementation program, but allow CalFed and other studies to be completed before dischargers must take actions to achieve their allocations. In Phase 1, incorporate a methylmercury study period. The Phase 1 studies' design and implementation would be guided by allocations adopted by this amendment, along with new results from CalFed studies. In Phase 2, implement methylmercury control actions based on studies completed before and during Phase 1. At the end of Phase 2, the Central Valley Water Board could consider a discharge prohibition if sufficient progress is not made in the methylmercury studies and control actions. During Phases 1 and 2, staff would continue to develop TMDLs to address upstream impairments. In Phase 3, continue maintenance of control actions implemented during Phases 1 and 2. Continued maintenance of control actions, along with natural erosion processes that remove total

Table 4.2: Implementation Alternatives

CONSIDERATION OPTIONS		Alternatives		
		1	2	3
1(a)	Incorporate expanded public education and outreach programs.	X	X	X
2(b)	Incorporate both methyl and total mercury controls.		X	X
3(c)	Incorporate MeHg study period in implementation plan as Phase 1.		X	X
4(b)	Adopt Phase 1 guidance for pilot MeHg/TotHg offset projects. Consider the adoption of a MeHg and TotHg offset program at the beginning of Phase 2.		X	X
5(b)	Develop allocations for existing MeHg sources within the Delta and Yolo Bypass and reduction requirements for TotHg sources in the Delta and its tributary watersheds downstream of major dams.		X	X
6(a)	Focus TotHg reduction efforts on nonpoint sources in the tributary watersheds that export the most mercury-contaminated sediment to reduce TotHg loading to the Delta by 110 kg/yr. Do not apply TotHg limits to other point and nonpoint sources in the Delta or its source region.		X	X
7(c)	Develop allocations for MeHg sources in the Delta/Yolo Bypass equal to existing MeHg loads for open-water inputs, atmospheric deposition and nonpoint source urban runoff. Develop allocations to reduce MeHg from the other source categories (e.g., municipal and industrial WWTPs, MS4s, agricultural lands and wetlands) as needed to achieve the fish tissue objectives in each Delta/Yolo Bypass subarea.		X	X
8(a)	Within the NPDES facility, MS4, agricultural and wetland source categories, designate MeHg allocations that incorporate reductions only for large individual sources that discharge to Delta/Yolo Bypass subareas that require MeHg source reductions to achieve fish tissue objectives.		X	
8(b)	Within the NPDES facility, MS4, agricultural and wetland source categories, designate MeHg allocations that incorporate reductions for all individual sources that discharge to Delta/Yolo Bypass subareas that require MeHg source reductions to achieve fish tissue objectives.			X
9(a)	Entities responsible for MeHg characterization and control studies: large WWTPs with discharges greater than 0.06 ng/l MeHg, large MS4s, and wetlands and agricultural sources that discharge to subareas of the Delta and Yolo Bypass that require MeHg source reductions; and any new or expanded projects that have the potential to discharge MeHg to the Delta or Yolo Bypass.		X	
9(b)	Entities responsible for MeHg characterization and control studies: the same entities as those listed in Option 9(a) plus large WWTPs with discharges greater than 0.06 ng/l MeHg, large MS4s, and any new or expanded WWTPs and MS4s in the tributary watersheds (downstream of major dams) that contribute to subareas of the Delta and Yolo Bypass that require MeHg source reductions.			X
10(c)	Minimize MeHg inputs from new or expanded projects in the Delta, Yolo Bypass, and tributary watersheds. Develop MeHg allocations for existing Delta/Yolo Bypass sources that incorporate reductions so that assimilative capacity can be reserved for new and expanded sources. Apply Phase 1 MeHg concentration limits to point sources in the Delta/Yolo Bypass and tributary watersheds downstream of major dams that are expected to increase due to population growth to minimize the potential for the methylmercury impairment to worsen in the Delta/Yolo Bypass while control studies and actions are implemented.		X	X
11(a)	No requirements for TotHg discharges from new or expanded projects in the Delta or tributary watersheds or from point sources expected to increase due to population growth.	X	X	
11(c)	Minimize TotHg inputs from new or expanded projects in the Delta and tributary watersheds. Require existing point sources expected to increase due to population growth to minimize their TotHg loading.			X

mercury deposited in creek beds and banks that could not otherwise be remediated, ultimately would lead to achievement of the fish tissue objectives throughout the Delta and Yolo Bypass.

- Option 4(c): Allow voluntary pilot offset projects during Phase 1, and develop an offset program to implement during Phase 2. The Phase 2 offset program would be guided by results of the proposed Phase 1 methylmercury characterization and control studies (see Consideration #3) and pilot offset projects.
- Option 5(b): Establish methylmercury allocations and total mercury reduction requirements for within-Delta sources and the part of the Yolo Bypass north of the legal Delta boundary (Figure 4.6).
- Option 6(a): Focus total mercury load reduction on nonpoint sources in tributary watersheds exporting the most mercury-contaminated sediment to reduce overall total mercury loading to the Delta by 110 kg/yr. Do not apply limits to other point and nonpoint sources in the Delta and tributary watersheds, except as needed to address new or expanded sources of total mercury (e.g., municipal WWTP and MS4 discharges).
- Option 7(c): Develop methylmercury allocations for all source categories. Set allocations for the water management and atmospheric deposition source categories at existing levels, except in the Yolo Bypass and Marsh Creek subareas, where open-water methylmercury production needs to be reduced to achieve the proposed fish tissue objectives. The Central Valley Water Board would recommend that the State Water Board and other State and Federal agencies conduct studies to determine baseline conditions and potential management practices for nonpoint sources of methylmercury. New water management projects and projects that could result in additional atmospheric deposition of methylmercury completed during Phase 1 would be addressed by Consideration #10 for new sources of methylmercury. Incorporate reductions needed to achieve the proposed fish tissue objectives in each Delta/Yolo Bypass subarea into the methylmercury allocations for the other source categories (e.g., discharges from municipal and industrial wastewater treatment plants, MS4s, agricultural lands and wetlands). This option relies upon issuance of NPDES permits and WDRs, utilization of 401-certification authority over future watershed projects, coordination with State Water Board authority over water rights, and development of inter-agency agreements. Methylmercury flux from open-water habitats is expected to decline gradually as total mercury control actions completed in the tributary watersheds and natural erosion reduces the mercury concentration of sediment deposited in the Delta waterways.
- Option 10(c): New methylmercury sources (e.g., wetland, agricultural and water management projects with outflow methylmercury concentrations greater than their intake water methylmercury concentrations, and new or expanded NPDES-permitted facility and MS4 discharges with discharge methylmercury concentrations greater than the implementation goal for methylmercury in ambient water) completed during Phase 1 of the proposed TMDL implementation program in the Delta or its tributary watersheds downstream of major dams would be considered in compliance with the Delta methylmercury TMDL implementation program if their responsible parties participate in the methylmercury characterization and control studies described under Consideration #3 and submit a methylmercury control plan to the Central Valley Water Board at the completion of the studies that indicates how their projects will minimize their methylmercury

discharges. Such projects also could participate on a voluntary basis in approved pilot offset projects. In addition to minimizing new methylmercury inputs to the Delta and its tributary watersheds, develop methylmercury allocations for existing sources that would require additional reductions so that assimilative capacity can be reserved for new sources. Once that reserve is exhausted, new sources with discharge methylmercury concentrations greater than the implementation goal (or their intake water methylmercury levels) would be required to submit a methylmercury control plan to the Central Valley Water Board to address that portion of their loading that could contribute to exceedances of the fish tissue objectives. Depending on the magnitude and discharge characteristics of new sources that begin during Phases 1 and 2, the allocations adopted for this amendment may need to be adjusted by another Basin Plan amendment at the beginning of or later in Phase 2 to accommodate any resulting increase in ambient methylmercury levels in the Delta.

The following sections described the options unique to each alternative.

Alternative 1 (No Action)

Although Alternative 1 requires public outreach and education regarding consumption of contaminated fish, it does not require active methyl or total mercury control actions. Alternative 1 relies on continued natural erosion and transport of sediments containing mercury out of the Delta and its tributaries and passive dilution of streambed sediments by cleaner, incoming sediment to decrease concentrations of mercury in surficial sediment, thereby decreasing methylmercury production in the Delta. Methyl and total mercury would continue to be discharged from point and nonpoint sources in the Delta. Mercury-contaminated sediments would continue to erode from inactive mercury and gold mines in tributary watersheds directly into tributary waters and be transported to the Delta and San Francisco Bay.

Because this alternative allows continued discharge from point and nonpoint sources in the Delta and its tributary watersheds, it is highly unlikely that the fish tissue objectives would be reached through natural erosion and passive dilution alone within the next several centuries. The same would be true for complying with the San Francisco Bay mercury TMDL implementation program's allocation for total mercury from the Central Valley. In addition, because anticipated population growth, habitat restoration projects, and changing water management practices in the Delta/Yolo Bypass and its tributary watersheds may lead to increases in methylmercury levels in Delta waters, fish tissue methylmercury levels are likely to increase in the Delta before any reductions are seen due to passive dilution of streambed sediments by cleaner, incoming sediment.

Alternative 2

In addition to the "Common Options" listed at the beginning of Section 4.2.2, Alternative 2 includes the following:

- Option 8(a): Designate allocations for relatively small methylmercury sources (e.g., WWTPs that discharge less than 1 mgd and MS4s that service less than 100,000 people), and for larger sources that discharge to subareas of the Delta/Yolo

Bypass in which the proposed fish tissue objectives are achieved, equal to their existing loads. Designate allocations for larger methylmercury sources that include reductions necessary to achieve the fish tissue objectives in each Delta subarea.

- Option 9(a): Responsible parties for individual sources that meet the following criteria would be responsible for conducting studies:
  - Discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives;
  - Have relatively large volumes of discharge compared to other individual sources in each respective source category (e.g., MS4s that serve municipalities with greater than 100,000 people and WWTPs that discharge greater than 1 mgd); and
  - Have discharge methylmercury concentrations that exceed the proposed implementation goal (or exceed intake water methylmercury concentrations).

  The Central Valley Water Board's Irrigated Land Regulatory Program would implement the methylmercury TMDL implementation program for irrigated agriculture and managed wetlands; not every landowner would necessarily be responsible for conducting a study. Both large and small point and nonpoint dischargers in the Delta/Yolo Bypass may be required to implement feasible control technologies and management practices during Phase 2. Upstream dischargers may be required to implement feasible controls as part of Phase 2 or as part of upstream TMDL implementation programs.
- Option 11(a): Do not establish requirements for total mercury discharges from existing or new sources.

Alternative 3

Alternative 3 is different from Alternative 2 in that it includes the following three options:

- Option 8(b): Establish allocations that include methylmercury load reductions for all individual sources, rather than requiring only the larger sources to reduce their methylmercury discharges.
- Option 9(b): Responsible parties for individual sources that meet the Option 9(a) criteria as well as the following additional criteria would be responsible for conducting studies:
  - Option 9(a) criteria: large WWTPs that discharge greater than 0.06 ng/l methylmercury, large MS4s, and wetlands and agricultural sources that discharge to Delta/Yolo Bypass subareas that require MeHg source reductions; and any new or expanded projects that have the potential to discharge methylmercury to the Delta or Yolo Bypass;
  - Additional criteria: large WWTPs that discharge greater than 0.06 ng/l methylmercury and large MS4s that discharge to tributary waterways (downstream of major dams) that drain to subareas of the Delta and Yolo Bypass that require methylmercury source reductions; and any new or expanded projects that have the potential to discharge methylmercury to those waterways.
- As with Option 9(a), the Central Valley Water Board's Irrigated Land Regulatory Program would implement the methylmercury TMDL implementation program for irrigated

agriculture and managed wetlands; not every landowner would necessarily be responsible for conducting a study. Both large and small point and nonpoint dischargers in the Delta/Yolo Bypass may be required to implement feasible control technologies and management practices during Phase 2. Upstream dischargers may be required to implement feasible controls as part of Phase 2 or as part of upstream TMDL implementation programs.

- Option 11(c): Require new urban development, WWTP, and water management projects that have the potential to increase total mercury loading to the Delta or Yolo Bypass to evaluate their potential effects and implement on-site projects to minimize any increase in total mercury loading. Also require existing point sources that are expected to increase due to population growth to minimize their total mercury loading by requiring: (i) large NPDES facilities to implement mercury evaluation and minimization programs and maintain compliance with a USEPA approved pretreatment program, as applicable, and (ii) large NPDES MS4s to implement mercury-specific pollution prevention measures and BMPs to the maximum extent practicable to control total mercury discharges, and all MS4s to implement BMPs to the maximum extent practicable to control erosion and sediment discharges. Recommend that the State Water Board, California Air Resources Board, and USEPA develop an MOU to evaluate total mercury emissions in California and, if local emissions substantially contribute to mercury loading to the Delta or its tributary watersheds, develop and implement a mercury control program for air emissions from existing and future facilities.

4.3 Reasonably Foreseeable Methods of Compliance with Alternatives 1 through 3

All three alternatives require public outreach and education regarding consumption of contaminated fish, fish tissue mercury monitoring and regular reporting to the Board. Alternative 1 does not require any methyl or total mercury control actions. Alternatives 2 and 3 require varying levels of control actions that address existing and new sources of methyl and total mercury in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams. Alternatives 2 and 3 have several differences that center mainly on the level of effort required from the variety of source categories and individual dischargers of methyl and total mercury. The appropriate actions for individual dischargers to take will vary depending on discharge-specific characteristics.

The following sections describe the reasonably foreseeable methods of compliance with each alternative so that the potential environmental effects, costs, ability to achieve the proposed fish tissue objectives, and overall feasibility of each alternative can be evaluated. Although staff considers these reasonably foreseeable methods of compliance, the Central Valley Water Board will not require implementation of specific practices or technologies.

4.3.1 Risk Management

Until methylmercury reductions are reflected in attainment of the proposed fish tissue objectives, activities need to be undertaken to help manage the health risk and reduce methylmercury exposure to people who eat Delta fish. All three implementation alternatives include a recommendation that effective programs be developed and implemented to reduce mercury

related risks to humans and quantify risk reductions. The program could incorporate risk management in the form of outreach to educate the public regarding the levels of fish consumption that may cause adverse health effects.

All three implementation alternatives would involve the Central Valley Water Board staff working with the State Water Board, Office of Environmental Health Hazard Assessment, California Department of Public Health (CDPH), local county health departments, members of local fishing and consumer communities, and methylmercury dischargers to develop a strategy for expanding and sustaining existing public education and outreach programs and support stakeholders implementing the strategy. Outreach would provide information about the health effects of mercury and about which local fish species to avoid or eat less frequently.

Foreseeable methods of compliance for the risk management component may involve the following:

- Collaboration with affected communities, dischargers, local agencies, and health and social service providers to determine their knowledge, concerns, fish consumption patterns, and information needs. Local groups would be involved in design, dissemination, and evaluation of materials and outreach and education activities.
- Development, distribution, and evaluation of educational materials with translation into appropriate languages. Materials could include Delta fish advisory signs and posters, fact sheets and other written materials, and other media.
- Trainings for community-based organizations, agencies, and health and social service providers that serve target groups in target communities.
- Evaluation of mercury exposure by monitoring hair or blood.
- Coordination with affected communities to develop of other risk management programs as needed, possibly including providing access to fish with less mercury or other protein sources.

The California Department of Public Health would have primary responsibility for coordinating public outreach and education. The CDPH coordinated public outreach and education with local stakeholders in the Delta since 2003 but has been constrained by available funding. The Central Valley Water Board funded a non-governmental organization to develop a strategy for management of risks arising from eating fish contaminated with mercury. Water Board staff will be working closely with the contracted party, local stakeholders, and the CDPH to develop an outline and complete the strategy. Staff expects that the strategy will be completed by June 2008. In addition, the Central Valley Water Board funded CDPH to continue public outreach and education activities in the Delta. Funds from the Board allowed CDPH to begin a new project that combines a fish consumption survey, education about mercury risks, and assessment of exposure through blood mercury tests. The study is being conducted with low-income, pregnant women.

Staff recommends that agencies proposing new wetland projects in Delta/Yolo Bypass that have the potential to increase methylmercury discharges to surface waters, and NPDES permitted WWTPs and MS4s that meet the following criteria, be required to coordinate with the public health agencies and other stakeholders to develop and implement an expanded outreach and education program:

- Discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives;
- Have relatively large volumes of discharge compared to other individual sources in each respective source category (e.g., MS4s that serve municipalities with greater than 100,000 people and WWTPs that discharge greater than 1 mgd); and
- Have discharge methylmercury concentrations that exceed the proposed implementation goal for ambient water (or exceed intake water methylmercury concentrations).

The following WWTPs and MS4s meet these criteria:

- WWTPs: Davis WWTP (CA0079049), Manteca WWTP (CA0081558), Mountain House CSD WWTP (CA0084271), Rio Vista Northwest WWTP (CA0083771), Sacramento Combined WWTP (CA0079111), SRCSD Sacramento River WWTP (CA0077682), Stockton WWTP (CA0079138), and Tracy WWTP (CA0079154).
- Urban storm water agencies: Sacramento Area MS4 (CAS082597), Stockton Area MS4 (CAS083470), and Tracy MS4 (CAS000004).

The wetland project proponents, WWTPs and MS4s may work together to develop a comprehensive risk management program(s). Staff recommends the following timeline for discharger program development activities:

- Submit a risk management workplan for Executive Officer approval by [two years after the effective date of the proposed amendments].
- Implement the plan by [four years after the effective date of the proposed amendments].
- Every three years thereafter, provide a progress report to the Central Valley Water Board.

These recommendations are consistent with requirements for NPDES permittees that discharge to the San Francisco Bay that have been promulgated by the San Francisco Bay and State Water Boards. In 2005 the State Water Board remanded the San Francisco Bay mercury TMDL Basin Plan amendment with Resolution No. 2005-0060. In Resolution No. 2005-0060, the State Water Board:

> *"Directs the San Francisco Bay and Central Valley Water Boards to investigate ways, consistent with their regulatory authority, to address public health impacts of mercury in San Francisco Bay/Delta fish, including activities that reduce actual and potential exposure of and mitigate health impacts to those people and communities most likely to be affected by mercury in San Francisco Bay-Delta caught fish, such as subsistence fishers and their families."*

In turn, the San Francisco Bay Water Board revised the San Francisco Bay mercury Basin Plan amendment with specific requirements for NPDES permits for municipal and industrial wastewater discharges and urban runoff to *"Develop and implement effective programs to reduce mercury-related risks to humans and wildlife and quantify risk reductions resulting from these activities."* The State Water Board approved the San Francisco Bay amendments in July 2007 with Resolution No. 2007-0045 (see Section 6.2.11 in Chapter 6).

Activities conducted as part of the Basin Plan amendments implementation would continue and expand upon current efforts.

4.3.2 Methylmercury Load and Waste Load Allocations, Phase 1 Methylmercury Concentration Limits, and Total Mercury Minimization Requirements

1. Methylmercury Load and Waste Load Allocations

Alternatives 2 and 3 include establishment of load allocations (for nonpoint sources) and waste load allocations (for point sources) for all methylmercury dischargers in the legal Delta boundary and Yolo Bypass, including irrigated agriculture, wetlands, municipal and industrial wastewater treatment plants, urban runoff, and open water. The alternatives also contain methylmercury allocations for tributary inputs to the Delta and Yolo Bypass, including a methylmercury allocation for methylmercury discharges from the Cache Creek Settling Basin. Alternative 2 designates methylmercury allocations that incorporate reductions for large sources that (a) discharge to subareas of the Delta and Yolo Bypass that require methylmercury source reductions to achieve the fish tissue objectives and (b) exceed the proposed implementation goal for methylmercury in ambient water (or their intake methylmercury concentration), while Alternative 3 designates methylmercury allocations that require reductions for both large and small sources that meet these criteria.

Currently, only point sources such as WWTPs and MS4s have methylmercury concentration data available for individual discharge locations in the Delta region and can be assigned allocations on a permit-by-permit basis. Methylmercury data are not available for individual nonpoint sources such as wetlands, agricultural lands, and open channel areas; as result, under both Alternatives 2 and 3, these source categories would be assigned subarea allocations. For example, all inputs from existing wetlands within the Central Delta would be grouped into a single Central Delta wetlands allocation; methylmercury inputs from new wetland restoration projects completed after the effective date of the Basin Plan amendments would be incorporated in the subarea allocations for existing wetlands. These subarea allocations may be adjusted in the future, as needed based on new information.

Both Alternatives 2 and 3 designate methylmercury allocations for open water, atmospheric deposition, and runoff from urban lands outside of MS4 service areas[23] that cap average annual loading at current levels, with one exception. Reductions will be needed in the open water methylmercury contributions to the Marsh Creek and Yolo Bypass subareas to achieve the fish tissue objectives in those subareas; however, staff recommends that the methylmercury reductions be achieved through reductions in tributary total mercury inputs rather than in-channel management practices.

[23] Discharges from urban areas that are not currently subject to Phase I or Phase II of the NPDES storm water program are not required to obtain NPDES permits (see 33 U.S.C. §1342(p)(1) & (p)(6)). Therefore, for regulatory purposes, they are analogous to nonpoint sources (see 40 C.F.R. §130.2(g)). Available information indicates within-Delta urban areas outside of MS4 service areas comprise less than 4% of all urban acreage and associated urban methylmercury loading to the Delta. Urban areas outside of MS4 service areas in the Delta's tributary watersheds comprise a similarly small percentage. As a result, methylmercury source reductions will not be required unless such urban areas expand significantly, or are found to be significant contributors of mercury or other pollutants, and are as a result become designated Phase II MS4 dischargers and required to develop and implement mercury control plans like those proposed for existing Phase II dischargers.

The available MS4 methylmercury concentration data collected at eleven sites in Sacramento, Tracy and Stockton ranged from 0.04 to 2.04 ng/l; all but two of the 58 samples had methylmercury concentrations that exceeded the proposed ambient water methylmercury goal, and the average methylmercury concentrations observed at each sample location exceeded the proposed ambient goal (Section 6.2.5 and Appendices H and L in the TMDL Report). In addition, inspection of the available methylmercury data suggests that the differences between urban watersheds are not related entirely to land use. As a result, under both Alternatives 2 and 3, allocations would not be developed for individual MS4 outfalls; instead, all outfall discharges within a given MS4 service area within a given subarea would be grouped into a single allocation. As with the subarea allocations for nonpoint sources, these MS4 allocations may be adjusted in the future as needed based on new information.

As noted earlier, populations in the Delta/Yolo Bypass counties are predicted to increase 76% to 213% by 2050 (CDOF, 2007), with an average increase of about 120%. Staff assumed that half of the growth between now and 2050 would be serviced by existing municipal WWTPs and half of the growth would be serviced by new municipal WWTPs (see Chapter 8 in the TMDL Report). To ensure that new and expanded facilities do not further impair the Delta, new facilities should have their effluent methylmercury concentrations capped at 0.06 ng/l, and expanded discharges from existing facilities should be incorporated in the allocations for those facilities.

As described in Section 4.2.1 (Consideration #8) and Chapter 8 in the TMDL Report, individual sources that act as dilution (e.g., have discharge methylmercury concentrations less than the proposed implementation goal) would have allocations that incorporate expected increases in discharge volume. Facilities with effluent methylmercury concentrations greater than the proposed implementation goal that want to increase their discharge volume would not be able allowed to exceed their allocated methylmercury loads, and therefore would be required to reduce their effluent methylmercury concentration to compensate for any increase in discharge volume. This approach is consistent with State Water Board Resolution No. 2005-0060,[24] which required the San Francisco Bay Water Board to incorporate provisions that acknowledge the efforts of those point sources whose effluent quality demonstrates good performance, and require improvement by other dischargers, when establishing waste load allocations. Staff recommends that discharges from new WWTPs be encompassed by "Unassigned WWTP allocations" for each subarea. The "Unassigned WWTP allocations" should be based on the volume predicted for new WWTPs in each subarea multiplied by 0.06 ng/l methylmercury (see Section 8.1.2 in the TMDL Report).

Methylmercury loads and concentrations in heating/cooling and power facility discharges that use ambient water for cooling water vary with intake water conditions. Based on the comparison of the available intake and outfall methylmercury data (Bosworth *et al.*, 2008), power and heating/cooling facilities that use ambient water for cooling water do not appear to act as a source of methylmercury to the Delta. As a result, staff recommends that such dischargers in the Delta/Yolo Bypass conduct concurrent monitoring of intake water and effluent

[24] On September 7, 2005, the State Water Board adopted Resolution No. 2005-0060 ("Remand Order") remanding the San Francisco Bay Water Board's San Francisco Bay Mercury TMDL Amendment with requirements for specific revisions to the TMDL and associated implementation plan.

and have allocations equal to 100%, such that the discharge limits equal the detected methylmercury concentrations found in the intake water. GWF Power Systems (CA0082309) acquires its intake water from sources other than ambient surface water (see Chapter 8 in the TMDL Report) and has effluent methylmercury concentrations less than the analytical method detection limit (0.03 ng/l). As a result, staff recommends that its allocation be equal to an annual load of 0.0052 g/yr, calculated by using the design flow (0.125 mgd) and the methylmercury method detection limit (0.03 ng/l).

Discharge methylmercury data were not available for the Metropolitan Stevedore Company (0084174), a marine bulk commodity terminal on leased land at the Port of Stockton in the Central Delta subarea. Staff recommends that a methylmercury wasteload allocation for non-storm water discharges from the Metropolitan Stevedore Company be established in its NPDES permit once it completes at least three sampling events for methylmercury in its discharges. Its wasteload allocation would be a component of the "Unassigned WWTP Allocation" for the Central Delta subarea.

2. Phase 1 Methylmercury Concentration Limits

Both Alternatives 2 and 3 would incorporate Phase 1 methylmercury concentration limits for NPDES facilities and MS4s in the Delta/Yolo Bypass and tributary watersheds. Such limits are critical components of NPDES permits for facilities that discharge to CWA 303(d)-Listed water bodies until they achieve their TMDL methylmercury allocations. In addition, maintenance of the limits – along with implementation of mercury reduction programs – would minimize the potential for population growth to worsen the methylmercury impairment in the Delta/Yolo Bypass while control studies and actions are implemented.

NPDES MS4 Phase 1 Limits. Developing methylmercury concentration limits for large MS4s is complicated by variable short- and long-term climate conditions (e.g., wet versus dry years, antecedent conditions before storms, storm frequency and intensity, etc.). Much of the MS4 methylmercury data used in the Delta TMDL was collected during a relatively dry period during just a few runoff events. To account for variable runoff conditions, staff recommends that MS4 limits be based on the 90th percentile methylmercury concentration of urban runoff samples collected during 2000 to 2010 (a period expected to have a range of meteorological and climatic conditions) and that the limits become effective in 2012 (e.g., four years after the effective date of the proposed Basin Plan amendments, assuming an effective date in 2008).

Staff recommends that Phase 1 methylmercury concentration limits apply to the Sacramento, Stockton, and Tracy MS4s because:

- The Sacramento and Stockton MS4s service more than half of the population in the Delta and its tributary watersheds serviced by MS4s.
- The Tracy MS4 is encompassed within the legal Delta boundary and is a rapidly growing municipality.

As described in Section 4.3.7 and footnote #25, most of the Contra Costa MS4 (CAS083313) service area falls within the San Francisco Bay Water Board's jurisdiction. Therefore, during Phase 1 of the Delta TMDL implementation program (Alternatives 2 and 3), Central Valley Water Board staff recommends that the mercury control requirements approved by the San

Francisco Bay Water Board (Resolution R2-2006-0052, which includes requirements for urban dischargers to reduce total mercury loading) for the Contra Costa County MS4 be applied to its service area within the Central Valley Water Board's jurisdiction. Phase 1 limits for the Contra Costa MS4 and other large MS4s upstream of the Delta may be considered as part of upstream TMDL programs or at the end of Phase 1 of the Delta TMDL implementation program.

NPDES Facility Phase 1 Limits. In response to the July 2004 13267 Order (see Section 6.2.4 in the TMDL Report), effluent methylmercury concentration data was collected by virtually all of the NPDES facilities in the Delta and its tributary watersheds downstream of major dams. As a result, staff recommends that Phase 1 methylmercury concentration limits be set at the average annual concentration measured at the time the Delta TMDL was developed. However, many facilities did not continue effluent methylmercury monitoring beyond that required by the July 2004 13267 Order. As a result, staff recommends that the Phase 1 methylmercury concentration limits become effective in the January three years after the effective date of the proposed Basin Plan amendments. This implementation schedule allows time for facilities to amend their monitoring programs, collect one year of methylmercury effluent data, and incorporate compliance time schedules in their permits as needed should their effluent methylmercury concentrations have increased since TMDL development. Staff recommends that compliance time schedules be allowed to extend through the Phase 1 control study period (see Sections 4.3.3 and 4.3.8), not to exceed ten years, so that a facility can make use of new management practices and control methods developed by the studies to come into compliance with its Phase 1 concentration limit.

Staff recommends that the Phase 1 limits apply to all NPDES facilities that discharge to the Delta or Yolo Bypass and large municipal WWTPs (those that discharge > 1 mgd) in the tributary watersheds downstream of major dams. Staff recommends that Phase 1 methylmercury concentration limits apply to just the large municipal WWTPs that discharge upstream of the Delta because, of the 43 upstream municipal WWTPs, the 25 that discharge greater than 1 mgd account for about 95% of the municipal WWTP discharge volume.

Many of the municipal WWTPs have average effluent methylmercury concentrations less than the proposed implementation goal for methylmercury in ambient water (0.06 ng/l), most of which have average concentrations less than the current minimum reporting level, and some even less than the method detection limit, for laboratory analyses for methylmercury. Minimum reporting levels are equivalent to the lowest calibration standard for methylmercury, which is currently 0.05 ng/l. Though water methylmercury concentrations below the minimum reporting level can be detected, they cannot be quantified accurately. Thus, staff recommends that facilities with existing average methylmercury concentrations less than 0.06 ng/l have Phase 1 methylmercury concentration limits set equal to 0.06 ng/l.

As noted earlier, power and heating/cooling facilities that use ambient water for cooling water do not appear to act as a source of methylmercury to the Delta. However, the annual volume discharged by power and heating/cooling facilities in the Delta comprises more than 30% of all NPDES facility discharges in the Delta. As a result, staff recommends that such facilities in the Delta with discharges greater than 1 mgd conduct concurrent monitoring of intake water and effluent and have Phase 1 methylmercury concentration limits equal to 100%, such that the discharge limits equal the detected methylmercury concentration found in the intake water.

GWF Power Systems, which discharges greater than 1 mgd to the Delta, acquires its intake water from sources other than ambient surface water (see Chapter 8 in the TMDL Report) and has effluent methylmercury concentrations less than the minimum reporting level. As a result, staff recommends that its Phase 1 methylmercury concentration limit be set equal to 0.06 ng/l.

There are several other commercial, industrial and aquaculture facilities that discharge greater than 1 mgd to the tributary watersheds downstream of major dams. Staff recommends that they not be assigned Phase 1 methylmercury concentration limits for the following reasons:

- The groundwater treatment, aggregate/cement, and food preparation facility discharges monitored to date have average methylmercury concentrations below current method detection limits (< 0.02 ng/l; Bosworth *et al.*, 2008). In addition, the annual volume discharged by these facilities comprises only a couple percent of all NPDES facility discharges in the tributary watersheds and it is not expected to increase substantially during the next ten years.
- The annual volume discharged by paper mills comprises less than one percent of all NPDES facility discharges in the tributary watersheds (Bosworth *et al.*, 2008), only one of the paper mills, Pactiv Corporation Molded Pulp Mill (CA0004821), discharges greater than 1 mgd, and none are expected to substantially increase their discharges during the next ten years. The Pactiv facility's 2004/2005 13276 Order monitoring indicated very low methylmercury concentrations (twelve samples that ranges between nondetect and 0.085 ng/l, with five samples with concentrations below 0.02 ng/l, and another three samples with concentrations below 0.05 ng/l), and its 2004 NPDES permit reported discharges with low total mercury concentrations (six samples that ranged between 0.7 and 4.78 ng/l total mercury).
- Aquaculture facility discharges comprise about half of all NPDES facility discharges in the tributary watersheds and available monitoring data indicate that the facilities may act as sources of methylmercury (Bosworth *et al.*, 2008). However, all but one of the aquaculture facilities have average discharge methylmercury concentrations equal to or less than 0.06 ng/l (Bosworth *et al.*, 2008), and their discharges are not expected to increase substantially during the next ten years.

Staff recommends that new facilities that begin discharging during Phase 1 be required to conduct one year of monthly monitoring and have Phase 1 methylmercury concentration limits set equal to the annual average effluent methylmercury concentration calculated from their first 12 months of monitoring. As noted earlier, facilities that discharge greater than 0.06 ng/l methylmercury would be required to take part in the proposed Phase 1 characterization and control studies.

The Phase 1 methylmercury concentration limits for existing NPDES facilities should replace the interim total mercury mass limits that have been included in many of the NPDES permits for facilities in the Delta and its tributary watersheds downstream of major dams. Facilities that are not assigned methylmercury concentration limits as part of Phase 1 would not be required to have Phase 1 limits in their NPDES permits under the TMDL implementation plan. However, the Central Valley Water Board may require such facilities to monitor methylmercury and can assign methylmercury concentration limits based on facility- and receiving water-specific conditions in their NPDES permits. In addition, NPDES facilities and MS4s in the tributary

watersheds could be assigned methylmercury allocations or other effluent limits as part of upstream TMDL implementation programs or during later phases of the Delta TMDL implementation program.

3. Total Mercury Limits & Minimization Requirements

Both Alternatives 2 and 3 include total mercury load limits for the Cache Creek Settling Basin, American and Feather Rivers, and Putah Creek inputs to the Delta/Yolo Bypass that incorporate a cumulative reduction of 110 kg/yr. Alternative 3 also includes requirements for minimizing total mercury discharges from existing point sources expected to increase due to population growth. Staff recommends that large NPDES municipal WWTPs (e.g., those that discharge greater than 1 mgd) and large NPDES MS4s develop and implement mercury evaluation and minimization programs.

Staff recommends that the Sacramento, Stockton, and Tracy MS4s be required to implement mercury-specific pollution prevention measures and BMPs because, as noted previously, the Sacramento and Stockton MS4s service more than half of the population in the Delta and its tributary watersheds serviced by MS4s, and the Tracy MS4 is encompassed within the legal Delta boundary and is a rapidly growing municipality. All MS4s in the Delta source region should implement BMPs to the maximum extent practicable to control erosion and sediment discharges, which also will be effective in reducing mercury discharges because mercury is typically particle-bound. Staff recommends that the mercury control requirements approved by the San Francisco Bay Water Board (Resolution R2-2006-0052) for the Contra Costa County MS4 be applied to its service area within the Central Valley Water Board's jurisdiction.

Of the 127 NPDES facilities that discharge to the Delta and its tributary watersheds downstream of major dams, 61 facilities discharge less than 1 mgd. These small facilities account for only about 3% of the volume discharged by NPDES facilities to the Delta source region. Therefore, staff recommends that facilities that discharge less than 1 mgd not be required to implement mercury evaluation and minimization programs.

Power, heating/cooling and aquaculture facilities, which account for about 50% of the volume discharged by NPDES facilities to the Delta source region, do not appear to act as measurable sources of total mercury to the Delta and its source region. However, the NPDES permits for several power and heating/cooling facilities in the tributary watersheds indicate that mercury-containing chemicals may be added to their cooling water and other low-volume waste streams may be included in their discharges (see Tables G.6 and G.7 in Appendix G of the TMDL Report). As a result, staff recommends that power and heating/cooling plants that discharge greater than 1 mgd be required to implement mercury evaluation and minimization programs, unless they can demonstrate that (1) they use ambient surface water for cooling water and (2) do not add any mercury-containing treatment chemicals to their cooling water or other waste to their discharge.

No total mercury data are available for groundwater treatment plants currently discharging in the Delta source region; however, these facilities and other commercial and industrial facilities contribute only a small percentage of overall NPDES discharges and are not expected to

increase their discharges. As a result, staff recommends that total mercury minimization requirements not be required for groundwater treatment plants.

Section 4.3.12 describes reasonably foreseeable methods of compliance with the requirement for evaluation and minimization of total mercury discharges. Depending on the geographic scope of future population growth in the Delta source region, and the results of the proposed Phase 1 methylmercury control studies, the Central Valley Water Board could consider applying total mercury minimization requirements to additional point and nonpoint sources during Phase 2 of the Delta TMDL implementation program or as a component of upstream TMDL programs. In addition, the Central Valley Water Board could consider the addition of Phase 2 total mercury load limits if a technically valid offset program can be developed and implemented for Phase 2.

4.3.3 Implementation Phases

Because Alternative 1 does not establish methylmercury allocations or total mercury limits, nor entails any source control actions, there is no need for implementation of any actions except those for risk management. Alternatives 2 and 3 both have three phases for achieving the methylmercury allocations and fish tissue objectives. The length of each phase would be the same, regardless of which alternative is implemented. Phase 1 of the implementation program would encompass:

- Evaluation of the progress of the implementation program, reporting to the Board, and making changes as needed using an adaptive management approach;
- Actions to reduce total mercury in Cache Creek Settling Basin outflows;
- Implementation of methylmercury characterization and control studies;
- Source analyses and feasibility studies to identify and prioritize total mercury control projects in the tributary watersheds;
- Monitoring of the sources in the Delta and Yolo Bypass assigned methylmercury allocations;
- Implementation of pilot methylmercury or total mercury offset projects; and
- Actions to minimize methyl and total mercury inputs from new or expanded sources in the Delta and its tributary watersheds downstream of major dams.

Phase 1 should be long enough for entities responsible for methylmercury characterization and control studies to develop funding sources, plan the studies with oversight from the Central Valley Water Board and a technical advisory committee (TAC), implement the studies and pilot projects, and evaluate the results to propose an implementation plan for achieving their methylmercury allocations. Based on past experience and input from stakeholders expected to conduct the studies, staff recommends that Phase 1 encompass seven years (about 2009 to 2015) after the effective date of the Basin Plan amendments (assumed to be 2008). An additional year should be allowed for the TAC and Central Valley Water Board to review results from the studies and pilot projects to determine which methylmercury sources have the most feasible and cost-effective controls and amend the methylmercury allocations and implementation program as needed.

In addition, both alternatives require certain entities to implement total mercury controls during Phase 1 of the implementation program. Alternatives 2 and 3 differ in the number of entities required to make methylmercury reductions and to implement total mercury controls. In addition, implementation requirements for both alternatives vary for individual dischargers based on the (a) location of discharge (dischargers in or upstream of subareas of the Delta that meet the fish tissue objectives may have different requirements from those in or upstream of impaired subareas); (b) performance (e.g., some WWTPs have effluent methylmercury concentrations less than the proposed implementation goal of 0.06 ng/l for ambient water in the Delta and Yolo Bypass); and (c) discharge volume (e.g., small versus large MS4 and WWTP dischargers).

The implementation program for Phase 2 activities could encompass:

- Actions to reduce methylmercury discharges to the Delta and Yolo Bypass from existing local and upstream methylmercury sources to comply with the Delta/Yolo Bypass methylmercury allocations, including the Cache Creek Settling Basin;
- Actions to reduce total mercury discharges to comply with the Delta/Yolo Bypass methylmercury allocations and the San Francisco Bay TMDL's total mercury allocation for the Central Valley, with particular focus on nonpoint sources in the tributary watersheds that discharge the most mercury-contaminated sediment to the Delta and Yolo Bypass;
- Implementation of a monitoring and surveillance program;
- Implementation of upstream TMDL program control actions; and
- Implementation of a methylmercury and total mercury offset program.

For Phase 2, staff recommends 15 years (about 2017-2030). This period is long enough for entities responsible for methyl and total mercury control actions to develop long-term funding sources and implement the actions. The proposed Basin Plan amendments set the maximum time that will be allowed for NPDES permittees to comply with their requirements. Specific compliance schedules will be determined for each NPDES permit and will be based on the individual permittee's need for time to construct facilities or infrastructure, implement programs, and secure funding.

Reasonably foreseeable methods of compliance with Phase 2 for both Alternatives 2 and 3 are reviewed in the following sections so that the potential environmental effects and costs of various alternatives can be evaluated. However, until the Phase 1 methylmercury characterization and control studies are completed, evaluation of potential methylmercury and total mercury control actions for many sources is difficult. The Phase 1 methylmercury characterization and control studies may identify new ways for dischargers to meet their allocations.

Some methylmercury allocations – such as the tributary watershed input allocations and the open-water allocations for the Yolo Bypass and Marsh Creek subareas – likely will not be achieved until after 2030.

Phase 3 (about 2031 onward) for both Alternatives 2 and 3 is expected to encompass:

- Continued maintenance of control actions implemented during Phases 1 and 2;
- Continued implementation of upstream TMDL program control actions; and

- Natural erosion processes that remove total mercury deposited in creek beds and banks that could not otherwise be remediated.

Upstream TMDL program control actions will be evaluated and implemented by future Basin Plan amendments specific to those TMDL implementation programs.

4.3.4 Surveillance and Monitoring Program

All three alternatives incorporate a surveillance and monitoring program to track compliance with fish tissue methylmercury objectives. Reasonable means of compliance could include fish tissue and water quality monitoring, which are types of monitoring that have been successfully conducted by various agencies, researchers, and dischargers over the past several years. The initial fish tissue monitoring could take place at the following compliance reaches in each subarea to represent subarea-specific conditions:

- Central Delta subarea: Middle River between Bullfrog Landing and Mildred Island;
- Marsh Creek subarea: Marsh Creek from Highway 4 to Cypress Road;
- Mokelumne/Cosumnes River subarea: Mokelumne River from the Interstate 5 bridge to New Hope Landing;
- Sacramento River subarea: Sacramento River from River Mile 40 to River Mile 44;
- San Joaquin River subarea: San Joaquin River from Vernalis to the Highway 120 bridge;
- West Delta subarea: Sacramento/San Joaquin River confluence near Sherman Island;
- Yolo Bypass-North subarea: Tule Canal downstream of its confluence with Cache Creek; and
- Yolo Bypass-South subarea: Toe Drain between Lisbon and Little Holland Tract.

Once fish tissue methylmercury concentrations at a given subarea's compliance reach have achieved the methylmercury fish tissue objectives, fish tissue monitoring could take place at additional waterways in the subarea to ensure that the objectives are achieved throughout the subarea.

Compliance fish methylmercury monitoring should include representative fish species for comparison to each methylmercury fish tissue objective, for example:

- Trophic Level 4: bass (largemouth and striped), channel and white catfish, crappie, and Sacramento pikeminnow.
- Trophic Level 3: American shad, black bullhead, bluegill, carp, Chinook salmon, redear sunfish, Sacramento blackfish, Sacramento sucker, and white sturgeon.
- Small (<50 mm) fish: primary prey species consumed by wildlife in the Delta, which may include juveniles of the species listed above, as well as inland silverside, juvenile bluegill, mosquitofish, red shiner, threadfin shad, or other fish less than 50 mm.

Trophic level 3 and 4 fish sample sets should include three species from each trophic level and should include anadromous and non-anadromous fish. Trophic level 3 and 4 fish sample sets should include a range of fish sizes between 150 and 500 mm total length. Striped bass, largemouth bass, and sturgeon caught for mercury analysis must be within the CDFG legal

catch size limits. Sample sets for fish less than 50 mm should include at least two fish species that are the primary prey species consumed by wildlife at sensitive life stages. In any subarea, if multiple species for a particular trophic level are not available, one species in the sample set would be considered acceptable.

Central Valley Water Board staff will work with the State Water Board and dischargers to develop a strategy to fund the fish tissue monitoring program.

Alternatives 2 and 3 would incorporate a fish monitoring frequency designed to track the progress of their respective methyl and total mercury source reduction strategies. Fish tissue monitoring could be initiated five years after dischargers implement projects to reduce methylmercury and total mercury discharges. Monitoring could take place every ten years thereafter. Because no mercury reduction actions are required by Alternative 1, fish tissue monitoring could take place less frequently, e.g., about every twenty years, so that any significant increase in fish methylmercury levels could be detected and public outreach and education programs could be modified.

In addition to the fish monitoring described above, ambient water column monitoring must take place:

- The aqueous methylmercury goal of 0.06 ng/l for ambient Delta water is the annual, average concentration in unfiltered samples. For comparison of Delta waterways and tributary methylmercury concentration data with the aqueous methylmercury goal, water samples should be collected periodically throughout the year and during typical flow conditions as they vary by season, rather than targeting extreme low or high flow events. Ambient water monitoring should take place at the same locations as the fish methylmercury compliance monitoring as well as at the tributary inputs. Ambient water monitoring should take place for at least one year before the fish monitoring takes place. Aqueous methylmercury data may be collected by the Central Valley Water Board or required of project proponents.
- Delta outflows to the San Francisco Bay must comply with the total mercury allocation assigned to the Delta by the San Francisco Bay mercury TMDL implementation program, which requires a decrease in mercury loads of 110 kg/year from existing conditions. In addition, Suisun and Grizzly Bays in the San Francisco Bay region may contribute methylmercury to the western Delta by way of tidal pumping. As resources are available, the Central Valley and San Francisco Bay Water Boards should periodically monitor methylmercury and total mercury in ambient water in the western Delta and Suisun and Grizzly Bays to track progress in meeting the implementation goal for methylmercury in ambient water in the western Delta and the total mercury allocation for Delta outflows to San Francisco Bay.
- The Central Valley Water Board would continue monitoring methylmercury in Delta tributaries as part of developing TMDLs for those tributaries and implementing the Delta TMDL.
- Responsible parties in the Delta and tributaries will need to monitor total mercury and methylmercury in ambient water.

4.3.5 Reporting Schedule & Adaptive Management

All three implementation alternatives would incorporate an adaptive management approach that evaluates additional information as it becomes available and adapts the risk management and control programs so that effective and efficient actions can be taken. Alternative 1 could have the following schedule:

- In 2010 and 2012 [two and four years after the effective date of the proposed amendments] and every three years thereafter, staff would report to the Central Valley Water Board the local and State agencies' and dischargers' progress with developing and implementing programs to reduce methylmercury exposure to people who eat Delta fish.
- In 2010 and every 20 years thereafter, staff would report to the Central Valley Water Board the recent fish mercury monitoring results, compare the results to the fish tissue mercury objectives to determine improvement or worsening, and recommend how the results could be integrated into risk management efforts.

Alternatives 2 and 3 could have the following schedule for Phase 1 of their implementation programs, assuming that the USEPA approves the proposed fish tissues objectives and implementation plan in 2008:

- In 2009 and 2011, staff would report to the Central Valley Water Board the responsible parties' progress towards compliance with required characterization and control studies and implementation actions described in the following sections.
- In 2010 and 2012 [two and four years after the effective date of the proposed amendments] and every three years thereafter, staff would report to the Central Valley Water Board the local and State agencies' and dischargers' progress with developing and expanding programs to reduce methylmercury exposure to people who eat Delta fish.
- In 2016, staff would update the TMDL methyl and total mercury source analyses and reevaluate implementation strategies using information from the characterization and control studies and other available scientific information.
- By December 2016, the Central Valley Water Board would evaluate the completed studies, proposed management practices, implementation schedules, and environmental impacts of proposed methylmercury control actions. The Central Valley Water Board then could adapt the TMDL to incorporate new and relevant scientific information. The Board could consider allowing any combination of the following for Phase 2 of the methylmercury TMDL implementation program: modification of methylmercury allocations or total mercury limits; adoption of management practices and implementation schedules for on-site methylmercury controls; or adoption of an offset program to compensate for loads in excess of the methylmercury allocations or total mercury limits.

As described above, fish tissue monitoring could be initiated five years after dischargers implement projects to reduce methylmercury and total mercury discharges and conducted every ten years thereafter to assess compliance with the fish tissue objectives. Other periodic ambient water monitoring and special studies also would likely take place. As a result, a reasonably foreseeable schedule for Phase 2 would be:

- Once the results of the first round of fish monitoring are available (about 2020), staff would report to the Central Valley Water Board the (a) responsible parties' progress towards

compliance with required implementation actions, (b) current fish and water methylmercury and total mercury levels throughout the Delta compared to conditions during Phase 1, and (c) any other monitoring and special study results and scientific literature. The Board could adapt the TMDL implementation program at that time to ensure effective control actions take place based on recent information. Any necessary modifications to the objectives, allocations, or implementation plan would be incorporated into the Basin Plan. The Basin Planning process would provide opportunities for stakeholder participation.

- In 2030, staff would provide progress reports to the Central Valley Water Board. If a source category or individual discharger cannot demonstrate achievement of its allocation despite implementation of all technically and economically feasible and cost effective control measures recognized by the Board as applicable for that source category or discharger, the Board could consider revising the allocation scheme and implementation plan.
- Every ten years thereafter, staff would provide progress reports to the Central Valley Water Board that track continued changes in Delta and Yolo Bypass ambient water and fish methylmercury levels resulting from natural erosion processes that remove total mercury deposited in creek beds and banks that could not otherwise be remediated, and the addition of any new local or global sources of methyl or total mercury. During each review, the Board could consider revising the allocation scheme and implementation plan to ensure that fish tissue objectives are ultimately achieved and maintained.

The following focusing questions, along with any additional questions developed in collaboration with stakeholders during each review, could be used to guide the Board's evaluation of the Delta methylmercury TMDL implementation program and any new information from monitoring, special studies, and scientific literature:

- Are the Delta and Yolo Bypass progressing toward attainment of the fish tissue objectives as expected? If it is unclear whether there is progress, how should monitoring efforts be modified to detect trends? If there has not been adequate progress, how might the implementation actions or allocations be modified?
- What are the methylmercury loads for the various source categories, how have these loads changed over time, and how might source control measures be modified to improve load reduction?
- Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should the TMDL be modified?
- Are effective risk management activities in place to reduce human and wildlife exposure to methylmercury? If not, how should these activities be modified or enhanced?
- Are watershed total mercury and methylmercury control actions proceeding as expected? Are any additional actions needed to protect water quality?

4.3.6 Actions to Reduce Total Mercury in Cache Creek Settling Basin Outflows

Both Alternatives 2 and 3 include actions to reduce total mercury from the Cache Creek Settling Basin. The basin is the largest single source of mercury-contaminated sediment to the Delta.

The Cache Creek Settling Basin is a 3,600-acre structure located at the base of the Cache Creek watershed that discharges to the Yolo Bypass just west of the Sacramento Airport. The basin was constructed in 1937 to contain sediment that would otherwise build up in Yolo Bypass and decrease its ability to protect the Sacramento region from flooding.

The basin was modified in 1993 to increase its sediment trapping efficiency. It currently traps about 52% of the sediment volume input from the watershed. The basin has a USACE-designed project life of 50 years with an average sediment trapping efficiency of about 50% over the entire project life (CDM, 2004a; USACE, 2005). The sediment trapping efficiency of the basin will decrease as it fills. The basin will fill to its design capacity in about 35 years, and its trapping efficiency may reach zero in about 50 years, unless a maintenance program is established. At this time, no maintenance program to maintain the trapping efficiency or life of the basin is in place. Most of the inorganic mercury in Cache Creek is transported on sediment; hence, about 64% of the sediment and total mercury mass (when the volumes of sand, uncompacted silt and clay are converted to sediment mass; see CDM, 2004b, Table 4-3) input to the basin is trapped. However, even though the basin traps a large portion of the mercury that comes into it, the basin still accounts for about 60% of all inorganic mercury that enters the Yolo Bypass.

The Cache Creek Settling Basin consists of levees, a roller compacted concrete outlet weir, a low-flow outlet structure, low-flow channels, internal inlet training channel and levee, and patrol roads and access ramps (CDM, 2004a and 2004b). The USACE constructed the basin in 1937, completed improvements in 1993, and turned over operation and maintenance of the basin to DWR in 1994. USACE's draft sediment management plan includes the following activities to maintain an average trapping efficiency of 50% over the 50-year life of the basin: construction and maintenance of a training channel and levee, incremental removal of the existing training levee, and raising of the outlet weir in year 25 (~2018) of the basin project. Although the USACE's draft sediment management plan for the basin has not been finalized, DWR has done some maintenance activities in the settling basin including vegetation clearing, levee maintenance, and minor sediment removal projects.

The 1979 Environmental Statement prepared by the USACE described expected maintenance activities, which included annual removal of sediments. However, the current draft operation and maintenance plan does not include excavation or dredging of the main portion of the basin; as previously noted, the basin is expected to be filled to design capacity at the end of the project life (50 years) in about 2042 (CDM, 2004a and 2004b). Thus, settling basin operation and maintenance activities (i.e., raising the outlet weir and periodic sediment removal) could be considered part of the baseline project and not need additional environmental or cost analyses. These activities were recognized early on as reasonably foreseeable methods of compliance for reducing settling basin total mercury discharges. To be thorough, Alternatives 2 and 3 include requirements for basin maintenance and the alternatives analysis includes a discussion of possible costs and environmental effects due to operation and maintenance activities.

Initial modeling results (CDM, 2004b, Table 4-3) indicate that basin trapping efficiency increases from the current 64% to 68-75% (in terms of sediment and mercury mass loads) could be accomplished by several means: (1) raising the outlet weir early (e.g., in 2013 instead of 2018), (2) excavating the basin (e.g., periodically remove sediment that has accumulated in the basin),

(3) enlarging the basin, or (4) a combination of excavating and raising the weir early, or enlarging the basin and raising the weir early. The modeling results indicated that the combination of excavating the basin and raising the weir early produced the largest increase (from 64% to 75% trapping efficiency) in trapped sediment and mercury. Additional periodic excavation would likely be necessary to maintain the trapping efficiency for total mercury mass loading at 75% so that its efficiency would not decline over time.

Alternatives 2 and 3 require improvements to the basin to increase its sediment- and mercury-load trapping efficiency to 75%. This would require the agencies responsible for Cache Creek Settling Basin operations and maintenance (e.g., DWR and Reclamation Board) to implement a plan to improve and maintain the trapping efficiency of the basin to reduce its total mercury discharge to the Yolo Bypass during Phase 1. As previously noted, USACE's draft sediment management plan already includes the construction and maintenance of a training channel and levee, incremental removal of the existing training levee, and raising of the outlet weir in year 25 (2018) of the basin project, but does not include excavation or dredging of the main portion of the basin.

Reasonably foreseeable methods to comply with the basin improvement requirements include structural modifications to increase the trapping efficiency (raise the outlet weir, excavate the basin, and/or expand the size of the basin) and periodic removal of contaminated sediment to maintain the trapping efficiency. Raising the outlet weir to final specifications would involve adding six feet of concrete to the existing structure; other levee improvements are not expected to be needed as they are already at design elevations. Increasing the size of the basin would require purchase of adjacent land and construction of new levees. Periodic sediment removal would require excavation equipment and trucks to transport the material outside the basin. Because the sediment likely does not contain hazardous concentrations of mercury, the sediment could be used for building materials, landfill cover, or other construction projects. Erosion control would be required to minimize erosion of the material back into surface waters. The environmental affects of these construction and maintenance activities are summarized in Section 4.4.1 and described in more detail in the CEQA analysis in Chapter 7.

As part of the program to make improvements to the Cache Creek Settling Basin, the raising of the outlet weir may take place earlier than previously planned by the USACE (e.g., 2013). However, because this activity was already planned, it is considered a baseline condition, although there may be some cost considerations if the activity occurs earlier. Improving the basin's efficiency also would likely entail periodic excavation to maintain the trapping efficiency at 75% and thereby extend the life of the basin. Early plans for the basin's maintenance and sediment management call for the periodic removal of sediment accumulated within the basin to maintain flow capacities. However, the latest draft operation and maintenance (O&M) plan does not mention sediment removal. For this reason, excavation of the basin is not considered a baseline condition. Any additional improvements to the basin (other than raising the weir, excavation, and expansion) are speculative and will be discussed in future Basin Planning documents.

Although Alternatives 2 and 3 could require basin improvements not previously planned by the USACE and DWR, new property easements for the improvements will not be required. Land within the Cache Creek Settling Basin was condemned for the purposes of managing sediment

from the Cache Creek watershed as documented in a settlement between the State of California and the landowners (Final Order of Condemnation, 14 July 1995). The State has easements in the basin to flow and impound water and sediment, excavate and remove sediment, and clear and remove any obstructions or vegetation for operations and maintenance of the basin. In addition, the landowners acknowledged that the State may modify, enlarge, or implement future modifications and improvements to the basin that may cause additional flood flows, material deposition, and other physical changes, and the Final Order of Condemnation allows the modifications, enlargements, and improvements to be implemented.

4.3.7 Monitoring Requirements for Sources Assigned Methylmercury Allocations

Both Alternatives 2 and 3 would include monitoring requirements for sources with methylmercury allocations in the Delta and Yolo Bypass. Both alternatives would have allocation-related monitoring requirements for the following sources in the Delta and Yolo Bypass: NPDES facilities; large MS4s entirely within the Central Valley Water Board's jurisdiction;[25] and irrigated agriculture and managed wetland areas. The following describes reasonably foreseeable means of compliance with the monitoring requirements.

Both Alternatives 2 and 3 would require a monitoring program for agriculture and wetlands in all Delta/Yolo Bypass subareas except the Central and West Delta subareas. The Central and West Delta subareas do not require methylmercury source reductions,[26] and would not require a monitoring program unless new agricultural or wetland restoration projects were implemented in the Central and West Delta subareas that had the potential to increase ambient methylmercury levels. The monitoring program would be developed as a component of the Phase 1 methylmercury studies described in the following section and would be essentially the same for both alternatives. The primary difference between the alternatives would be that Alternative 3 would require entities responsible for smaller irrigated agriculture and managed wetland areas to participate in the Phase 1 methylmercury studies.

The goal of the monitoring program would be to estimate the sum of annual methylmercury loads produced by the multitude of agriculture and wetland areas in each subarea for comparison to the subarea allocations. The monitoring program would assess the variety of wetland and agriculture types in the Delta/Yolo Bypass and establish periodic monitoring at representative sites. Monitoring would evaluate irrigation/intake water, discharge and receiving water volumes and methylmercury concentrations at a frequency that addresses seasonal variability and varying management practices throughout the year. Water Quality Coalitions

[25] The Contra Costa County MS4 discharges to both the Delta (CAS083313) and San Francisco Bay (CAS029912). Most of the MS4's service area falls within the San Francisco Bay Water Board's jurisdiction. Therefore, during Phase 1 of the Delta Mercury Control Program, Central Valley Water Board staff recommends that the mercury control requirements approved by the San Francisco Bay Water Board (Resolution R2-2006-0052) for the Contra Costa County MS4 be applied to its service area within the Central Valley Water Board's jurisdiction, which includes: (1) monitoring concentrations of methyl and total mercury in its urban runoff discharges and receiving waters, and (2) implementing management practices to reduce total mercury discharges.

[26] Irrigated agriculture and wetlands in the Central and West Delta subareas would require monitoring only if wetland restoration projects or widespread changes in agricultural crops or practices were to take place. Refer to Section 4.3.12, "Actions to Minimize Methyl and Total Mercury from New or Expanded Sources".

established under the Irrigated Land Regulatory Program (ILRP) currently have monitoring programs that evaluate surface waters that receive discharges from agricultural and wetland areas in the Delta/Yolo Bypass, but those programs do not include analyses for methylmercury, nor sampling of irrigation or discharge waters except when special studies are conducted. Hence, a reasonably foreseeable method of compliance with the monitoring requirements for wetlands and agriculture would be for the existing ILRP monitoring programs to add methylmercury analyses to their current receiving water monitoring locations and to incorporate additional monitoring locations representative of discharges from the variety of wetland and agriculture types in the Delta/Yolo Bypass.

Both Alternatives 2 and 3 require a monitoring program for the Cache Creek Settling Basin as an inherent component of the Phase 1 methylmercury characterization studies described in Section 4.3.8. The purpose of the monitoring would be to characterize methyl and total mercury concentrations and loads in import and export waters during varying flow regimes.

Both Alternatives 2 and 3 would require all NPDES facilities in the Delta/Yolo Bypass to monitor methylmercury and total mercury in their effluent and receiving water and submit the monitoring results in annual reports. Facilities that discharge to surface water already are required to monitor their effluent and receiving water for other constituents regulated by effluent limits mandated in NPDES permits (e.g., monthly monitoring for facilities that discharge greater than 1 mgd and quarterly monitoring for facilities that discharge less than 1 mgd) and to submit annual reports. Effluent and receiving water monitoring for compliance with the CTR criterion of 50 ng/l total recoverable mercury is a current NPDES permit requirement for WWTPs and therefore is considered a baseline condition for Basin Plan amendments. Regular methylmercury monitoring would be a new monitoring constituent for most facilities.

Alternatives 2 and 3 would not require the establishment of new monitoring programs or monitoring frequencies; however, methylmercury would be a new monitoring constituent for two of the MS4s (Stockton and Tracy MS4s). Both Alternatives 2 and 3 would require large MS4s that intersect the Delta and are entirely within the Central Valley Water Board's jurisdiction (Sacramento, Stockton, and Tracy MS4s) to monitor methylmercury and total mercury at representative urban runoff sites and to submit the monitoring results in annual reports. These large MS4s already have monitoring programs that evaluate a variety of constituents, including total mercury, at representative urban runoff sites during wet and dry weather conditions and submit the monitoring results in annual reports.

4.3.8 Methylmercury Characterization and Control Studies

Alternatives 2 and 3 require entities responsible for existing and new methylmercury sources in the Delta, Yolo Bypass and tributary watersheds downstream of major dams to conduct methylmercury characterization and control studies. Source categories include WWTPs, urban runoff, agricultural return flows, wetlands, water management activities that have the potential to

affect methylmercury levels in the Delta,[27] and the Cache Creek Settling Basin. Alternative 3 would require more entities to participate in the studies than Alternative 2. Appendix C identifies the entities within each source category responsible for characterization and control studies under the two alternatives. Characterization studies would evaluate methyl and total mercury concentrations and loads in source/irrigation waters, discharges, and receiving waters. Control studies would identify variables that control methylmercury production, develop management practices, and determine implementation schedules to reduce methylmercury loads. If characterization study results indicate that particular discharges do not act as a net source of methylmercury, the responsible parties for those discharges would not be required to conduct control studies. Both alternatives would require the characterization and control studies to be completed during Phase 1.

Reasonably foreseeable methods of compliance with the study requirements include planning for the studies, data collection and analysis, development of management practices to reduce methylmercury discharges, and on-the-ground pilot projects to evaluate the effectiveness of potential management practices. The studies could be conducted by individuals or by collaborative groups based on discharge source type. Staff highly recommends that a technical advisory committee (TAC) of independent, nationally or internationally recognized mercury experts be formed to review study designs, evaluate results, propose follow up experiments and make recommendations on whether sufficient information is available to implement management practices. The studies could have the following timeline, assuming that the Basin Plan amendments become effective in 2008:

- 2009: Staff reports to the Central Valley Water Board the progress towards formation of the TAC.
- 2009: Each discharger, or entities representing dischargers, provides to the Board a report that describes how individual dischargers or groups of discharger or coalitions will implement the methylmercury characterization and control studies. For dischargers conducting coordinated studies, the report should include a list of the dischargers participating in the study.
- 2010: Dischargers or entities representing dischargers, submit study workplans to Board staff for approval by the Executive Officer. The workplans should contain a general description of all the studies that need to be done and a detailed description for the initial work to be accomplished in the following two years. The TAC may review the workplans and provide input indicating whether the studies are likely to characterize methylmercury production and control. Staff would review the workplans, including the recommendations of the TAC, and report to the Board on whether satisfactory progress is being made.
- 2012: Dischargers, or entities representing dischargers, submit a report to Board staff documenting progress towards complying with the study requirements and management practice development. The report should include workplans for any additional studies needed to address methylmercury and total mercury characterization or control. The TAC

[27] Water management activities that have the potential to affect methylmercury levels in the Delta include water deliveries to, diversions from, and storage within the Delta; changes to salinity standards or operations to maintain salinity standards; flood conveyance; and dredging projects and activities that reuse dredge material.

may evaluate the scientific basis of the findings to date and recommend what additional studies should be undertaken. Staff would review the workplans (including the recommendations of the TAC) and report to the Board on whether satisfactory progress is being made.

- 2015: Dischargers, or entities representing dischargers, complete the studies and submit to Board staff a final report that presents the study results and descriptions of methylmercury control options, their preferred methylmercury controls, and proposed implementation schedules for achieving methylmercury allocations and/or total mercury limits. The reports may contain a statement from the TAC on whether they agree with the study findings and whether the preferred management practices are ready for implementation. If the Board determines that existing and new dischargers are making sufficient progress towards completing the studies, it could consider extending the time for the studies' completion and implementation of control options. If insufficient progress is made, the Board could consider a prohibition of individual methylmercury discharges or other control options.

Entities not identified in Appendix C are not subject to Alternative 2 and 3 study requirements but could be subject to future mercury control programs in upstream tributary watersheds and therefore should consider participating in coordinated mercury control studies during Phase 1.

4.3.9 Development of Phase 2 Offset Program, Phase 1 Offset Pilot Projects & Early Implementation of Total Mercury Reduction Efforts

1. Development of Phase 2 Offset Program

Under Alternatives 2 and 3, the Central Valley Water Board may consider adoption of an offset program for Phase 2, if necessary, that would allow dischargers to offset total mercury and/or methylmercury in excess of requirements by implementing more feasible or cost effective projects elsewhere in the watershed. Participation in the offset program would be allowed only after dischargers have completed characterization and control studies, as described earlier, and clearly demonstrated that it may be more feasible or cost effective to remove methyl and/or total mercury elsewhere. The offset program must be: (a) consistent with any State Board offset policy, (b) developed in coordination with the State Board, USEPA, dischargers, and other stakeholders, and (c) reviewed at a public workshop. Appendix C evaluates potential costs associated with the development of a Phase 2 offset program. Any type of Phase 2 offset program would be implemented by a future Basin Plan amendment. Reasonably foreseeable methods of compliance and any costs and environmental affects associated with those methods will be evaluated as part of the Basin Planning process for the future Basin Plan amendment.

2. Phase 1 Pilot Offset Projects

During Phase 1, Alternatives 2 and 3 would allow all mercury and/or methylmercury dischargers to conduct voluntary pilot offset projects. The pilot offset projects could achieve one or more of several goals: accomplish early implementation of mercury reduction projects; provide information that can be used to develop the Phase 2 offset program; and/or allow dischargers to earn credit to offset methylmercury allocation and total mercury limit requirements during

Phase 2. To be most useful, the pilot offset projects should focus on projects that can be implemented relatively quickly. The Central Valley Water Board must approve any pilot offset project. During the pilot program, staff recommends that any discharger proposing a pilot offset project must also conduct characterization and control studies to determine the feasibility of on-site controls for its own methylmercury and total mercury discharges.

Alternatives 2 and 3 should include the following criteria to evaluate proposed Phase 1 pilot projects:

- Proposed projects will be evaluated and credits calculated based on estimates of reductions in loads of total mercury and/or methylmercury that would be expected to be achieved on an annual basis in the Delta or Yolo Bypass. The offset proponent must submit documentation on reductions in total mercury or methylmercury loading measured at the project site as well as reductions expected to be achieved in the Delta or Yolo Bypass.
- In cases where the site for the pilot project has a methylmercury allocation and the owner of the site intends to keep a portion of the credits generated from the offset demonstration project, the partners in the project must document how credit for the project will be apportioned.
- The implementation of pilot offset projects must not result in changes to the methylmercury allocations that are applicable in each subarea of the Delta/Yolo Bypass. If a pilot offset project occurs within the same Delta/Yolo Bypass subarea or upstream watershed as the offset proponent's discharge, no changes in other source allocations would be needed for that subarea. The Central Valley Water Board can consider approving pilot projects in an adjacent subarea or watershed when it can be demonstrated that the pilot offset project will provide substantial Delta-wide benefits. In this case, load and waste load allocations for other sources within or upstream of the subarea of the offset proponent's discharge would need to be adjusted.
- Projects expected to result in long-term annual load reductions (e.g., more than 20 years) are preferred. However, the Central Valley Water Board may consider approving a pilot offset project that is not expected to result in long-term reductions if the project would result in substantial short-term improvements.

Alternatives 2 and 3 would require that pilot offset project proponents submit documentation of the total mercury and/or methylmercury reduction achieved after the project is implemented in order to receive offset credit. Staff recommends that methylmercury and total mercury credits earned in the pilot program be used to extend time schedules for compliance with methylmercury by up to five years. For example, an NPDES-permitted facility with an allocation compliance schedule of 2030 could extend its schedule to 2035 if it has accrued adequate credits.

Methylmercury and/or total mercury load reductions from the following sources would be acceptable for credit accrual: mercury and gold mine sites, Cache Creek Settling Basin, in-stream contaminated sediments, NPDES facility and MS4 discharges, wetlands, irrigated agriculture, flood conveyance and water management activities, or other Board-approved projects.

Implementation of pilot offset projects during Phase 1 would constitute a voluntary effort on the part of dischargers that want to accrue offset credit and extend their allocation compliance schedule using less expensive means than on-site control actions and/or conduct projects that would have more environmental benefit than reducing their on-site discharges for five years. Implementation of many watershed projects to reduce total mercury and methylmercury loads are expected to take place during Phase 1 and Phase 2 even if there were no Phase 1 pilot projects or Phase 2 offset program. Completion of voluntary pilot offset projects would result in cleanup actions taking place more quickly. However, there are reasonably foreseeable Phase 1 administrative and study efforts associated with obtaining approval for pilot offset projects:

1. Development and approval of a pilot offset project credit strategy by the Central Valley Water Board in coordination with the State Board, USEPA, dischargers and other stakeholders; and
2. Evaluation of the relative potential for inorganic mercury and/or methylmercury from different sources (e.g., the project proponent's discharge compared to the pilot offset project's discharge) to enter the food web in the Delta and Yolo Bypass.

Implementation of pilot offset projects could result in more immediate fish mercury reductions. In addition, use of the accrued credit is expected to reduce the overall cost of compliance with the proposed methylmercury allocations under both Alternatives 2 and 3. However, there could be substantial administrative and implementation costs associated with a pilot project conducted in a watershed different from the project proponent's own discharge, particularly if its accrued credit were used to allow the project proponent to increase its discharge over an indefinite period (e.g., versus a five year extension of its allocation compliance schedule). For example, if a project proponent discharges to the San Joaquin subarea of the Delta, but implements a pilot project in the Cache Creek watershed, which discharges to the Yolo Bypass subarea, the pilot project would result in no improvement for the San Joaquin subarea. If the project proponent wanted to use its accrued offset credits for its discharge to the San Joaquin subarea, it may be necessary to adjust methylmercury allocations to reduce the other discharges to the San Joaquin subarea to ensure that the fish tissue objectives are met in the San Joaquin subarea.

3. Early Implementation of Total Mercury Reduction Efforts

In addition to accumulating offset credits by implementing Central Valley Water Board approved pilot mercury offset projects, staff recommends that the Board consider approving credit for dischargers that can demonstrate early reduction of their total mercury discharges. NPDES permits for the SRCSD and Stockton WWTPs allow them to accumulate total mercury mass credit if they can demonstrate that they have implemented mercury reduction programs and can document total mercury discharges below their annual mass limits. The Delta TMDL implementation program and future upstream TMDL programs must address any such total mercury mass credit accrued by dischargers according to their permit conditions. In addition, to be consistent and fair, staff recommends that both Alternatives 2 and 3 for the Delta TMDL implementation program should allow other facilities in the Delta and its upstream tributary watersheds downstream of major dams to accrue and use total mercury mass credit if they can demonstrate that they, too, have implemented effective mercury reduction measures and can document resulting total mercury load reductions. Staff also recommends that facilities be able to use accrued total mercury credit to extend their compliance schedules for achieving

methylmercury wasteload allocations by five years, as recommended for credit accrued from pilot offset pilots.

Numerous facilities in the Delta and its tributary watersheds downstream of major dams potentially could have the opportunity to request Board approval for credit for total mercury reductions because:

- Fifteen facilities are required by their NPDES permits to implement some type of mercury minimization program (e.g., pollution prevention plans for mercury defined by Section 13263.3 of the California Water Code or other mercury reduction efforts) (Table C.22 in Appendix C).
- Twenty-seven facilities are required to implement pretreatment programs (Table C.22).
- Between 2000 and 2007, 23 facilities were required by their permits to begin maintaining total mercury mass limits (Table C.24).
- Future NPDES permits are expected to include total mercury mass limits until the Delta and upstream waterway mercury TMDLs have been approved by the USEPA.

Staff recommends that Alternatives 2 and 3 incorporate the following guidance:

- The Central Valley Water Board should consider approving credit for dischargers that can demonstrate that they have implemented mercury control programs and can document measurable improvements in their effluent quality with regards to the discharge of total mercury and/or methylmercury between 2000 and the effective date of the Basin Plan amendments (expected to be 2008).
- Methylmercury and total mercury credits accrued as a result of effluent quality improvements may be used to extend the time schedules for compliance with methylmercury allocations to the extent sufficient credit has accumulated, not to exceed five years.

The Sacramento Regional County Sanitation District (SRCSD) has been evaluating mercury reduction projects to improve the understanding of how offset projects may be used to effectively achieve the goals of mercury reduction in the Sacramento-San Joaquin Delta by offsetting mercury and methylmercury in discharges from the SRCSD's Sacramento River WWTP. SRCSD evaluated offset projects at mercury mines, Sulphur Creek, and the Cache Creek Settling Basin, and worked with a large stakeholder group to evaluate the technical and legal issues of these projects. SRCSD plans to propose a pilot offset project that will follow the requirements included in this section and the project will be brought back to the Regional Water Board for consideration. In addition, SRCSD has implemented mercury control programs and documented significant improvements in effluent quality from the Sacramento River WWTP for mercury and methylmercury discharges since 2003.

Staff recommends that the Central Valley Water Board recognize these efforts and grant credits for SRCSD's activities in accordance with the following:

1. Central Valley Water Board Order No. 5-00-188 (NPDES Permit No. CA 0077682) established a maximum annual mass discharge limitation of total mercury to the Sacramento River, and allowed the accumulation of credits and debits for total mercury discharges below and above the annual mass limitation. Any net mass credit of total

mercury accumulated under Order No. 5-00-188 and subsequent revisions to this NPDES permit, and the equivalent mass credit of methylmercury (100 grams of methylmercury per kilogram of total mercury, the average methylmercury to mercury ratio in SRCSD's effluent) will be available to offset its methylmercury allocation up to the extent sufficient credit has accumulated.

2. Methylmercury and total mercury credits accrued as a result of effluent quality improvements and credits accrued as a result of any pilot offset project that is implemented may be used to extend the time schedule for compliance with the methylmercury wasteload allocation for the Sacramento River WWTP by up to five years, and shall not be used to extend its compliance schedule beyond 2035.
3. These provisions will not affect any other provisions of the Delta Mercury Control Program.
4. Accrual of mercury and methylmercury credits accumulated under Order No. 5-00-188 and subsequent revisions to this NPDES permit will cease after the effective date of the proposed Basin Plan amendments.

As with the credit strategy for pilot offset projects, early implementation of total mercury discharge reduction efforts could result in more immediate fish mercury reductions. Use of accrued credit is expected to reduce the overall cost of compliance with the proposed methylmercury allocations under both Alternatives 2 and 3. However, there could be substantial administrative and implementation costs associated with use of accrued credit to allow a discharger to increase its discharge over an indefinite period (e.g., versus a five year extension of its allocation compliance schedule). For example, if a discharger in the San Joaquin subarea wanted to use its accrued credits later in Phase 2 or Phase 3 of the Delta TMDL implementation to allow it to increase its discharge, it may be necessary to adjust methylmercury allocations to reduce the other discharges to the San Joaquin subarea to ensure that fish tissue objectives continue to be met in the San Joaquin subarea.

4.3.10 Phase 2 Actions to Reduce Methylmercury Inputs from Existing Sources

Attainment of the methylmercury allocations set forth by Alternatives 2 and 3 are expected to result in achieving the fish tissue objectives. Methylmercury allocations for sources to the Delta and Yolo Bypass will be achieved chiefly by (1) implementation and ongoing maintenance of Phase 2 actions to address methylmercury sources in the Delta, Yolo Bypass and tributary watersheds, (2) total mercury and methylmercury control actions for upstream TMDL implementation programs, and (3) natural erosion that removes total mercury deposited in creek beds and banks.

This section describes reasonably foreseeable actions that could be taken during Phase 2 to reduce methylmercury discharges to the Delta and Yolo Bypass from existing local and upstream sources. The methylmercury characterization and control studies conducted under Phase 1 of Alternatives 2 and 3 are expected to increase the number of methylmercury control options and to determine the most effective methylmercury control options. The costs and environmental effects of control options developed by the Phase 1 characterization and control studies would be evaluated during future Basin Planning efforts at the end of Phase 1.

The methylmercury allocations described in Section 4.3.2 for Alternatives 2 and 3 would direct which entities within the Delta and Yolo Bypass would be required to take methylmercury reduction actions. However, if the Phase 1 studies do not determine feasible means of on-site methylmercury control for all sources required to make reductions, and a mercury offset program is not approved by the beginning of Phase 2, the allocation scheme for either Alternative 2 or 3 would likely need to be revised. TMDLs programs and other source analyses scheduled for upstream water bodies will determine which entities within and upstream of the Delta and Yolo Bypass will be responsible for taking action during Phase 2 and beyond.

1. NPDES-permitted WWTPs

Sixteen WWTPs in the Delta and Yolo Bypass have methylmercury allocations. Under Alternative 2, ten of these are not required to make reductions to their effluent methylmercury load because they discharge less than 1 mgd, their effluent acts as dilution (i.e., their effluent average methylmercury concentrations are less than the methylmercury goal for ambient water, 0.06 ng/l), they have no available data, and/or they discharge to the Central Delta or West Delta subareas, which do not require source load reductions. Alternative 3 requires all facilities with average effluent methylmercury concentrations greater than 0.06 ng/l to make reductions if they discharge to subareas where fish tissue objectives are exceeded. Under Alternative 3, eight WWTPs are not required to make reductions to their effluent methylmercury load.

As described later in Section 4.3.12, Alternative 3 requires municipal WWTPs that discharge greater than 1 mgd in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams to implement programs to minimize total mercury discharges during Phase 1. Total mercury and methylmercury reductions associated with this action alone may enable some WWTPs in the Delta and Yolo Bypass to achieve and maintain their methylmercury allocations. WWTPs that discharge less than 1 mgd to the Delta and Yolo Bypass also could implement total mercury minimization programs to reduce effluent methylmercury levels. Other reasonably foreseeable methods of compliance with the methylmercury allocations could include, but are not limited to, the following actions:

(a) Implement additional secondary[28] or advanced treatment processes to further reduce particle-bound methyl and total mercury, e.g., by increasing retention in aeration tanks, increasing retention in the primary and secondary clarifiers, and/or employing tertiary processes (e.g., reverse osmosis and multimedia filtration).

(b) Incorporate ultraviolet radiation disinfection in coordination with advanced filtration, which could conceivably promote photo-demethylation of the remaining methylmercury in the effluent.

(c) Increase effluent disposal to land.

(d) Participate in an offset program (if one is approved by the Water Board) (see Section 4.3.9).

[28] Fate and transport studies conducted by the Sacramento Regional County Sanitation District and the San Jose/Santa Clara Pollution Control Plant indicated that most of the decrease in methylmercury concentrations is realized during secondary treatment (SJ/SC, 2007; Palmer *et al.*, 2005).

Neither Alternative 2 nor 3 includes numeric load limits for total mercury discharges from WWTPs. However, there is a possibility that, after the Phase 1 methylmercury characterization and control studies are completed, capping or reducing total mercury discharges from some WWTPs may be one of the only feasible methods to reduce ambient methylmercury levels in the Delta and Yolo Bypass. At this point it is speculative if the Central Valley Water Board will adopt total mercury load limits in Phase 2. Even so, the above paragraphs describe reasonably foreseeable methods of compliance with total mercury load limits (if any are adopted for Phase 2) as well as the proposed methylmercury load limits.

2. NPDES-permitted MS4s

Alternative 3 requires all MS4s that discharge to the Delta, Yolo Bypass or their tributaries downstream of major dams to implement BMPs to control erosion and sediment discharges to the maximum extent practicable. Alternative 3 also requires large MS4s (Sacramento, Stockton and Tracy) to implement pollution prevention measures and BMPs to the maximum extent practicable to control total mercury discharges. Because mercury and methylmercury are typically particle-bound, BMPs to control erosion and sediment transport will be effective in reducing mercury discharges. This action alone may enable some MS4s in the Delta and Yolo Bypass to achieve and maintain their methylmercury allocations and Phase 1 concentration limits under either Alternative 2 or Alternative 3. Other reasonably foreseeable methods of compliance with the methylmercury allocations could include, but are not limited to, the following actions:

- Implementation of BMPs to reduce erosion and sediment transport, which are already required under existing individual and general NPDES permits;
- Modification of storm water collection and retention systems to reduce methylmercury production, for example, installation of aerators in basins may promote degradation of methylmercury in the water column, and removal of sediment from basins would reduce the supply of inorganic mercury available for methylation;
- Implement pollution prevention measures such as:
    - Thermometer exchange and fluorescent lamp recycling programs;
    - Public education and outreach on disposal of household mercury containing products and replacement with non-mercury alternatives.
    - Education of auto dismantlers on how to remove, store, and dispose of mercury switches in autos.
    - Enhancement of household hazardous waste collection programs to better address mercury-containing waste products (potentially including thermometers and other gauges, batteries, fluorescent and other lamps, switches, relays, sensors and thermostats).
    - Survey of use, handling, and disposal of mercury-containing products used by the Sacramento, Stockton and Tracy permittee agencies and development of a policy and time schedule for eliminating the use of mercury containing products by the permittees.
- Participation in an approved offset program (see Section 4.3.9).

Such methods of compliance could conceivably be implemented by just large MS4s under Alternative 2 and both large and small MS4s under Alternative 3 to achieve and maintain methylmercury allocations.

3. Managed Wetlands

Alternatives 2 and 3 require Phase 1 characterization and control studies to evaluate feasible methods to address methylmercury produced by existing permanent and seasonal wetlands. It is speculative to guess where and which methylmercury reduction management practices would be incorporated at existing wetland sites during Phase 2. However, a range of possibilities for methylmercury allocation compliance for existing wetlands could include, but not be limited to:

- Modify managed wetlands' design, e.g., water depth, flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands), vegetation types, and vegetation density (dense cover or more open water);
- Modify managed wetlands' discharge patterns, e.g., hold irrigation water on-site longer at seasonal wetlands to allow methylmercury concentrations to decrease before discharging the water or otherwise transfer and re-use the water at another marsh to decrease the amount of discharge; and
- Participate in an approved offset program (see Section 4.3.9) to reduce total mercury in the irrigation water obtained from surface water sources.

Such methods of compliance conceivably could be required for more wetland areas under Alternative 3 than under Alternative 2. Both Alternatives 2 and 3 would require methylmercury reductions from wetlands that act as sources of methylmercury to Delta/Yolo Bypass subareas that need methylmercury source reductions.

Preliminary results from ongoing wetland studies (see Chapter 3 in the TMDL Report) indicate that seasonal wetlands may be overall net producers of methylmercury, while permanent wetlands may be overall less productive of methylmercury or even net sinks (that is, more methylmercury enters the wetlands than leaves). If a similar pattern is observed by the Phase 1 characterization and control studies, then Phase 2 control practices may focus on seasonal wetlands in the Delta/Yolo Bypass subareas that require source reductions. Subareas that require methylmercury source reductions include the Yolo Bypass, Sacramento, San Joaquin, Mokelumne, and Marsh Creek subareas. According to the USFWS National Wetlands Inventory (USFWS, 2006), there are about 14,400 acres of freshwater emergent wetlands in these subareas, about 11,800 acres (82%) of which are seasonal wetlands.

4. Irrigated Agriculture

The Delta is composed of 65 islands and tracts on about three-quarters of a million acres. Agriculture is the main land use, comprising more than half of a million acres. In addition, there are nearly two million acres of agricultural lands within 30 miles of the Delta. Limited methylmercury data are available for Delta island agricultural return flows. Preliminary sampling conducted during the summer of 2000 in five Delta island main drains indicates that the islands are a net source of methylmercury. The State Water Board has funded a study with Moss

Landing Marine Laboratories (Contract 04-235-150-0) to characterize methylmercury concentrations and loads from representative drains and to use the results to determine the overall contribution of the islands to the methylmercury mass balance of the Delta. The study also will determine land use practices that contribute disproportionately to annual methylmercury loads from one Delta island. The latter may prove valuable in identifying and focusing management practices on key land use practices. The study is being conducted in cooperation with local Reclamation Districts and should be completed in 2008.

If study results indicate that agricultural lands act as a source of methylmercury to the Delta, then responsible parties could be required under the Central Valley Water Board's Irrigated Lands Conditional Waiver Program to undertake studies to further characterize agricultural source and return waters. Parties responsible for agricultural lands that act as a source of methylmercury (e.g., agricultural lands discharge methylmercury loads that are greater than methylmercury loads in the irrigation water) would conduct control studies to determine feasible management practices to reduce methylmercury discharges. Responsible parties would be encouraged to use a watershed approach to coordinate the characterization and control studies.

Until the characterization and control studies are completed, it is speculative to guess which methylmercury reduction management practices would be incorporated at existing agricultural areas during Phase 2. A range of possibilities for methylmercury allocation compliance could include, but not be limited to:

- Modify return water discharge patterns, e.g., implement tailwater recovery systems to prevent discharge of irrigation water to receiving waters or hold irrigation water on-site longer to allow methylmercury concentrations to decrease (e.g., through photodegradation) before discharging the water;
- Utilize drip irrigation systems or other water-efficient systems to eliminate or limit irrigation runoff and discharge to the receiving water; and
- Participate in an approved offset program (see Section 4.3.9) to implement feasible reduction actions for upstream methylmercury sources.

Such methods of compliance could conceivably be implemented by more agricultural areas under Alternative 3 than under Alternative 2.

5. Methylmercury Flux from Open-Channel Sediments in the Yolo Bypass and Marsh Creek Subareas

The TMDL source analysis and allocations evaluation indicates that reductions will be needed in the open-water methylmercury contributions to the Marsh Creek and Yolo Bypass subareas under both Alternatives 2 and 3. One reasonably foreseeable method of compliance with the open water allocations for these subareas could be the reduction of total mercury inputs from upstream sources in order to decrease sediment mercury concentrations in the open channels and associated methylmercury production. Such upstream total mercury reduction efforts could be accomplished through projects carried out by the entities responsible for the open-channel areas in the Yolo Bypass and Marsh Creek subareas, or coordinated with Phase 1 pilot offset project proponents, other approved Phase 2 offset program projects, or upstream TMDL implementation programs. Section 4.3.11 describes reasonably foreseeable total mercury

control studies and projects that could take place to accomplish the open-water methylmercury allocations for the Yolo Bypass and Marsh Creek subareas.

6. Cache Creek Settling Basin

Alternatives 2 and 3 include a methylmercury allocation for the Cache Creek Settling Basin that requires a substantial reduction in methylmercury loading from the basin to Yolo Bypass. The Cache Creek watershed TMDL implementation plan, which was adopted by the Central Valley Water Board in October 2005, also contains a methylmercury allocation for the "Cache Creek Settling Basin Outflow" (see Table IV-6.1 of the Fourth Edition of the Basin Plan with February 2007 revisions). Staff proposes that the Cache Creek Settling Basin allocation be moved from the Cache Creek section of the Basin Plan implementation chapter to the Delta implementation section. This change would involve deleting the last line of Table IV-6.1 and adding a footnote referring the reader to the Delta implementation tables. This deletion would not change any goals or requirements in the Cache Creek mercury implementation plan. Although the estimate of methylmercury loading from the basin is higher in the Delta TMDL calculations (more data were available for the Delta TMDL source analysis), the methylmercury discharge allowed from the basin is essentially the same under the two implementation plans (12 and 13 g/yr calculated for the Cache Creek and Delta implementation plans, respectively).

Production of methylmercury in the Cache Creek watershed is positively correlated with the level of mercury in surficial sediment (Cooke and Morris, 2005). As a result, reducing total mercury loads transported to Cache Creek will reduce concentrations of mercury in sediment and is expected to reduce subsequent methylmercury production in both Cache Creek and the Cache Creek Settling Basin. A reasonably foreseeable method of compliance with the methylmercury allocation for Cache Creek Settling Basin discharges could be the reduction of in-basin methylmercury production through the reduction of the total mercury concentration of suspended sediment entering the basin from the Cache Creek watershed.

The Cache Creek watershed TMDL implementation plan includes cleanup activities at mercury mines in the watershed, control of erosion in mercury-enriched areas, and remediation/removal of contaminated floodplain sediment in the Cache Creek canyon and in Bear Creek. Such actions are expected to reduce mercury loads entering the Cache Creek Settling Basin by about 60 kg/year (Cooke and Morris, 2005). Natural erosion would further reduce sediment mercury concentrations to background levels (between 0.1 and 0.3 mg/kg, dry weight). Per the 2005 Basin Plan Amendment staff report for the Cache Creek watershed TMDL implementation plan, additional actions could take place in the watershed to achieve background mercury levels more quickly. For example, there could be select removal or remediation of sediments in lower Cache Creek streambeds and banks where mercury sediment concentrations are enriched (greater than 0.4 mg/kg). Though such actions were not a required element, the potential costs and environmental impacts of such actions were evaluated by the Basin Planning process for the watershed's mercury control program (Cooke and Morris, 2005). It is possible to conduct additional sediment mercury remediation efforts in the lower Cache Creek watershed to further stabilize or remove mercury-enriched channel sediment in order to decrease sediment mercury concentrations, and associated methylmercury production, in the basin at a faster rate than would be accomplished by the Cache Creek watershed mercury control program alone.

Until the Phase 1 characterization and control study for the basin has been completed, additional methylmercury control options that involve improvements to the Cache Creek Settling Basin are too speculative to evaluate. Additional improvements to the basin will be evaluated in future Basin Planning documents for Phase 2 of the Delta TMDL mercury implementation program.

7. Other Tributary Watersheds

Alternatives 2 and 3 include methylmercury allocations for tributary inputs to the Delta and Yolo Bypass. Under Alternative 2, large tributaries that discharge to the Delta/Yolo Bypass subareas where fish tissue objectives are not met would require reductions in their methylmercury concentration and associated loading; the methylmercury concentration and loading from smaller tributary inputs to these subareas and all tributary inputs to the Central and West Delta subareas would be capped. Table 4.3 lists which tributaries would require methylmercury reductions under the two alternatives.

Identified sources of methyl and total mercury in the Delta's tributary watersheds include geothermal springs, methylmercury flux from sediments in wetlands and open water habitats, municipal and industrial dischargers, agricultural drainage, urban runoff, atmospheric deposition, and erosion of naturally mercury-enriched soils and excavated overburden and tailings from historic gold and mercury mining operations. Reasonably foreseeable methods of compliance with the methylmercury allocations for tributary inputs to the Delta and Yolo Bypass under both Alternatives 2 and 3 could include any or all of the methods outlined in previous sections for WWTPs, MS4s, irrigated agriculture, wetlands, and open water methylmercury sources. In addition, another reasonably foreseeable method would be to focus total mercury reduction efforts on sources that supply mercury to hotspots of methylation in the tributary watersheds. Total mercury actions associated with this method are described in the Section 4.3.11.

Several upstream waterways are also on the CWA 303(d) List as impaired by mercury and are scheduled for TMDL development during Phase 1 of this project. The watersheds with 303(d) Listed mercury-impaired waterways downstream of major dams include: American River, Feather River, Marsh Creek, Merced River, Putah Creek, Sacramento River, San Joaquin River, and Stanislaus River. As a result, both implementation alternatives entail coordination with upstream TMDL development efforts to identify, prioritize and implement methylmercury control projects in the tributary watersheds downstream of major dams to effectively reduce water column and fish methylmercury levels in the tributary and Delta waterways. A reasonably foreseeable method of compliance would be to develop TMDL implementation programs for the American, Sacramento, Feather, and San Joaquin Rivers and Putah and Marsh Creeks that identify watershed-specific water quality objectives and methylmercury allocations needed to achieve both the watershed-specific and Delta water quality objectives.

As part of these tributary control efforts, a comprehensive source analysis would be conducted to identify hotspots of methylmercury production. The potential costs and environmental effects of pilot projects and watershed TMDL implementation actions would be evaluated as part of the Basin Planning process for the watershed TMDLs. The potential costs and environmental

effects of any actions that need to be taken beyond those watershed TMDL implementation actions to address the Delta impairment would be addressed by future Basin Planning efforts.

Table 4.3: Tributary Allocation Strategies under Implementation Alternatives 2 and 3

Delta Subarea	Tributary	Type of Methylmercury Allocation [a]	
		Alternative 2	Alternative 3
Central Delta	Calaveras River, Bear/Mosher Creeks, Bethany Reservoir Area	Cap	Cap
Marsh Creek	Marsh Creek	Cap	Reduction
Mokelumne River	Mokelumne River Cosumnes River	Reduction	Reduction
Sacramento River	Sacramento River	Reduction	Reduction
	Morrison Creek	Cap	Reduction
San Joaquin River	San Joaquin River	Reduction	Reduction
	French Camp Slough Manteca-Escalon, Mountain House & Corral Hollow Creeks Areas	Cap	Reduction
West Delta	Antioch & Montezuma Hills Areas	Cap	Cap
Yolo Bypass	Cache Creek Settling Basin, Fremont Weir, Knights Landing Ridge Cut, Putah Creek, Prospect Slough	Reduction	Reduction
	Cache Slough/Lindsey Slough, Dixon Area, Ulatis Creek, Willow Slough	Cap	Reduction

(a) "Cap" indicates annual average methylmercury concentrations and loads must not increase; "Reduction" indicates tributary inputs must be decreased.

4.3.11 Phase 1 and 2 Actions to Identify, Prioritize and Implement Total Mercury Control Projects in the Tributary Watersheds

Total mercury control actions are needed in the Delta's tributary watersheds for both Alternatives 2 and 3 for two primary reasons: (1) to reduce sediment mercury levels and resulting methylmercury production in tributary and Delta open water and wetland habitats, particularly in the Yolo Bypass and Marsh Creek subareas, and (2) to enable full compliance with the San Francisco Bay TMDL mercury allocation for the Central Valley. As a result, both alternatives entail total mercury studies and implementation actions beyond those required for the Cache Creek Settling Basin (Section 4.3.6).

Local, State, and Federal agencies responsible for water and air quality, flood conveyance, and public lands would be responsible for coordinating total mercury source identification and prioritization studies with input from interested and affected stakeholders. Entities that wish to conduct pilot offset projects also could conduct their source identification and feasibility studies in coordination with the TMDL-related watershed studies. Figure 4.7 illustrates the potential sequence of the methyl and total mercury studies and implementation activities.

Both Alternatives 2 and 3, in combination with the Cache Creek watershed mercury control program, entails a total mercury reduction of 77 kg/yr from the Cache Creek Settling Basin outflow (see Chapter 8 in the TMDL Report). This reduction is approximately 70% of the 110 kg/yr reduction required by the San Francisco Bay mercury TMDL implementation program. An additional total mercury reduction of 33 kg/yr from other Delta or Delta region mercury sources must take place to comply with the San Francisco Bay mercury control program. Some fraction or even all of this additional reduction may be addressed by on-site or offset control projects to achieve methylmercury allocations and/or maintain total mercury limits for specific discharges in the Delta, Yolo Bypass, and tributary watersheds during Phases 1 and 2. However, additional total mercury control actions may be required to comply with the San Francisco Bay TMDL's total mercury allocation for the Central Valley and/or to achieve the methylmercury allocations for tributary inputs and/or Delta and Yolo Bypass open water and wetland habitats.

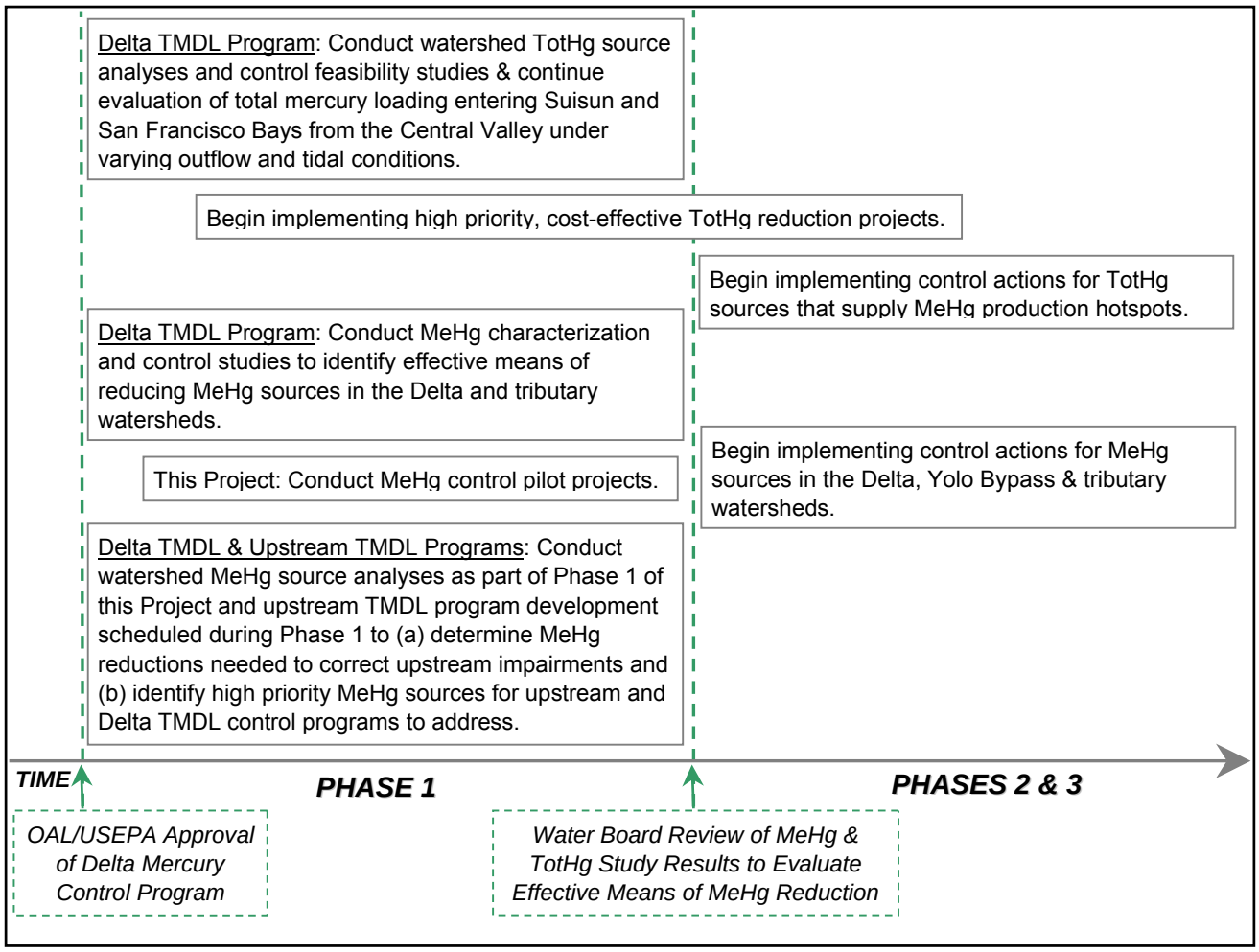

Figure 4.7: Sequence of Actions to Identify, Prioritize and Implement Total Mercury and Methylmercury Control Projects in the Tributary Watersheds

As a result, Phase 1 of both Alternatives 2 and 3 should include watershed source analyses and feasibility studies to identify and prioritize mercury reduction projects, with special focus on the Feather River, American River, and Putah Creek watersheds. Total mercury reduction efforts should focus on nonpoint sources in these watersheds because they, along with the Cache Creek watershed, export the largest volume of highly contaminated sediment (see Tables 7.5 and 7.17 in the TMDL Report) and also are on the CWA 303(d) List as impaired by mercury. However, total mercury reductions likely will be required in other watersheds, especially those that discharge to the Yolo Bypass and Marsh Creek, to help reduce methylmercury production in those watersheds and the Delta/Yolo Bypass.

Alternative 2 and 3's Phase 1 actions could include, but are not limited to, the following:

- Continued evaluation of total mercury loading entering Suisun and San Francisco Bays from the Central Valley under different outflow and tidal conditions;
- Implementation of watershed total mercury source analyses and control feasibility studies; and
- Implementation of high priority, cost-effective total mercury reduction projects.

Phase 2 actions could include continued implementation of high priority, cost-effective total mercury reduction projects; control efforts focused on sources that supply mercury to hotspots of methylation in the tributary watersheds and Delta/Yolo Bypass; and any additional efforts required to achieve the San Francisco Bay mercury TMDL implementation program's allocation for the Central Valley.

Specific actions during Phases 1 and 2 could include, but are not limited to, the following:

- Remediation of inactive gold and mercury mines including the adjacent stream banks that contain mercury, with particular focus on mine sites downstream of major dams;
- Stabilization or remediation of dredged areas that act as ongoing sources of total mercury (e.g., potentially the Yuba and Folsom Gold Fields);
- Stabilization of mercury-enriched sediments in stream channels and floodplains downstream of mine sites and dredge fields;
- Construction of new settling basins downstream of mine sites and/or other erosive areas with contaminated sediment that cannot be otherwise stabilized or remediated;
- Identification of reservoirs that are accumulating mercury-contaminated sediment and development and implementation of sediment management plans to prevent the release of mercury-contaminated sediment during reservoir maintenance activities (e.g., by off-site disposal of dredged sediment);
- Control of erosion in mercury-enriched upland areas from activities such as grazing and road maintenance; and
- Development of a statewide atmospheric total mercury reduction program during Phase 1 and implementation of actions to reduce mercury emissions from facilities during Phase 2. California Air Resources Board emissions data reviewed in Appendix J of the TMDL Report indicate that in 2002 almost 10 kg of total mercury was released in the Delta by sugar beet facilities, electric services, paper mills, feed preparation, and rice milling; cement and concrete manufacturing facilities and crematories in the Delta's tributary

watersheds appear to have relatively high mercury emissions. The two major approaches under development for controlling mercury emissions from coal-fired power plants are multi-pollutant controls (using current controls for SO_2, NO_x, and particulate matter) and mercury-specific controls (activated carbon injection (ACI)) (Srivastava, 2004); however, the effectiveness of mercury removal for other industries is not well studied. Local air emissions and controls of mercury warrant additional research.

Because of the sediment-trapping nature of many major dams in tributary watersheds, the above mercury control actions are likely to be most effective at reducing total mercury loading to the Delta if they focus on sites downstream of major dams.

The Central Valley Water Board has contracted with an engineering consultant to identify and evaluate a suite of potential inorganic mercury reduction projects in the Central Valley. Particular options that may be explored further as part of this study include:

- Determination of potential sites for new settling basins below mercury-contaminated watersheds;
- Identification of dredge tailings for which remediation may be feasible;
- Identification of mine sites and/or streambeds with contaminated material for which stabilization or other remediation actions may be feasible; and
- Determination of projects that could be implemented to more immediately reduce mercury levels in the Yolo Bypass.

Those projects identified as reasonable will be evaluated in detail for implementability (long-term operation and maintenance, regulatory acceptance, scheduling constraints), effectiveness (short and long-term effectiveness, impacts of the alternative on humans and the environment, and community acceptance), and cost (capital and operations and maintenance). Additional watershed total mercury source analyses and control feasibility studies likely will be needed as part of this Delta TMDL program and future upstream TMDL implementation programs during Phases 2 and 3.

There are thousands of abandoned and inactive mines in the Central Valley, many of which are contributing to surface water pollution. Inactive mercury mines are predominately in the coastal foothills and mercury is present at and downstream of many gold mining sites in the Sierra foothills. Mine cleanup requirements for the mercury mines in the Cache Creek watershed were adopted by the Central Valley Water Board in 2005 and are considered baseline requirements for the purposes of the Delta mercury control program. The Porter Cologne Water Quality Control Act gives the Regional Water Boards the authority to require responsible persons to cleanup and abate wastes that cause or threaten to cause pollution. Mine sites that discharge wastes may be subject to waste discharge requirements (Title 27 requirements for mine wastes and/or NPDES storm water requirements). Even in the absence of a Delta mercury control program, mine owners are responsible for discharges from their property. In this context, the Delta mercury control program will not pose new economic costs or environmental impacts to address discharges from mercury and gold mines.

4.3.12 Actions to Minimize Methyl and Total Mercury Inputs from New or Expanded Sources

Both Alternatives 2 and 3 require actions to minimize methyl and total mercury inputs from new and expanded sources in the Delta and its tributary watersheds downstream of major dams. Several ongoing local and regional changes may affect methyl and total mercury loading in the Delta region during the next 5 to 50 years, for example: wetland restoration, population growth, and changes in water management practices due to climate change or other priorities. Extensive wetland restoration activities are underway in the Yolo Bypass and Delta that have the potential to substantially increase ambient methylmercury levels. In addition, the California Department of Finance predicts that populations in counties in the Delta/Yolo Bypass and its source region will increase 76% to 213% by 2050 (CDOF, 2007). Increasing populations will result in increasing total mercury and methylmercury discharges from municipal wastewater treatment plants and urban runoff. Changes to water diversions, salinity control, and flood conveyance, as well as dredging activities, could affect water column methylmercury and sediment total mercury concentrations in the Delta and Yolo Bypass.

1. NPDES-permitted WWTPs

Alternative 3 requires that NPDES facilities described in Table C.23 maintain Phase 1 methylmercury concentration limits. In addition, new NPDES facilities that discharge or propose to discharge methylmercury to the Delta or its upstream tributaries downstream of major dams during Phase 1 would have an effluent methylmercury concentration limit of 0.06 ng/l unless they participate in the Phase 1 characterization and control studies described in the previous section and implement controls to reduce their methylmercury concentration or otherwise offset their exceedance during Phase 2 after the completion of the control studies. Alternative 3 also requires existing and new municipal WWTPs and power and heating/cooling facilities that discharge greater than 1 mgd in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams to implement programs to evaluate and minimize total mercury discharges.

The purpose of the Phase 1 methylmercury concentration limits and total mercury evaluation and minimization requirements is to minimize any increase in ambient Delta and Yolo Bypass methylmercury concentrations due to increased WWTP mercury discharges to the Delta resulting from population growth in the Delta region while the characterization and control studies are taking place during Phase 1. WWTP discharge volumes would be allowed to increase, but discharge methylmercury concentrations would not be allowed to increase. The Phase 1 methylmercury concentration limits would be in effect until facilities achieve their methylmercury waste load allocations or other effluent limits are established for Phase 2, based on the results of the characterization and control studies described in the previous section and any upstream TMDL programs.

Alternatives 2 and 3 both would require NPDES-permitted WWTPs to monitor methylmercury and total mercury in their effluent. As noted in the previous section, WWTPs that discharge to surface water already are required to monitor their effluent for other constituents regulated in NPDES permits. Therefore Alternatives 2 and 3 would not require new monitoring programs or monitoring frequencies; however, methylmercury would be a new monitoring constituent for many WWTPs. Effluent and receiving water monitoring for compliance with the CTR criterion of

50 ng/l total recoverable mercury is a current NPDES permit requirement and therefore is considered a baseline condition. Permittees would be required to include their monitoring results and annual average concentration calculations in annual monitoring reports that they already submit per their NPDES permit requirements.

The facility-specific Phase 1 methylmercury concentration limits for existing facilities are based on annual average effluent methylmercury concentrations observed at each facility in the Delta/Yolo Bypass in 2004/2005 (the period that defines available data), with the exception of the SRCSD Sacramento River WWTP, which collected data during WY2001-2003 and was the only facility that collected data during the TMDL period. Compliance with the WWTP effluent methylmercury concentration limits would be determined by comparing annual average effluent methyl mercury concentrations to the facility-specific methylmercury concentration limits.

Reasonably foreseeable methods of compliance with the Phase 1 methylmercury concentration limits include maintaining the efficiency of existing WWTP treatment processes and pretreatment programs as WWTP discharge volumes increase. The concentration limits are based on data expected to represent normal monthly variability. In addition, as described in the following paragraphs, WWTPs that currently do not implement total mercury minimization programs would be required to do so during Phase 1 under Alternative 3. As a result, it is expected that the effluent methylmercury concentrations will remain the same or decrease, and the increase in mass for methylmercury will increase only very slightly or even decrease. Hence, any exceedance of the concentration limits would represent a material change in treatment or pretreatment conditions.

Reasonable steps to address an exceedance of a methylmercury concentration limit are those typical for maintaining other common effluent limits in current permits. Steps include: accelerated or additional monitoring as necessary to determine the nature of the increased discharge concentration; identification of the possible sources that could cause an increase (e.g., spills, untreated by-pass, or treatment processes or management practices that have suffered a temporary or permanent failure or are no longer adequate for the increased volume of discharge); submission of a control strategy; and implementation of corrective actions or improved treatments/management practices consistent with the control strategy. Section 4.3.10 reviews reasonably foreseeable methods for effluent methylmercury reduction based on available information that could be implemented by existing or new facilities. As noted in Section 4.3.2, staff recommends that, if a WWTP exceeds its Phase 1 limit, compliance time schedules be allowed to extend through the Phase 1 control study period, not to exceed ten years, so that a facility can make use of new management practices and control methods developed by the studies to come into compliance with its Phase 1 limit.

Alternative 3 requires municipal WWTPs and power and heating/cooling facilities that discharge greater than 1 mgd to the Delta or its tributary watersheds downstream of major dams to implement evaluation and minimization programs for total mercury discharges and to maintain compliance with a USEPA-approved pretreatment program, as applicable for industry and other non-domestic wastewater sources into municipal sewer systems. Reasonably foreseeable methods of compliance with evaluation and minimization requirements could include, but are not restricted to, the following:

- Monitor effluent total mercury concentrations monthly for one year beginning three months after the effective date of the proposed Basin Plan amendments, calculate the average annual concentration of total mercury in effluent, and submit a report to the Central Valley Water Board. This annual average effluent total mercury concentration would be the baseline for evaluating the effectiveness of the facility-specific mercury evaluation and minimization programs during subsequent years. After one year of monitoring, facilities could modify their monitoring frequency with approval of the Executive Officer.
- Submit a mercury evaluation and minimization plan to the Central Valley Water Board by two years after the effective date of the proposed amendments for approval by the Executive Officer. Staff recommends that the mercury evaluation plans include the following elements:
    - A description of the discharger's existing mercury control efforts and baseline annual average effluent total mercury concentration and loads;
    - A description of all mercury sources contributing, or potentially contributing, to the mercury loading in the facility influent;
    - An analysis of potential pollution prevention and control actions that could reduce effluent total mercury concentrations and/or loads;
    - A description of the tasks, cost, and time required to implement actions to control effluent total mercury concentration and load;
    - A monitoring program for determining the results of the pollution prevention and control actions; and
    - An analysis of the benefits and any potential adverse environmental impacts, including cross-media impacts or substitute chemicals, that may result from the implementation of the mercury minimization plan.
- Report annually to the Board all mercury monitoring results; a summary of all actions undertaken during the previous year pursuant to the minimization plan; and a description of actions to be taken in the following year. The report should compare the annual average concentration for the past calendar year (January through December) to the baseline concentration.
- If the annual average concentration is greater than baseline, the discharger should conduct additional monitoring, evaluate the increase, and develop and implement changes to the mercury minimization plan to correct any concentration increase. Staff recommends that if the annual average concentration is greater than the baseline concentration due to implementation of a water conservation program in a WWTP's service area or additional reclamation by a WWTP, the discharger be allowed to request from the Executive Officer a variance from maintaining the baseline concentration.

Reasonably foreseeable total mercury minimization actions could include, but are not restricted to, the following:

- Establish or enhance pretreatment programs that reduce sources of mercury discharges from municipal WWTPs, such as mercury thermometer exchange programs; residential drop-off programs for mercury-containing products; best management practices for hospitals, dentists, other medical facilities, laboratories, and pottery studios; and distribution of a guide for installing graywater systems.

- In the case of industrial dischargers, develop programs to identify sources of mercury in the waste stream (e.g., pH-altering chemicals, gages, and switches) and modify procedures or materials to reduce the mercury in the discharge.

Mercury control requirements for municipal WWTPs are not new. Because the Delta and many of its upstream tributaries are listed as impaired by mercury on the CWA Section 303(d) List, Central Valley Water Board NPDES permits have included requirements for mercury control (e.g., total mercury mass limits) in many recent new and updated permits (see Section 4.3.10). Existing NPDES permits require 15 of 40 municipal WWTPs that discharge greater than 1 mgd in the Delta and its tributary watersheds downstream of major dams to implement total mercury pollution prevention plans in accordance with CWC §13263.3 or other similar mercury minimization programs. Future permit cycles for other WWTPs that discharge to the Delta or upstream water bodies on the CWA Section 303(d) List for mercury impairment will continue to add total mercury mass limits and total mercury minimization requirements until TMDLs for the Delta and upstream water bodies are approved. The requirement for total mercury minimization programs would be new for 25 municipal WWTPs and one power plant[29] that discharge greater than 1 mgd in the Delta and its tributary watersheds downstream of major dams (Tables C.6, C.22 and C.23 in Appendix C). These or similar requirements will be in effect even without a Delta TMDL implementation program. However, including the requirement for total mercury evaluation and minimization programs in the Basin Plan amendments will ensure their inclusion in NPDES permits and is therefore evaluated in the CEQA and cost analyses (Chapter 7 and Appendix C, respectively).

The Phase 1 methylmercury concentration limits would replace the total mercury mass limits in the permits for municipal WWTPs that discharge greater than 1 mgd. As explained in Section 4.3.2, municipal WWTPs that discharge less than 1 mgd and other discharger types (e.g., commercial, industrial and aquaculture discharges), would not be required to implement mercury minimization programs or to maintain total mercury mass limits. Staff recommends that NPDES permits for new discharges require mercury control based on best practicable treatment and control.

2. NPDES-permitted MS4s

Both Alternatives 2 and 3 include methylmercury allocations for MS4s in the Delta/Yolo Bypass and require large MS4s to develop Phase 1 methylmercury concentration limits before 2012. In addition, Alternative 3 requires all MS4s that discharge to the Delta, Yolo Bypass or their tributaries downstream of major dams (Table E in the proposed Basin Plan amendment language) to implement BMPs to the maximum extent practicable to control erosion and sediment discharges. Alternative 3 also requires large MS4s (Sacramento, Stockton and Tracy MS4s) to implement pollution prevention measures and BMPs to control total mercury discharges to the maximum extent practicable. The MS4 methylmercury allocations implicitly

[29] The State of California Central Heating/ Cooling Facility's NPDES permit (CA0078581) indicates that it does not add any chemicals to its cooling water or other waste to its discharge. Therefore, staff recommends that it not be required to implement a total mercury evaluation and minimization program.

include all current and future urban discharges not otherwise addressed by another methylmercury allocation within the geographic boundaries of urban runoff management agencies, including but not limited to Caltrans roadway and non-roadway facilities and rights-of-way, public facilities, properties proximate to banks of waterways, industrial facilities, and construction sites.

The purpose of the Phase 1 methylmercury concentration limits is to minimize any increase in MS4 methylmercury discharges to the Delta resulting from changing urban land uses and management practices in the Delta region while the characterization and control studies are taking place during Phase 1. Long-term average MS4 discharge volumes would be allowed to increase, but discharge methylmercury concentrations would not be allowed to increase. Reasonably foreseeable methods of compliance for the development and maintenance of methylmercury concentration limits would entail large MS4s monitoring methylmercury and total mercury in urban runoff. Permittees would be required to include their monitoring results and annual average concentration calculations in annual monitoring reports. Methylmercury monitoring can be added to existing monitoring programs and is not considered to be a difficult parameter to measure.

Developing methylmercury concentration limits for large MS4s is complicated by variable short- and long-term climate conditions (e.g., wet versus dry years, antecedent conditions before storms, storm frequency and intensity, etc.). As a result, staff recommends that limits be based on the 90th percentile methylmercury concentration of urban runoff samples collected during 2000 to 2010 (a period expected to have a range of meteorological and climatic conditions) and would become effective in 2012. After the establishment of an MS4-specific methylmercury concentration limit, compliance during the following years could be evaluated by comparing the 95% confidence interval for the mean of the concentration data collected by a given MS4 during a given year to its methylmercury concentration limit.

The nature of the performance-based Phase 1 methylmercury concentration limits requires that large MS4s maintain the efficiency of their best management practices as their discharge volumes increase with increased urbanization. The concentration limits are based on a range of years expected to represent normal monthly and inter-annual variability. In addition, as described in the following paragraphs, all MS4s would be required by Alternative 3 to control total mercury discharges through best management practices that likely would target sediment (and associated particle-bound total mercury). Hence, any exceedance of the concentration limits would represent a material change in conditions. Reasonable steps to address an exceedance of a methylmercury concentration limit include:

- Accelerated or additional monitoring as necessary to determine the nature of the increased discharge methylmercury concentration;
- Identification of the possible sources that could cause a methylmercury increase (e.g., BMPs that have suffered a temporary or permanent failure; new developments or other changed land uses upstream of the sampling location; or implementation of new BMPs for purposes other than methylmercury control that could have resulted in increased methylmercury production);
- Submission of a control strategy; and

- Implementation of corrective actions or improved treatments/management practices consistent with the control strategy.

Alternative 3 requires all MS4s that discharge to the Delta, Yolo Bypass or their tributaries downstream of major dams to implement BMPs to the maximum extent practicable to control erosion and sediment discharges. Alternative 3 also requires large MS4s to implement pollution prevention measures and BMPs to control total mercury discharges. Because mercury is attached to sediment, BMPs to control erosion and sediment transport will be effective in reducing mercury discharges. All MS4s currently are required to implement BMPs to the maximum extent practicable to control erosion. Sediment control is not a new requirement and therefore is considered to be baseline. In addition, the Sacramento and Stockton MS4 permits require the permittees to implement mercury control plans. Therefore, implementation of a mercury control plan is a new requirement only for the Tracy MS4.

The NPDES General Permit for Storm Water Discharges Associated with Construction Activity currently regulates construction activities; therefore, erosion control requirements are not new requirements for construction activities in the Delta and its source region. Reasonably foreseeable methods of compliance for urban erosion and sediment control could include, but are not restricted to, the following activities widely used in the Central Valley:

- Erosion control: avoidance of increased erosion and transport of contaminated soil into receiving waters via runoff by not conducting construction activities during wet weather; preservation of existing vegetation; development of slope drains; stabilization of stream banks; and use of hydraulic mulch, hydroseeding, straw mulch anchored with a tackifier, polyacrylamide, rolled erosion control products (e.g., blankets and mats), earth dikes, drainage swales, and velocity dissipation devices.
- Sediment control: installation of silt fences, sediment basins, sediment traps, fiber rolls, gravel bag berms, sandbag barriers, storm drain inlet protection, and check dams.

Mercury pollution prevention measures can include, but not be limited to, the following:

- Thermometer exchange and fluorescent lamp recycling programs;
- Public education and outreach on disposal of household mercury containing products and replacement with non-mercury alternatives.
- Education of auto dismantlers on how to remove, store, and dispose of mercury switches in autos.
- Enhancement of household hazardous waste collection programs to better address mercury-containing waste products (potentially including thermometers and other gauges, batteries, fluorescent and other lamps, switches, relays, sensors and thermostats).
- Survey of use, handling, and disposal of mercury-containing products used by the Sacramento, Stockton and Tracy permittee agencies and development of a policy and time schedule for eliminating the use of mercury containing products by the permittees.

As described in Section 4.3.7 and footnote #25, most of the Contra Costa MS4 (CAS083313) service area falls within the San Francisco Bay Water Board's jurisdiction. Therefore, during Phase 1 of the Delta TMDL implementation program (Alternatives 2 and 3), Central Valley Water Board staff recommends that the mercury control requirements approved by the San

Francisco Bay Water Board (Resolution R2-2006-0052, which includes requirements for urban dischargers to reduce total mercury loading) for the Contra Costa County MS4, be applied to its service area within the Central Valley Water Board's jurisdiction. For the purposes of Alternative 3, the requirements for Contra Costa County MS4 are considered baseline conditions.

3. Wetland Restoration

Research conducted in the Delta and elsewhere has found that seasonally and permanently flooded wetlands are efficient sites for methylmercury production (see Chapter 3 in the TMDL Report). There are about 21,000 acres of freshwater emergent wetlands in the Delta and Yolo Bypass. The Record of Decision for the California Bay-Delta Authority commits it to restore 30,000 to 45,000 acres of fresh, emergent tidal wetlands, 17,000 acres of fresh, emergent nontidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CALFED Bay-Delta Program, 2000a & 2000c). This is a total of 75,000 to 90,000 acres of additional seasonal and permanent wetlands in the Delta, which represents about a three to four times increase in wetland acreage from current conditions. Much of the restoration is expected to take place in the Yolo Bypass, Cosumnes/Mokelumne, Marsh Creek and San Joaquin subareas, areas that require substantial reductions from existing methylmercury sources to achieve the proposed fish tissue objectives. These areas also are downstream of major sources of mercury-contaminated sediment.

For Alternatives 2 and 3, proponents of new wetland restoration projects scheduled for construction during Phase 1 would be required to:

- Either participate in a comprehensive methylmercury monitoring and studies as described earlier in Sections 4.3.7 and 4.3.8, or implement a site-specific monitoring and study plan;
- Evaluate practices to minimize methylmercury discharges; and
- Implement newly developed management practices, as feasible, with monitoring to demonstrate effectiveness of management practices.

Many marsh restoration actions in the Delta require a CWA Section 401 Water Quality Certification from the Central Valley Water Board (see Section 6.5.5 in Chapter 6). In addition, managed wetlands are regulated by the Central Valley Water Board's Irrigated Land Regulatory Conditional Waiver program (Central Valley Water Board, 2003). The above requirements could be implemented through the addition of new conditions in Clean Water Act 401 Water Quality Certifications and the Conditional Waiver program.

Site-specific monitoring could include seasonal monitoring of methyl and total mercury concentrations in surface sediment and water at the restoration site for one year before the restoration activities take place and two years after restoration actives are completed. If there were an increase in surface sediment and water methylmercury concentrations that cannot be explained by pre-project seasonal variability, then during Phase 2 (after the completion of the methylmercury characterization and control studies), the project proponents would need to develop and implement management practices to reduce methylization to the extent practicable.

Additional reasonably foreseeable methods of compliance to address methylmercury from new wetlands will be evaluated during Phase 1 of both Alternatives 2 and 3. As with the potential methylmercury management practices for existing wetland areas (see Section 4.3.10), it is speculative to guess where and which methylmercury reduction management practices would be incorporated at various wetlands. Possibilities for compliance include modifying the following: wetland design (deep or shallow water depth); location (e.g., consider not building wetlands downstream of watersheds containing mercury or gold mines); flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands); vegetation types; vegetation density (dense cover or more open water); source water; and wetland discharge patterns. Wetland managers will be able to design and build pilot wetland projects to evaluate wetland management practices developed in Phase 1.

4. Activities that Affect Open-Channel Mercury Levels

The Delta and Yolo Bypass has almost 60,000 acres of open water (Table 6.4 in the TMDL Report). Associated bottom sediments produce about 15% of the annual Delta methylmercury load. Several water management practices that affect methyl and total mercury levels in the open channels of the Delta and Yolo Bypass include:

(a) Operations to maintain current or future salinity standards in the Delta;

(b) Current water deliveries to, diversions from, and storage within the Delta;

(c) Yolo Bypass flood conveyance; and

(d) Dredging projects throughout the Delta and Yolo Bypass to maintain channel levees for flood conveyance, depths of deep water ship channels, and marina depths.

Alternatives 2 and 3 require agencies that propose changes to the aforementioned activities to evaluate and minimize methyl and total mercury inputs from new projects in the Delta and its tributary watersheds downstream of major dams. Both alternatives also require responsible agencies to conduct mercury studies and develop management plans if changes to water management practices and/or salinity standards would result in increased methylmercury production. They would be required to:

- Characterize the project's effects on the Delta's ambient methylmercury and total mercury concentrations and loads;
- Conduct methylmercury and/or total mercury control studies; and
- Minimize to the extent practicable any methylmercury and/or total mercury loading to the Delta resulting from new projects using feasible management practices that are not in conflict with salinity standard or other mandates (e.g., minimum flow and temperature mandates).

Methylmercury production in sediment has often been a function of pore water sulfate concentrations (Chapter 3 in the TMDL Report). Two factors influencing sulfate concentrations in the Delta are the water quality objectives for electrical conductivity and changes in water management, such as the construction of water barriers in the southern Delta. Water Rights Decision 95-1WR specifies maximum ambient electrical conductivity values for various locations in the Delta by month and water year type. Sulfate concentrations are strongly a function of

electrical conductivity. As a result, Water Rights Decision 95-1WR also regulates sulfate concentration and therefore may influence sediment methylmercury production rates.

The water management decision that may affect methylmercury production in the Delta is the Record of Decision for the Bay-Delta Authority. The Record of Decision commits the Authority to evaluate and, if practical, construct a series of permanent barriers in the southern Delta as part of the South Delta Improvement Project (SDIP). This project is intended to mitigate the water supply and water quality impacts associated with increasing the maximum allowable diversion capacity into Clifton Court Forebay, from which the State Water Project pumps its water. One alternative being considered as mitigation for the effects of increased diversion is the installation of operable flow control barriers at the head of Old River and other locations in the southern Delta. These barriers will reduce the amount of San Joaquin River flow diverted down Old River towards the pumps and away from the San Joaquin River near Stockton. Operation of the permanent barriers would control the ratio of San Joaquin to Sacramento River water in much of the southern Delta.

Sulfate concentrations in the San Joaquin are about seven times higher than in the Sacramento River. Therefore, operation of the permanent barriers could exert a strong influence on sediment sulfate concentrations in the southern Delta and may influence ambient methylmercury levels. In addition, because the SDIP will involve dredging in some southern Delta channels and construction of other in-stream structures, a CWA Section 404 permit from the USACE and a CWA Section 401 certification from the Central Valley Water Board will be required. To obtain this certification, the SDIP will need to provide adequate mitigation measures on a specific implementation timeline for the potential impacts of the project on methylmercury conditions in the southern Delta, dissolved oxygen conditions in the Stockton Deep Water Ship Channel, and any other water quality concerns. The Central Valley Water Board could use this authority to ensure the potential impacts of this project on ambient methylmercury levels in the Delta are properly evaluated and minimized. The evaluation could entail conducting studies to characterize the project's effects on the Delta's ambient sulfate and methylmercury concentrations as well as sulfate amendment studies.

The largest acreage of marsh in the Delta is in the Yolo Bypass.[30] The Yolo Bypass was constructed as a floodwater conveyance system to divert flood flows from the Sacramento Valley around the City of Sacramento. Prospect Slough, downstream of the Cache Creek Settling Basin in the Yolo Bypass, has the highest annual average methylmercury concentration of any location in the Delta (see Table 6.3 in the TMDL Report). Ongoing studies suggest that much of the methylmercury in Prospect Slough is produced in local marshes, particularly when the Yolo Bypass receives flood flow from Cache and Putah Creeks and from the upper Sacramento River through Fremont Weir (C. Foe, personal communication). If flood flows were not routed down the bypass, the wetlands and other lands in the bypass would have little-to-no discharge to the Delta.

[30] The established marshes and duck clubs are owned by the California Department of Fish and Game and by private parties. Several State and Federal agencies also have recently purchased property in the Yolo Bypass and are in the process of converting it to wetlands.

Changes in flood conveyance and other water management projects could include new or modified weirs in the Yolo Bypass, new or expanded reservoirs upstream of the Delta, and changes in the *Central Valley Project – Operations Criteria and Plan, 30 June 2004* (CVP-OCAP) that result in alterations to the currently permitted water storage or release schedules (e.g., increased flows, flood frequency, or flood duration in the Yolo Bypass). If changes to the Yolo Bypass flood conveyance or other water management projects are proposed, Alternatives 2 and 3 would require responsible agencies to conduct methyl and total mercury characterization and control studies for new projects and minimize to the extent practicable any methylmercury loading to the Delta resulting from new projects. Reasonably foreseeable methods of compliance include conducting the studies described above and evaluating potential management options.

It is speculative to guess which methylmercury reduction management practices would be incorporated for changes to water diversions and storage, changes to salinity standards in the Delta, and/or changes to Yolo Bypass flood conveyance. However, management practices for changes in water diversions and storage and salinity standards could include:

- Alternate locations for water storage reservoirs (i.e., is the proposed project in a mercury contaminated watershed?);
- Alternative project discharge patterns (volume, frequency, season);
- Engineered controls to minimize anoxic zone (e.g., aeration);
- Modification of discharge from top or bottom of reservoirs; and
- Reduction of upstream sources of total mercury.

Methylmercury management practices for the Yolo Bypass flood conveyance could include:

- Modification of flow regimes within the Yolo Bypass;
- Modification of the channel geometry to route more water down the eastern side of the bypass (away from sediment inputs from the Cache and Putah Creek watersheds); and
- Active remediation or removal of mercury-contaminated sediment within the Yolo Bypass downstream of the Cache and Putah Creek watersheds.

Staff recommends that flood control agencies enter into cooperative agreements with wetland managers and agricultural landowners to conduct studies to determine the cumulative effects on methylation in bypass lands caused by flood flows and management practices that minimize methylmercury production. In addition, if funding is available, staff could conduct studies to evaluate the effects of water management, flood conveyance and salinity control projects on ambient methylmercury levels in the Delta.

Portions of the Delta are depositional in nature. This requires sediment removal to maintain navigation channels and marinas. Recent dredge projects within the Delta have taken place in the Sacramento River Deep Water Ship Channel, Stockton Deep Water Channel, Village West Marina, Korths Pirates Lair, Big Break Marina, Sportsman Yacht Club, and Discovery Bay. The Sacramento and Stockton deep-water channels have annual dredging programs; the locations dredged each year vary. Dredging occurs at other Delta locations when needed, when funds are available, or when special projects take place. Approximately 533,400 cubic yards of sediment are dredged annually on average, with 199,000 cubic yards from the Sacramento

Deep Water Ship Channel and 270,000 cubic yards from the Stockton Deep Water Channel. Other minor dredging projects at marinas remove sediment at various frequencies for a combined total of about 64,400 cubic yards per year. Dredge material typically is pumped to either disposal ponds on Delta islands or upland areas with monitored return flow.

Alternatives 2 and 3 require project proponents for future dredging activities and dredge material disposal activities in the Delta/Yolo Bypass to minimize increases in ambient methylmercury in Delta/Yolo Bypass waterways. Reasonably foreseeable methods of compliance include:

- Characterizing pre- and post-project surface sediment concentrations through pre-dredge sediment coring. If the sediment to be exposed by the project has an average total mercury concentration greater than the surface material before dredging, the project proponent would submit a workplan for Executive Officer approval that demonstrates that the project will minimize new methylmercury loading to the Delta/Yolo Bypass.
- Characterizing methylmercury concentrations of return waters from dredge material disposal (DMD) sites and receiving waters and ensuring that return waters discharged into the adjacent surface water do not have methylmercury concentrations greater than the receiving water methylmercury concentrations.
- Ensuring that reuse of dredge material at aquatic locations, such as wetland and riparian habitat restoration sites, results in minimal increases in methylmercury discharges from the sites. Project proponents would conduct monitoring to demonstrate that activities do not increase the bioavailability of total mercury in the reused dredge material.
- Characterizing total mercury loads removed from Delta waterways by dredge activities.
- Employing management practices during and after dredging activities as required by existing Basin Plan objectives for sediment and turbidity to minimize sediment (and associated sediment-bound mercury) releases into the water column.
- Ensuring that dredged material reused at upland sites, including the tops and backs of levees, is protected from erosion.

The above requirements could be implemented through the addition of new conditions in Clean Water Act 401 Water Quality Certifications and WDRs for dredging and dredge material reuse projects. Recent WDRs include requirements for dredge projects to conduct chemical and physical testing of sediments that are representative of the area to be dredged before each maintenance project, as well as of DMD site return flows to receiving waters. Reasonably foreseeable methods of compliance with dredging project evaluation requirements could include, but are not limited to, the following:

(a) To determine whether a dredge project increases *in situ* methylmercury production, conduct pre- and post-dredge project sediment sampling. If the sediment to be exposed by the project has an average total mercury concentration greater than the surface material before dredging, follow-up actions could include, but are not limited to, the following: (1) dredge deeper until a horizon with lower mercury levels is exposed; or (2) continue with the project as proposed, but conduct additional pre-project methylmercury sediment concentration monitoring and monthly post-project monitoring for at least four months to determine the time needed for natural sedimentation to cover the exposed surface with sediment having a total mercury concentration less than pre-

project surface concentrations. If the newly exposed surface is not covered with ambient sediment within four months, follow-up activities similar to option (1) could be performed.

(b) To determine whether DMD return water would increase ambient methylmercury in receiving waters, monitor methylmercury in DMD return water and receiving water. If monitoring indicates that DMD return flows have methylmercury concentrations greater than the receiving water concentration,[31] the return flow could be held in settling ponds or other diked disposal sites on land for a longer hold time until methylmercury concentrations decrease (e.g., through photodegradation). Similar practices already are required to comply with the CTR criterion of 50 ng/l for total recoverable mercury in the water column and water quality objectives for turbidity already established in the Basin Plan.[32] Alternatively, the return flow could be disposed to land with no discharge to surface water.

(c) To determine whether the reuse of dredge material at aquatic locations increases the bioavailability of mercury at the sites, monitoring could include, but is not limited to, the following: seasonal pre- and post-project monitoring of methyl and total mercury concentrations in surface sediment for one year before and three years after project completion. If there were an increase in surface sediment methylmercury concentration that cannot be explained by pre-project variability, then during Phase 2 (after the completion of the methylmercury characterization and control studies), the project proponents would implement management practices to reduce methylization to the extent practicable, using methods like those described in Sections 4.3.10 and 4.3.11.

(d) Total mercury loads removed from Delta/Yolo Bypass waterways by dredge activities could be calculated from the project-specific sediment core sampling mercury results described in (a) above and the volume of sediment removed, which is a typical metric recorded by dredge projects.

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[31] Recent WDRs for dredge projects require that return water shall not cause exceedances of water quality objectives or CTR/NTR criteria for any constituent that is on the 303(d) list for the receiving water where the effluent is discharged, unless a mixing zone is granted in the Notice of Applicability. In some DMD sites, the return water is discharged directly into agricultural drainage ditches. Recent WDRs have required that, since agricultural drainage ditches are eventually discharged into rivers and sloughs in the Delta, the limits for 303(d) constituents to be met in the eventual surface water destination be applied to the drainage ditch. Hence, methylmercury requirements proposed by Alternatives 2 and 3 for return flow would apply to DMD sites that discharge to agricultural ditches that ultimately drain to surface waters.

[32] Page III-9.00 of the Basin Plan states the following: "Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:

- Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU.
- Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent.
- Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs.
- Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. … For Delta waters, the general objectives for turbidity apply subject to the following: except for periods of storm runoff, the turbidity of Delta waters shall not exceed 50 NTUs in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions to the Delta specific objectives will be considered when a dredging operation can cause an increase in turbidity. In this case, an allowable zone of dilution within which turbidity in excess of limits can be tolerated will be defined for the operation and prescribed in a discharge permit."

(e) Actions to minimize sediment and associated sediment-bound mercury releases into the water column could include, but are not limited to the following: use a pipeline hydraulic suction dredge or "sealed" or "environmental" clamshell bucket dredge to reduce the amount of turbidity in the water column and the amount of water produced during the dredging operation; and increase DMD return water hold time to remove suspended material from the return flow to the maximum extent practicable. These or similarly-approved methods already are required under Waste Discharge Requirements and CWA Section 401 Certifications for dredging operations to prevent exceedances of water quality objectives for turbidity. Therefore, actions to control sediment releases are part of baseline conditions for both Alternatives 2 and 3.

(f) Erosion prevention measures at upland sites (e.g., levee maintenance and improvement projects) include, but are not limited to the following: re-vegetation, hard bank stabilization, and biotechnical bank stabilization. Alternatively, dredge material could be disposed in an upland environment that has no discharge to surface water.

Both Alternatives 2 and 3 actions to control sediment transport and turbidity at dredging sites and erosion from dredge disposal sites already are baseline requirements to comply with Basin Plan water quality objectives for sediment and turbidity.

4.4 Evaluation of Implementation Alternatives

The following sections summarize the analysis of economic and funding considerations for each implementation alternative as required by CWC Section 13141, summarize the potential environmental effects, evaluate the possibility of each alternative enabling the attainment of the proposed water quality objectives for methylmercury in Delta/Yolo Bypass fish, consider the feasibility of each alternative, and evaluate consistency with existing Federal and State regulations and policies. Detailed reviews of the existing Federal and State regulations and policies, potential environmental effects, and cost considerations are provided in Chapters 6 and 7 and Appendix C, respectively.

4.4.1 Potential Environmental Effects

Basin Plan amendments are projects subject to 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 proposed Phase 1 methylmercury control studies or expansion to existing public outreach and education programs. However, implementation actions taken by responsible entities to comply with some components of Alternatives 2 and 3 could impact the environment.

Alternatives 2 and 3 are expected to have the same types of environmental impacts because implementation of both Alternatives would like require the same types of control actions for point and nonpoint sources of methylmercury and total mercury. However, Alternatives 3 requires more individual dischargers to implement control actions than Alternative 2, which would increase the number of sites where control actions are required and therefore increase the potential for cumulative environmental impacts. Chapter 7 includes a detailed discussion of

potential environmental impacts resulting from the implementation of Alternative 3. The following paragraphs are a summary of the conclusions of that discussion.

Implementation of Alternatives 2 and 3 both could result in potentially significant impacts to biological resources, hydrology/water quality, and utilities/service systems, unless mitigation is incorporated. With one exception, all potential impacts are expected to be limited and mitigated to less than significant levels, if not completely avoided, through careful project planning, design, construction, and maintenance.

The implementation of methylmercury management practices to achieve safe fish mercury levels in the Yolo Bypass under both Alternatives 2 and 3 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 proposed Phase 1 characterization and 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. However, the environmental analysis in Chapter 7 identified several methods to minimize negative effects on wetland function, including but not limited to:

- Implement only those onsite methylmercury management practices that do not change desirable wetland functions;
- Focus implementation of management practices on wetland habitats that do no support endemic species with a limited geographic range;
- Reduce upstream methylmercury sources and/or sources of mercury-contaminated sediment that supply the wetland sites; and,
- For new habitat restoration projects, locate new wetlands away from mercury-contaminated watersheds.

4.4.2 Cost Considerations

The Porter-Cologne Water Quality Control Act (CWC §13141) requires consideration of economics when water quality objectives are established, and requires that "prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of financing, shall be indicated in any regional water quality control plan."

Alternative 1 (No Action) incurs the fewest costs while Alternative 3 incurs the most. The only costs associated with Alternative 1 are those incurred through the (a) expansion of existing public education and outreach programs to reduce the risk of mercury exposure to people who eat Delta fish and (b) ambient water and fish monitoring. The primary difference between Alternatives 2 and 3 that affects their implementation cost is Alternative 3 requires entities responsible for large point sources throughout the Delta region to implement total mercury pollution prevention measures and control actions. In addition, Alternative 3 requires methylmercury load reductions from six small watersheds that are not 303(d)-Listed as mercury impaired but drain directly to the Delta/Yolo Bypass.

The Central Valley Water Board does not specify the actual means of compliance by which responsible entities (e.g., dischargers, agencies or other persons responsible for total mercury and/or methylmercury sources) choose to comply with the proposed Basin Plan amendments. In addition, until the proposed Phase 1 methylmercury characterization and control studies are completed, evaluation of costs for potential methylmercury control actions for many sources is difficult.

Therefore, to estimate the potential overall cost of implementing Alternatives 2 and 3, assumptions were made regarding the overall number and types of actions that may be implemented to comply with amendment requirements. Appendix C provides explanations of how costs were estimated along with general assumptions. Table 4.4 at the end of this section summarizes the potential costs by source and activity (e.g., studies, total mercury control actions, and Phase 2 methylmercury control actions). The estimates represent only those costs that would be incurred for activities not already required under existing regulations and permits (i.e., only costs associated with adoption of this proposed mercury control program are included). Study costs are presented in terms of total dollars for the studies. Staff assumed a project life of 30 years to develop standardized annual costs for ongoing actions – monitoring, risk management, and implementation and maintenance of methyl and total mercury control projects – that could be implemented for several decades or longer. Key costs estimates for the three alternatives break down as follows:

			Alternative		
Delta TMDL Program Component	Low	High	1	2	3
Risk reduction activities:	$390,000/yr	$390,000/yr	√	√	√
Point & nonpoint source compliance monitoring:	$250,000/yr	$270,000/yr		√	√
Cache Creek Settling Basin TotHg / sediment trapping efficiency improvements:	$590,000/yr	$2.1 million/yr		√	√
Watershed nonpoint TotHg control feasibility studies:	$250,000	$500,000		√	√
High-priority TotHg control actions beyond those needed for upstream TMDL, Title 27, or NPDES requirements:	$250,000/yr	$470,000/yr		√	√
Phase 1 MeHg characterization & control studies for existing sources:	$1.9 million	$6.4 million		√	√
Phase 2 MeHg control actions for existing within-Delta/Yolo Bypass sources:	$1.1 million/yr	$9.4 million/yr		√	√
NPDES facility & MS4 TotHg minimization measures:	$3.6 million/yr	$7.3 million/yr			√
MeHg source analyses for watersheds not 303(d)-Listed as mercury-impaired that must reduce MeHg exports to the Delta:	$470,000	$470,000			√
Phase 2 MeHg control actions for sources in watersheds not 303(d)-Listed:	$660,000/yr	$1.2 million/yr			√

Cost estimates for risk reduction activities, compliance monitoring, Phase 1 studies, and total mercury control actions are realistic estimates. The costs for Phase 2 methylmercury control actions are more speculative and will be re-evaluated at the end of Phase 1 when the studies are complete and the Board decides which management practices are practical and should be implemented.

The estimated costs for the Phase 1 characterization and control studies is the sum of costs for all entities required by Alternative 3 to complete studies. Because the only substantial difference between the Phase 1 study requirements in Alternatives 2 and 3 is the number of WWTPs required to conduct individual or collaborative studies, Alternative 2 Phase 1 studies are expected to cost only about 30% less than Alternative 3 studies. The most substantial cost difference between Alternatives 2 and 3 results from the Alternative 3 requirement for NPDES-permitted dischargers (large MS4s and WWTPs that discharge greater than 1 mgd) to implement total mercury minimization measures.

Alternative 1 entails no costs to agriculture. Alternative 3 entails more costs for irrigated agriculture than Alternative 2 because it requires methylmercury load reductions from six watersheds – Cosumnes River, Colusa Basin, French Camp Slough, Morrison Creek, Ulatis Creek, and Upper Lindsay/Cache Slough, and Willow Slough – that are not 303(d)-Listed as mercury impaired but drain directly to the Delta/Yolo Bypass. Agricultural land uses comprise about 50% of the land cover in these watersheds. Hence, it is reasonably foreseeable that methylmercury management practices for agricultural lands may need to be implemented in these watersheds; however, potential costs will be re-evaluated once the proposed watershed source analyses have been conducted. Agricultural costs associated with Alternatives 2 and 3 break down as follows:

			Alternative	
Delta TMDL Program Component	Low	High	2	3
Compliance monitoring:	$14,000/yr	$25,000/yr	√	√
Phase 1 MeHg characterization & control studies:	$430,000	$820,000	√	√
Phase 2 MeHg management practices for within-Delta/Yolo Bypass agricultural areas:	$220,000/yr	$460,000/yr	√	√
Phase 2 MeHg management practices for agricultural areas watersheds not 303(d)-Listed:	$370,000/yr	$830,000/yr		√

The agricultural implementation costs are based on relatively expensive assumptions (i.e., that farmers would reduce their methylmercury discharges by installing tailwater recovery systems and micro-irrigation systems to reduce their volume of runoff). It is expected that the Phase 1 control studies will develop more cost-effective methods of complying with the methylmercury allocations. Potential funding sources include those identified in the San Joaquin River Subsurface Agricultural Drainage Control Program and the Pesticide Control Program.

As shown below, the implementation costs estimated for Alternative 3 are comparable to costs estimated for other TMDL implementation programs in the region:

TMDL Implementation	Estimated Annual Cost (averaged over 30 years)
Delta – Methylmercury & Total Mercury (existing sources only):	$5.7 to $22 million
Cache Creek – Methylmercury: (Cooke and Morris, 2005)	$1.2 million
Clear Lake – Total Mercury: (Cooke and Morris, 2002)	$1.7 to $5.5 million
San Francisco Bay – Total Mercury: (Johnson & Looker, 2004; SFBRWQCB, 2006)	$530,000 to $3.5 million
Delta – Diazinon/Chlorpyrifos: (McClure *et al.*, 2006)	$6.4 to $14 million
Sacramento & Feather Rivers – Diazinon/Chlorpyrifos: (Hann *et al.*, 2007)	$300,000 to $7.7 million
Stockton Deep Water Ship Channel – Dissolved Oxygen: (Gowdy and Grober, 2005)	$530,000
San Joaquin River (Lower) – Salt & Boron: (Oppenheimer and Grober, 2004)	$27 to $38 million

The Delta methylmercury TMDL implementation program costs more than the other mercury programs because it addresses a much larger geographic area and more types of sources (point and nonpoint sources of total mercury and methylmercury). For example, the San Francisco Bay TMDL implementation cost considerations addressed only those potential costs for controlling total mercury discharges from point sources (NPDES-permitted wastewater facilities and MS4s). The Clear Lake and Cache Creek TMDLs' cost estimates addressed the remediation of mines and contaminated sediments in the watersheds.

In addition, the Delta methylmercury control program is not the first to include requirements for studies. The control program for low dissolved oxygen in the Stockton Deep Water Ship Channel also required that responsible parties conduct studies estimated to cost $15.6 million (Gowdy and Grober, 2005). This cost is comparable to the estimated study costs for the Delta methylmercury TMDL. Alternative 3's Phase 1 methylmercury characterization and control study costs and total mercury loading and control feasibility study costs combined are expected to range from about $2.8 million to $7.5 million. A characterization and control study that evaluates mercury emissions in and upwind of the Delta source region and load reduction options could cost about $1.5 million to $3 million.

Table 4.4: Summary of Estimated Costs for Implementation Alternative 3 of the Proposed Basin Plan Amendments. [a]

Category	Phase	Action	Cost (Low)	Cost (High)	Type of Cost [b]
Cache Creek Settling Basin	1	Improve sediment/total mercury trapping efficiency	$590,000	$2.1 million	Annual
	1	MeHg characterization & control study	$120,000	$330,000	Total
NPDES permitted facilities	1	Effluent & receiving water monitoring for MeHg & TotHg	$172,000	$172,000	Annual
	1	TotHg minimization actions	$3.6 million	$7.3 million	Annual
	1	MeHg characterization & control study (existing facilities)	$500,000	$1.3 million	Total
	2	MeHg control actions in the Delta to comply with MeHg allocations	$580,000	$8.4 million	Annual
	2	MeHg control actions in upstream watersheds not 303(d)-listed as mercury-impaired that require MeHg reductions for Delta TMDL allocations	$210,000	$230,000	Annual
NPDES permitted MS4s	1	Urban runoff & receiving water monitoring for MeHg & TotHg	$9,500	$9,500	Annual
	1	TotHg pollution prevention & best management practices	$11,000	$46,000	Annual
	1	MeHg characterization & control studies	$120,000	$1.1 million	Total
	2	MeHg management practices in the Delta to comply with MeHg allocations	$83,000	$260,000	Annual
	2	MeHg management practices in upstream watersheds not 303(d)-listed as mercury-impaired that require MeHg reductions for Delta TMDL allocations	$82,000	$170,000	Annual
Wetlands	1	MeHg monitoring for irrigated agriculture & wetlands	$14,000	$25,000	Annual
	1	MeHg characterization & control studies	$730,000	$2.8 million	Total
	2	MeHg management practices for existing managed wetlands to comply with MeHg allocations	$200,000	$270,000	Annual
	2	MeHg management practices to minimize increases in ambient MeHg resulting from new wetland restoration projects	$93,000	$125,000	Annual
Agricultural lands	1	MeHg monitoring for irrigated agriculture & wetlands	$14,000	$25,000	Annual
	1	MeHg characterization & control studies	$430,000	$820,000	Total
	2	MeHg management practices in the Delta to comply with MeHg allocations	$220,000	$460,000	Annual
	2	MeHg management practices in upstream watersheds not 303(d)-listed as mercury-impaired that require MeHg reductions for Delta TMDL allocations	$370,000	$830,000	Annual
Yolo Bypass flood conveyance	1 & 2	MeHg characterization & control studies for new projects	$570,000	$770,000	Total
	1 & 2	MeHg management practices for new projects	$390,000	$770,000	Annual

Table 4.4: Summary of Estimated Costs for Implementation Alternative 3 of the Proposed Basin Plan Amendments. [a]

Category	Phase	Action	Cost (Low)	Cost (High)	Type of Cost [b]
Water management practices	1 & 2	MeHg characterization & control studies for new projects	$420,000	$640,000	Total
	1 & 2	Implement MeHg management practices for new projects as needed	$120,000	$210,000	Annual
Dredging within the Delta	1 & 2	Monitoring of MeHg & TotHg at dredge project sites, DMD discharges, & dredge material reuse areas	$37,000	$37,000	Annual
	1 & 2	MeHg management practices	$25,000	$25,000	Annual
Tributary watersheds	1 & 2	TotHg control feasibility studies for upstream watershed sources	$250,000	$500,000	Total
	1 & 2	High-priority TotHg control actions beyond those needed for upstream TMDL, Title 27, or NPDES requirements	$250,000	$470,000	Annual
	1	TotHg loading study for Suisun & San Francisco Bays & the Central Valley	$180,000	$180,000	Total
	1 & 2	Watershed MeHg source analyses for watersheds not 303(d)-listed as mercury-impaired that require MeHg reductions for Delta TMDL allocations	$465,000	$465,000	Total
Local air emissions	1	Recommended TotHg emissions characterization & control study & development of load reduction program(s) options	$1.5 million	$3.0 million	Total
Risk reduction efforts	1 & 2	Expand public education and human health risk management programs	$390,000	$390,000	Annual
Reporting to the Board & adaptive management efforts	1	Development of a Technical Advisory Committee, Phase 1 Studies coordination & progress reports to the Board	$300,000	$500,000	Total
	1	Re-evaluation of Delta MeHg TMDL & implementation program & additional Basin plan amendments at the end of Phase 1	$130,000	$190,000	Total
	2	Periodic (every 10 years) evaluation & adaptation of the control program based on new information from monitoring, special studies, & scientific literature.	$3,400	$9,600	Annual
Surveillance and monitoring program	2	Periodic fish-tissue MeHg monitoring in the Delta to determine compliance with the fish tissue objectives	$7,200	$12,000	Annual
	2	Periodic water-column MeHg monitoring in the Delta to determine compliance with the tributary MeHg allocations & to re-evaluate the TMDL fish-water linkage	$7,500	$17,000	Annual
Mercury offset program development	1	Development of Phase 1 pilot offset projects	$300,000	$300,000	Total
	1	Development of Phase 2 offset program	$720,000	$1.1 million	Total

(a) Appendix C describes the assumptions upon which this summary is based. All costs are 2007 dollars.

(b) Study costs are presented as the total costs to complete the studies entailed by Implementation Alternative 3. Monitoring and implementation costs are presented as annual costs standardized to a 30-year project life.

4.4.3 Attainment of Water Quality Objectives

Proposed fish tissue objectives are not expected to be achieved under Alternative 1 (No Action). This alternative allows existing point and nonpoint methyl and total mercury sources to continue to discharge at their current rates, and allows new sources to increase the methylmercury concentration and total mercury loading in Delta waters. As noted earlier, natural erosion and sediment deposition eventually will reduce sediment mercury concentrations, but the continuing inputs make significant improvements unlikely for centuries to come if at all.

Proposed fish tissue objectives are expected to be achieved under Alternatives 2 and 3. Both alternatives would implement control actions focused on reducing methylmercury concentrations in Delta waters to 0.06 ng/l, which should result in fish tissue concentrations being reduced to levels protective of humans and wildlife consuming local fish. Staff estimates that fish tissue objectives will be achieved approximately five to ten years (two to three fish life cycles) after the methylmercury goal for ambient water is met. More rapid decreases in fish tissue concentrations are expected to occur soon after the major control actions are completed, with more gradual declines in fish tissue concentrations occurring as sediment concentrations continue to decline through natural erosion.

Both Alternatives 2 and 3 should prevent fish mercury levels from increasing by minimizing methylmercury inputs from new discharges to the Delta and its source region.

Alternative 2 focuses total mercury load reduction efforts on nonpoint sources in tributary watersheds that export the most mercury-contaminated sediment (Feather and American Rivers and Cache and Putah Creeks), with no limits for other point and nonpoint sources in the Delta and its tributary watersheds downstream of major dams. Almost all the total mercury loading to the Delta and Yolo Bypass comes from nonpoint sources in the tributary watersheds. In addition, the San Francisco Bay mercury TMDL implementation program expects the Central Valley to meet its total mercury load allocation in twenty years and has an interim milestone of half the allocation in ten years. Actions proposed by the Cache Creek mercury control program would require mines to be remediated within ten years and other projects to begin implementation within the same time schedule. In addition, there are ongoing mercury studies in the Yuba and Bear River watersheds within the Feather River watershed currently evaluating sources of mercury. Therefore, focusing reduction efforts on upstream nonpoint sources would make the implementation program likely to succeed in measurably reducing total mercury loads.

Alternative 3 is different from Alternative 2 in that it also requires:

- Proponents for activities that have the potential to increase total mercury loading to the Delta/Yolo Bypass because of population growth and climate change (e.g., new WWTP and MS4 discharges and modifications to reservoir releases, flood conveyance and levee development and maintenance) to evaluate the potential impacts of their projects on total mercury loading and implement control actions to minimize their total mercury discharges; and
- Large point sources in the Delta and its source region downstream of major dams to minimize their total mercury discharges.

Alternative 3 is more likely to prevent fish mercury levels from increasing than is Alternative 2 because it directly addresses future sources of both methylmercury and total mercury. Given the proximity of many of the Central Valley point source discharges to the Delta, assigning both methylmercury and total mercury control actions to point and nonpoint sources to minimize the impacts of increased growth and climate change is an equitable manner to apportion control responsibility that does not hinder urban development and water management.

Alternative 2 would require methylmercury reductions only from large point and nonpoint sources (except atmospheric deposition, open water habitats, and nonpoint source urban runoff) that (a) discharge to Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives and (b) do not act as dilution (i.e. discharge concentrations greater than the proposed methylmercury goal for ambient Delta waters). Alternative 3 would require methylmercury reductions from all point and nonpoint sources regardless of their relative discharge amount (with the same exceptions as Alternative 2). Alternative 3 has a more equitable approach that is more likely to succeed because (1) the MS4 and nonpoint source categories are each typically comprised of a myriad of individual discharges (no one discharge point accounts for all the loading) and, more importantly, (2) it is not yet known which methylmercury sources will be the easiest to control (it may be more cost-effective to reduce many small sources by a small amount than to reduce just a couple sources by a great amount).

4.4.4 Feasibility

This section examines the technical feasibility of the three implementation alternatives. Actions are considered technically feasible if current technology and remediation practices are available for the various projects.

Implementation Alternative 1 is technically feasible because (a) proposed public outreach and education activities are based on existing programs, and (b) no remediation activities are proposed.

Implementation Alternatives 2 and 3 address both total and methylmercury sources. Regarding total mercury control actions, Implementation Alternatives 2 and 3 are technically feasible. Erosion control BMPs, sediment control BMPs, and mercury control methods have been successfully developed and implemented by MS4s, WWTPs, and facilities with air emissions elsewhere in California and the United States. Total mercury reductions through mine remediation projects are considered feasible because mines have been remediated successfully in other parts of the Central Valley. Metal mines such as Walker Mine, Penn Mine, Iron Mountain Mine, and numerous smaller mines in the Lake Shasta watershed have significantly reduced their metal loading into surface waters by greater than 95%.[33] Similarly, inactive mines in the Cache Creek watershed are expected to be able to reduce anthropogenic sources of mercury loading by 95%. Initial remediation efforts are underway at the Abbott and Turkey Run mines in the Cache Creek watershed; monitoring results are not yet available. In addition, management practices for erosion control in mercury-enriched areas are feasible, as

[33] Personal communication from Central Valley Water Board Redding staff.

management practices have been developed for erosion controls. The less viable activities may include sediment removal in the channels contaminated with legacy mercury in areas where vehicle and equipment access is difficult or where there are sensitive habitats. Active or passive remediation of geothermal springs may be technically feasible, but treatment may not be practical if the springs are too remote.

Regarding methylmercury sources, Alternatives 2 and 3 are technically feasible. Methods for accurate methylmercury sample collection and analysis are well developed. Methylmercury production has been found to be a function of the total mercury content of the sediment (see Section 3.3 in the TMDL Report); hence, reducing total mercury discharges from the watersheds that export the largest volumes of mercury-contaminated sediment to the Delta and Yolo Bypass would reduce the amount of methylmercury produced by Delta/Yolo Bypass sediments. In addition, available data indicate that detailed evaluations of methylmercury sources could reveal management measures to minimize methylmercury loads. For example, monitoring results from municipal WWTPs indicate that 28 of 65 facilities have effluent concentrations less than 0.06 ng/l, and that some facilities have higher effluent methyl to total mercury ratios than others (Appendix G in the TMDL Report and Bosworth *et al.*, 2008). A similar pattern is seen in preliminary data from studies of different types of wetlands in the Sacramento and San Joaquin River Basins: high aqueous and fish methylmercury concentrations in some, and low methylmercury concentrations in others (see Section 3.5 in the TMDL Report). These patterns indicate that it will likely be feasible to control methylmercury from some sources through design, management, and control options.

4.4.5 Compliance with Existing Federal and State Regulations and Policies

This section briefly describes how the implementation alternatives comply with existing Federal and State regulations and policies. A more detailed review is in Chapter 6. Table 4.5 lists the regulations and policies that were evaluated.

Implementation Alternative 1 is not consistent with Federal and State regulations and policies because it is not expected to attain mercury levels in fish that are safe for human and wildlife consumption. This alternative allows existing point and nonpoint methyl and total mercury sources to continue discharge at their current rates and for new sources to increase the methylmercury concentration and total mercury loading in Delta waters, which ultimately would result in further degradation of fish mercury levels.

Implementation Alternatives 2 and 3 are consistent with all Federal regulations and State and Central Valley Water Board policies. Alternative 3 would be better able to achieve the long-term goals of the Consolidated Toxic Hot Spots Cleanup Plan and various anti-degradation policies (e.g., prevent the creation of new toxic hot spots and further pollution of existing hot spots) by directly addressing future point sources of total mercury in addition to future sources of methylmercury.

Both Alternatives 2 and 3 are consistent with the California Wetlands Conservation Policy in that they do not entail a net loss in the quantity of wetlands acreage in California. As discussed in Section 4.4.1 and Chapter 7, the implementation of methylmercury management practices conceivably could affect the habitat function of wetlands. However, as noted earlier, there are

measures that would enable the Delta TMDL implementation program to minimize, if not avoid altogether, negative effects on wetland function. Alternatives 2 and 3 also could result in an increase in procedural complexity for the administration of State and Federal wetlands conservation programs. Both alternatives require State and Federal wetland managers to participate in methylmercury studies and consider methylmercury control requirements for wetland restoration projects.

Table 4.5: Federal and State Regulations and Policies Relevant to Development of Water Quality Objectives and Implementation Plans

FEDERAL	
• Clean Water Act (40 CFR §131.11 (b) *et seq.*, §401 and §404) • Antidegradation Policy (40 CFR §131.12) • Federal & State Endangered Species Acts (50 CFR *et seq.*, California Fish and Game Code §2050-2116 *et seq.*)	
STATE WATER BOARD	
• Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy) (Resolution No. 68-16) • Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Resolution No. 74-43) • Sources of Drinking Water Policy (Resolution No. 88-63) • Pollutant Policy Document (Resolution No. 90-67) • Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 (Resolution No. 92-49)	• Consolidated Toxic Hot Spots Cleanup Plan (Resolution No. 99-065 2004-0002) • Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Resolution No. 99-114 and 2004-0030) • Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Resolution No. 2005-0019) • Mercury Fish Tissue Objectives and TMDL for Mercury in San Francisco Bay (Resolution No. 2007-0045)
CENTRAL VALLEY WATER BOARD	
• Antidegradation Implementation Policy • Application of Water Quality Objectives Policy • Controllable Factors Policy	• Urban Runoff Policy • Water Quality Limited Segment Policy • Watershed Policy
OTHER POLICIES AND PROGRAMS	
• California Mercury Reduction Act • DTSC Universal Waste Rule • Delta Protection Act of 1992 • CALFED Bay-Delta Program	• California Wetlands Restoration Policy • Habitat Conservation Plans and Natural Community Conservation Plans

4.5 Recommended Implementation Alternative

Central Valley Water Board staff recommends Implementation Alternative 3 for adoption into the Basin Plan. Alternative 3 is both more equitable and more likely to succeed at achieving safe fish mercury levels in the Delta because it requires studies and implementation actions for a broader range of methylmercury and total mercury sources in the Delta and its tributary watersheds, and it directly addresses future sources. This alternative includes the following components:

- Incorporate an expanded public education, outreach, and risk management program that coordinates efforts between the State and Regional Water Boards, Office of

Environmental Health Hazard Assessment, California Department of Public Health, local county health departments, dischargers, and affected communities.

- Establish methylmercury load allocations (for nonpoint sources) and waste load allocations (for point sources) for all methylmercury dischargers in the legal Delta boundary and Yolo Bypass, including irrigated agriculture, wetlands, municipal and industrial wastewater treatment plants, urban runoff, and open water, as well as tributary inputs to the Delta and Yolo Bypass. Allocations for wetlands, municipal and industrial wastewater treatment plants, urban runoff, and irrigated agriculture sources incorporate load reductions if (a) they discharge to Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives, and (b) they have discharges that exceed 0.06 ng/l methylmercury (or their intake methylmercury levels). Allocations for open-water areas in the Yolo Bypass and Marsh Creek subareas incorporate load reductions, but these reductions are expected to be accomplished by upstream total mercury control actions.
- Establish total mercury load limits for the Cache Creek Settling Basin, American and Feather Rivers, and Putah Creek inputs to the Delta/Yolo Bypass.
- Establish Phase 1 methylmercury concentration limits for all sources within the Delta/Yolo Bypass and methylmercury concentration limits for point sources in the tributary watersheds downstream of major dams expected to increase due to population growth (e.g., large municipal WWTP and MS4 discharges).
- Adopt guidance for pilot methylmercury and total mercury offset projects and for a credit strategy for NPDES-permitted dischargers that can demonstrate early reduction of their total mercury discharges.
- Establish a monitoring and surveillance program.
- Evaluate the progress of the implementation program, report to the Board, and make changes as needed to the implementation program using an adaptive management approach.

<u>Implementation Phase 1 (about 2009-2016)</u>:

- Conduct source analyses and feasibility studies to identify and prioritize total mercury control projects to be implemented in tributary watersheds during Phases 1 and 2.
- Monitor the sources in the Delta, Yolo Bypass and tributary watersheds downstream of major dams that are assigned methylmercury allocations, Phase 1 methylmercury concentration limits, and total mercury minimization requirements.
- Conduct methylmercury characterization and control studies. The following entities are responsible for the studies: large WWTPs with discharge greater than 0.06 ng/l methylmercury and large MS4s that discharge to the Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives or the tributary watersheds that drain to them; wetlands and agricultural sources that discharge to the Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives; and any new or expanded projects that have the potential to discharge methylmercury to the Delta.
- Take actions to reduce total mercury in Cache Creek Settling Basin outflows and minimize total mercury inputs from point and nonpoint sources in the Delta and its tributary watersheds downstream of major dams expected to increase due to population growth and/or changes in water management practices due to climate change or other priorities.

- Take actions to minimize total mercury discharges and maintain methylmercury concentration limits for sources expected to increase due to population growth (e.g., large municipal WWTP and MS4s).
- Take actions to minimize methylmercury inputs from new or expanded sources in the Delta and its tributary watersheds downstream of major dams, e.g., wetland restoration projects, WWTP and MS4 discharges related to population growth, and changes in water management practices due to climate change or other priorities.
- Develop an offset program for methylmercury and total mercury for Board consideration by the end of 2016 that is guided by results available from the proposed methylmercury characterization and control studies and pilot offset projects

Implementation Phase 2 (about 2017-2030):

- Take actions to reduce methylmercury discharges to the Delta and Yolo Bypass from existing local and upstream methylmercury sources, including the Cache Creek Settling Basin, to achieve the methylmercury allocations.
- Take additional actions as needed to reduce total mercury discharges to comply with the Delta/Yolo Bypass methylmercury allocations and the San Francisco Bay TMDL's total mercury allocation for the Central Valley, with particular focus on nonpoint sources in the tributary watersheds that discharge the most mercury-contaminated sediment to the Delta and Yolo Bypass.

Implementation Phase 3 (about 2031 onward):

- Continue maintenance of control actions implemented during Phases 1 and 2 of the Delta methylmercury TMDL program.
- Continue implementation of upstream TMDL program control actions.
- Natural erosion continues to remove total mercury deposited in creek beds and banks that could not otherwise be remediated.

These required and recommended actions along with implementation timelines are reflected in the proposed Basin Plan amendments located after the Executive Summary at the beginning of this report. Also included are recommendations to the State Water Board and other agencies regarding actions that should be taken for which the Central Valley Water Board may not have direct authority. These actions and timelines are designed to achieve the methyl and total mercury source load reductions described in Section 4.1, and thereby achieve the water quality objectives for Delta fish, as well as the San Francisco Bay mercury TMDL implementation program's allocation for total mercury leaving the Central Valley and the USEPA's CTR criterion for total mercury in the water column.

Table 4.6 illustrates the timelines for Alternative 3's implementation components. The timelines are subject to change depending on the length of the Basin Plan amendment approval process; the assumption is that the Central Valley Water Board will adopt the Basin Plan amendments in 2008 and that the State Water Board, Office of Administrative Law and USEPA will grant approval of the amendments in late 2008 or 2009.

The Central Valley Water Board will employ an adaptive management approach to implementing Phase 1 of the program and developing actions for Phases 2 and 3, incorporating

new data and scientific information. The Central Valley Water Board will consider the nature of the mercury sources, the feasibility of on-site controls, and the need to reduce methylmercury discharges when determining which responsible parties will be required to implement on-site control programs and/or participate in an offset program to maintain methylmercury allocations during Phases 2 and 3.

The options selected for the study and control of methylmercury and total mercury balance equitability, the likelihood of success, and jurisdictional constraints. Development and implementation of nonpoint source management practices traditionally have proved difficult in California. The Central Valley Water Board may need to consider in Phase 2 whether satisfactory progress is being made on characterizing nonpoint source concentrations and loads to the Delta and whether effective management practices are possible. If effective management practices are not possible, then the Central Valley Water Board may consider requiring additional methylmercury load reductions from point source facilities located in critical Delta subareas and source areas outside the Delta.

Staff acknowledges that a variety of programmatic strategies and new projects are under development, such as the Delta Long Term Management Strategy (LTMS); Delta Special Area Management Plan (SAMP); regional, county, and local Habitat Conservation Plans and Natural Community Conservation Plans; and wetland restoration projects. In accordance with California Water Code Section 13247, lead agency staff, institutions and project managers proposing projects and programs affecting the Delta region must consider Basin Plan requirements when developing projects and programs. The Central Valley staff has and will continue to collaborate with agencies and institutions to ensure their projects attain and include appropriate management practices and mitigation measures to achieve Basin Plan amendment requirements.

Table 4.6: Summary of Recommended Implementation Actions and Timeline (Implementation Alternative 3)

TASKS	Years After Basin Plan Effective Date										
	0	1	2	3	4	5	6	7	8	Year 9 to 2030	2031 Onward
PROGRAMMATIC ACTIONS											
Basin Plan Amendment adoption process: Central Valley and State Water Boards, OAL, and USEPA.	X	X									
Expand fish consumption outreach and education program and reevaluate fishing advisories; staff reports progress to the Board in 2010 and 2012, and then every 3 years thereafter.		X	X	X	X	X	X	X	X	X	X
Issue 13267 Orders, revise NPDES facility and MS4 permits and CWA Section 401 water quality certifications and take other actions as necessary to implement discharger monitoring, methylmercury (MeHg) characterization and control studies, and MeHg and TotHg control actions.		X	X								
Dischargers assigned MeHg allocations, Phase 1 MeHg limits, and/or TotHg minimization requirements implement monitoring plans.		X	X	X	X	X	X	X	X	X	X
Phase 1 MeHg concentration limits for NPDES WWTPs become effective.				X							
Phase 1 MeHg concentration limits for large MS4s become effective.					X						
Conduct voluntary pilot MeHg and/or TotHg offset projects.		X	X	X	X	X	X	X			
Conduct upstream watershed MeHg source analyses and coordinate with upstream TMDL programs to ensure Delta tributary input allocations are achieved.		X	X	X	X	X	X	X	X		
PHASE 1 IMPLEMENTATION – TOTAL MERCURY CONTROL											
Conduct TotHg source analyses and feasibility studies to identify high priority projects, with particular focus on the Feather and American Rivers and Putah Creek watersheds.	X	X	X	X	X	X	X	X			
Implement high priority TotHg reduction projects.				X	X	X	X	X	X	X	
Submit operations and maintenance plan for Cache Creek Settling Basin to extend its life indefinitely.			X								
Submit plan for improvements to Cache Creek Settling Basin to increase its trapping efficiency to 75% to reduce TotHg discharges.				X							
Implement TotHg control actions for Cache Creek Settling Basin.						X	X	X			
Develop agency agreements with State Water Board, Air Resources Board, and USEPA to evaluate and reduce atmospheric mercury sources.	X	X	X								
NPDES WWTPs and MS4s implement control actions and BMPs to minimize TotHg discharges.			X	X	X	X	X	X	X	X	
PHASE 1 IMPLEMENTATION – METHYLMERCURY CHARACTERIZATION AND CONTROL STUDIES											
Complete Delta Island MeHg loading study (contracted to Moss Landing Marine Laboratories).	X										
Technical advisory committee (TAC) of independent, nationally or internationally recognized mercury experts reviews MeHg study designs, evaluates results, proposes follow-up studies and makes recommendations on whether sufficient information is available to implement MeHg management practices.		X	X	X	X	X	X	X	X		
Dischargers submit report that describes how individual dischargers or groups of dischargers will implement individual or coordinated MeHg studies.		X									
Dischargers submit MeHg study plans for EO approval and TAC evaluation and Board staff report progress to the Board.			X								
Dischargers conduct MeHg studies and pilot projects.				X	X	X	X	X	X		

Table 4.6: Summary of Recommended Implementation Actions and Timeline (Implementation Alternative 3)

TASKS	Years After Basin Plan Effective Date										
	0	1	2	3	4	5	6	7	8	Year 9 to 2030	2031 Onward
Dischargers submit MeHg study progress reports for Board staff and TAC evaluation and staff report progress to the Board.					X						
Dischargers submit final reports that present MeHg study results, MeHg control options, preferred control options, and proposed implementation schedules. TAC evaluates results and discharger recommendations and provides statement on whether TAC members agree with report findings.								X			
NPDES facilities and MS4s with MeHg allocations that were not required to conduct MeHg studies submit management plans that identify preferred control options and timelines for implementation.								X			
Expanded/new projects with the potential to discharge MeHg conduct MeHg studies (or coordinate with other dischargers' studies) and submit reports proposing methods to minimize their MeHg discharges.			X	X	X	X	X	X	X	X	
Staff reports to the Board the MeHg characterization/control study results, pilot offset project results, and TAC and staff recommendations for updated TMDL allocations, control program revisions for Delta and upstream sources, and offset program framework.									X		
PHASE 2 IMPLEMENTATION											
Phase 2 Basin Plan Amendment adoption hearing for offset program framework.									X		
Phase 2 Basin Plan Amendment adoption hearing for Delta MeHg TMDL implementation program revisions.									X		
Dischargers implement on-site and/or offset MeHg and TotHg control actions and management practices to achieve MeHg allocations.										X	
Implement additional TotHg control actions as needed to comply with the San Francisco Bay mercury TMDL implementation program's TotHg allocation for the Central Valley.										X	
Implement monitoring and surveillance program. Conduct Delta/Yolo Bypass fish tissue monitoring in ~2020 and 2030.										X	
Staff reports to the Board fish tissue monitoring results and progress towards achieving Delta MeHg allocations, Delta fish tissue objectives and San Francisco Bay total mercury allocation.										X	
PHASE 3 IMPLEMENTATION											
Continue maintenance of MeHg and TotHg control actions implemented during Phases 1 and 2.											X
Conduct Delta/Yolo Bypass fish tissue monitoring every 10 years; staff reports to the Board monitoring results and progress towards achieving fish tissue objectives. Board amends Basin Plan as necessary to achieve and maintain fish tissue objectives.											X
Natural erosion processes remove TotHg deposited in creek beds and banks that could not otherwise be remediated.											X

5 MONITORING

Chapter 5 of the Basin Plan describes the methods and programs that the Central Valley Water Board uses to acquire water quality information. Acquisition of data is a basic need of a water quality control program and is required by the Clean Water Act and the Porter-Cologne Water Quality Control Act.

A monitoring plan is also an essential element of the methylmercury control strategy for the Delta. The goal of monitoring is to measure whether ambient methylmercury concentrations have been reduced and to track progress in achieving the water quality objectives. Monitoring in the Delta and its tributaries will include fish tissue, water and sediment sampling. For methylmercury control studies conducted in Phase 1 of the implementation plan, Central Valley Water Board staff will review monitoring plans.

Central Valley Water Board staff will take the lead in determining compliance with the fish tissue objectives and work with the State Water Board and dischargers to develop a strategy to fund the fish tissue monitoring program. Fish tissue sampling required to evaluate the impact of a particular project (see Section 5.1) will be the responsibility of the project proponent. Monitoring for compliance with the proposed methylmercury allocations from specific sources shall be conducted by responsible parties for each source.

The proposed modifications to Basin Plan Chapter 5 (Surveillance and Monitoring) are presented after the Executive Summary at the beginning of this report. Section 4.3.4 describes the alternatives evaluated for a surveillance and monitoring program. This chapter reviews the recommended monitoring program. Section 5.1 contains guidance for fish tissue monitoring in the Delta and Yolo Bypass. Section 5.2 contains guidance for water monitoring in the Delta and Yolo Bypass. Section 5.3 provides guidance for sediment monitoring during dredging and methylmercury control studies.

5.1 Fish Tissue Monitoring

For all fish tissue monitoring discussed below, analysis for total mercury is an appropriate and economical option rather than analysis for methylmercury. Methylmercury comprises 85% to 100% of the total mercury measured in fish (Becker and Bigham, 1995; Slotton *et al.*, 2004). Total mercury may be analyzed and reported without adjustment instead of methylmercury in fish samples in order to reduce analytical costs.

5.1.1 Compliance with Large TL3 & 4 Fish Objectives

The proposed water quality objectives for the Delta are in the form of methylmercury in muscle tissue of large, trophic level three and four fish. The primary TL3 species in the Delta caught by humans or wildlife are black bullhead, bluegill, carp, Chinook salmon, redear sunfish, Sacramento blackfish, Sacramento sucker, American shad, and white sturgeon. The primary TL4 species are largemouth and striped bass, channel and white catfish, crappie, and Sacramento pikeminnow.

The initial fish tissue monitoring should take place at the following compliance reaches in each subarea to represent subarea-specific conditions:

- Central Delta subarea: Middle River between Bullfrog Landing and Mildred Island;
- Marsh Creek subarea: Marsh Creek from Highway 4 to Cypress Road;
- Mokelumne/Cosumnes River subarea: Mokelumne River from the Interstate 5 bridge to New Hope Landing;
- Sacramento River subarea: Sacramento River from River Mile 40 to River Mile 44;
- San Joaquin River subarea: San Joaquin River from Vernalis to the Highway 120 bridge;
- West Delta subarea: Sacramento/San Joaquin River confluence near Sherman Island;
- Yolo Bypass-North subarea: Tule Canal downstream of its confluence with Cache Creek; and
- Yolo Bypass-South subarea: Toe Drain between Lisbon and Little Holland Tract.

Once fish tissue methylmercury concentrations in a given subarea's compliance reach have achieved the methylmercury fish tissue objectives, fish tissue monitoring should take place at additional waterways in the subarea to ensure that the objectives are achieved throughout the subarea. Fish concentrations vary within the different Delta subareas. Multiple sites should be evaluated to ensure that human and wildlife consumers of fish are protected. Sampling should be conducted at popular angling sites. Sites with high fishing activity include Honker Cut/8 Mile Road, the Stockton Deep Water Ship Channel, the Sacramento River near Clarksburg, Whiskey Slough, Franks Tract, Taylor Slough, and Beaver Slough (FMP, 2005b). Local fish consumers, the Department of Public Health, the Office of Environmental Health Hazard Assessment, and other public health agencies and should be involved in selection of the sampling sites.

Compliance fish methylmercury monitoring should include representative fish species for comparison to each of the methylmercury fish tissue objectives:

- Trophic Level 4: bass (largemouth and striped), channel and white catfish, crappie, and Sacramento pikeminnow.
- Trophic Level 3: American shad, black bullhead, bluegill, carp, Chinook salmon, redear sunfish, Sacramento blackfish, Sacramento sucker, and white sturgeon.

Trophic level 3 and 4 fish sample sets should include three species from each trophic level and should include both anadromous and non-anadromous fish. Trophic level 3 and 4 fish sample sets should include a range of fish sizes between 150 and 500 mm total length.[34] Striped bass, largemouth bass, and sturgeon caught for mercury analysis must be within the CDFG legal catch size limits. In any subarea, if multiple species for a particular trophic level are not

[34] The proposed TL3 and TL4 fish objectives were developed assuming that humans and large, piscivorous wildlife species (e.g., bald eagle, osprey, and river otter) would likely consume fish in the size range of 150-500 mm total length.

available, one species of that trophic level evaluated in a range of sizes is considered acceptable.

Sample numbers for determining compliance should be determined using statistical methods approved by the Executive Officer of the Central Valley Water Board. The USEPA has published fish sampling guidance (1995). Staff recommends that the average concentrations should be calculated from at least nine samples of individual fish or three composite samples of at least three fish per composite.

To track the progress of the proposed implementation program, fish tissue monitoring should be initiated five years after dischargers implement projects to reduce methylmercury and total mercury discharges. Monitoring should take place every ten years thereafter.

5.1.2 Compliance with Small TL2/3 Fish Objective

The recommended fish tissue objectives include an objective for methylmercury in small TL2/3 fish. The least tern, which is federally listed as endangered, feeds on fish less than 50 mm in total length. Small fish should be sampled when large TL3 and TL4 fish are sampled for comparison with the fish tissue objective to verify that wildlife species that depend on small Delta fish are protected. Fish species appropriate for sampling to ensure that least tern and other wildlife feeding on small (<50 mm) fish are: juvenile bluegill, inland silverside, mosquitofish, red shiner and threadfin shad, or other fish less than 50 mm, such as the young-of-year of the species listed earlier for the large TL3/TL4 fish monitoring.

5.1.3 Additional Monitoring for Trends Analysis

Largemouth bass in the Delta and elsewhere have been shown to be good bioindicators of methylmercury contamination (Davis *et al.*, 2003). Largemouth bass are abundant, widely distributed throughout the Delta, and non-migratory. Largemouth bass maintain a localized home range (i.e., most stay within a mile of a given waterway [Davis *et al.*, 2003]), and show good length versus mercury concentration relationships. In addition, concentrations of mercury in largemouth bass show statistically significant, positive correlations with mercury in other fish in the Delta (see Section 4.7 of the TMDL Report) and methylmercury in the water column (see Chapter 5 of the TMDL Report). Sampling largemouth bass is an economical way to track spatial and temporal changes in fish mercury levels in the Delta.

Staff identified a methylmercury concentration in standard size (350 mm) largemouth bass that corresponds to the recommended fish tissue objectives (see Section 4.7.4 of the TMDL Report). Although sampling of multiple fish species is required for compliance with the recommended fish tissue objectives, collection of largemouth bass in a range of sizes appropriate for standardization would allow for excellent comparison with previous work and analyses of spatial and temporal trends in fish methylmercury levels and water-fish methylmercury relationships (Davis *et al.*, 2003; FMP, 2006 & 2007).

5.1.4 Source or Project Assessment

Fish tissue sampling can help to evaluate the impact of a particular source or project (e.g., testing a methylmercury control program in a wetland). For this purpose, monitoring of young fish that remain in a relatively defined home territory is recommended. Young fish will more quickly reflect changes in mercury bioavailability than will larger or older fish, which integrate mercury uptake over years and large spatial areas. Inland silversides are recommended for monitoring because they are widespread in the Delta, maintain relatively localized home ranges, and have very consistent same-site, individual, whole body mercury concentrations at sizes of about 45 to 75 mm (Slotton *et al.*, 2003). Other species listed in Section 5.1.2 may also be appropriate for monitoring, depending on local abundance. Baseline levels of methylmercury in these species are fairly well established in the Delta (Slotton *et al.*, 2003).

5.2 Water Monitoring

The Central Valley Water Board and responsible parties in the Delta or tributaries will need to monitor methylmercury and total mercury in water to satisfy requirements of the proposed implementation plan. Responsible parties that are assigned methylmercury allocations and/or methylmercury concentration limits must monitor methylmercury in their discharge and report results to the Central Valley Water Board. Methylmercury control studies will likely necessitate that dischargers and other responsible parties monitor methylmercury in discharge and ambient water.

The proposed implementation plan sets an implementation goal for average annual methylmercury concentration in unfiltered, ambient water of 0.06 ng/l. For comparison of Delta and tributary waterways methylmercury concentration data with the aqueous methylmercury goal, and to continue evaluation of the fish-water methylmercury linkage, the Central Valley Water Board should take the lead in collecting water samples periodically throughout the year and during typical flow conditions as they vary by season, rather than targeting extreme low or high flow events. Ambient water monitoring should take place at the same locations as the fish methylmercury compliance monitoring described in Section 5.1 as well as where tributaries enter the Delta and Yolo Bypass. Ambient water monitoring should take place for at least one year before the fish tissue objective compliance monitoring takes place.

Delta outflows to the San Francisco Bay must comply with the total mercury allocation assigned to the Delta in the San Francisco Bay Mercury TMDL, which requires a decrease in mercury loads of 110 kg/year from existing conditions. Attainment of the allocation can be measured two ways: measuring mercury in water and flow in the inputs to the Delta or measuring the concentration of mercury per unit suspended sediment passing the compliance point of Mallard Island and multiplying by the suspended sediment loads. In addition, Suisun and Grizzly Bays in the San Francisco Bay region may contribute methylmercury to the western Delta by way of tidal pumping. As resources are available, the Central Valley and San Francisco Bay Water Boards should periodically monitor methylmercury and total mercury in ambient water in the western Delta and Suisun and Grizzly Bays to track progress in meeting the implementation goal for methylmercury in ambient water in the western Delta and the total mercury allocation for Delta outflows to San Francisco Bay. If the San Francisco Bay Water Board changes its

allocation for Delta outflows during its periodic review of the San Francisco Bay Mercury TMDL, the Central Valley Water Board would adjust its total mercury monitoring and control program accordingly.

The Central Valley Water Board also would continue monitoring methylmercury in Delta tributaries as part of developing TMDLs for those tributaries and implementing the Delta TMDL.

5.3 Sediment Monitoring

Staff's proposed amendments to Chapter 5 of the Basin Plan do not contain sediment monitoring requirements for Delta and upstream water bodies. However, evaluating total mercury in sediment may be useful for identifying sources of mercury-enriched sediments, particularly for sources that supply areas of high methylmercury production. For the methylmercury source characterization and control studies and tributary watershed total mercury source analyses described in Chapter 4, the fine-grained fraction (less than 63 micron) of sediment or soil samples should be evaluated. Staff recommends sieving samples to less than 63 microns and drying them to evaluate mercury concentrations in a uniform manner.

To comply with the requirements proposed for dredging in Chapter 4, proponents of dredging projects must monitor concentrations of mercury in sediment. The implementation plan proposes that dredge operations ensure that newly exposed sediment at each project site has an average total mercury concentration equal to or less than the surface material before dredging. As recommended in the previous paragraph, sediment samples should be sieved to less than 63 microns and dried to evaluate mercury concentrations in a uniform manner.

6 REVIEW OF EXISTING FEDERAL AND STATE LAWS AND STATE & REGIONAL BOARD POLICIES

Any proposed changes to the Regional Water Board Basin Plans must be consistent with existing Federal and State laws and adopted State and Regional Water Board policies. Water Code Section 13146 requires that, in carrying out activities that affect water quality, all state agencies, departments, boards and offices comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the State Water Board in writing their authority for not complying with such policy. This chapter summarizes existing Federal and State laws and policies that are relevant to the proposed water quality objectives and implementation plan described by the proposed Basin Plan amendments.

6.1 Consistency with Federal Laws and Policies

Federal agencies have adopted water quality control policies and plans to which Central Valley Water Board actions must conform. The following Federal laws are relevant to the proposed Basin Plan amendments:

- Antidegradation Policy (40 CFR §131.12)
- Clean Water Act (40 CFR §131.11 (b) *et seq*.)
- Federal & State Endangered Species Acts (50 CFR *et seq*., California Fish and Game Code §2050-2116 *et seq*.)

These laws and their relevance to the proposed water quality objectives and implementation plan are described in the following sections.

6.1.1 Antidegradation Policy

The Federal Antidegradation Policy (40 CFR §131.12) states:

> "(a) The State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:
>
> (1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
>
> (2) Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or

lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

(3) Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act."

The proposed Basin Plan amendments would establish the first numeric water quality objectives for methylmercury in the Delta to protect and maintain its beneficial uses. The proposed implementation plan is designed to maintain and improve water quality in the Delta and is consistent with this policy.

6.1.2 Clean Water Act

State Adoption of Standard – Numeric Limit

Under Section 303(c) of the Clean Water Act, water quality standards adopted by a State are subject to USEPA approval. The Clean Water Act requires that numeric criteria be based on "(i) 304(a) Guidance; or (ii) 304(a) Guidance modified to reflect site-specific conditions; or (iii) other scientifically defensible methods" (40 CFR §131.11 (b) *et seq*.). The following actions are consistent with the Clean Water Act:

- Interpreting the current narrative water quality objectives to develop numeric objectives to adopt TMDLs, because states may adopt site-specific numeric water quality standards to protect designated beneficial uses.
- Basing objectives on the USEPA Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (USEPA, 2000b), because the methodology is part of 304(a) Guidance.

Approval of NPDES Permittee and Storm Water Compliance Schedules

The proposed Basin Plan amendments allow the Central Valley Water Board to include compliance schedules in NPDES permits for permittees that need time to comply with the proposed methylmercury allocations. In conjunction with approval of the proposed water quality objectives and the mercury TMDL, the State will seek USEPA approval of the NPDES wastewater and storm water allocation implementation schedules under 40 CFR §131.13, which allows the USEPA to approve water quality standard implementation policies adopted by a

state. The NPDES wastewater and storm water implementation schedules are necessary for achieving the proposed water quality objectives.

Title 40 CFR §122.47 sets forth the regulations for schedules of compliance for NPDES programs. The proposed Delta implementation schedule must be consistent with these regulations, which require that the compliance schedule be appropriate, require compliance as soon as possible, and include interim requirements at specified time intervals.

Is the Proposed Compliance Schedule Appropriate for NPDES Permittees? The proposed Basin Plan amendments allow dischargers up to 2030 to achieve methylmercury allocations. The proposed amendments are expected to be legally applicable in 2009. Following Phase 1 of implementation, which is an eight-year study and review period, dischargers will have about 15 years to comply with their allocations. The proposed Basin Plan amendments set the maximum time that will be allowed for NPDES permittees to comply with their requirements.

There are twenty-one NPDES-permitted municipal and industrial dischargers in the Delta and Yolo Bypass, which account for about 4% of the annual methylmercury loading. Eight of the facilities must reduce their effluent methylmercury loads to comply with their methylmercury allocations.

Urban runoff in the Delta is regulated by twelve NPDES permits issued to MS4s. Discharge from these MS4 service areas is estimated to contribute up to about 1% of the methylmercury loading to the Delta. All MS4s but one discharge to impaired subareas of the Delta and must decrease methylmercury loads.

Population increases are anticipated in Delta/Yolo Bypass areas served by municipal facilities and urban runoff systems. All NPDES permittees will have to control effluent methylmercury resulting from urban expansion such that the proposed fish tissue objectives are achieved and maintained.

Actions taken by NPDES permittees to achieve and maintain their methylmercury allocations will be dependent on the findings from the Phase 1 characterization and control studies. No single management action or plan will control methylmercury adequately at all NPDES facilities. Industry-wide, no standard method has been developed to control methylmercury. Concentrations of methylmercury in effluent from Delta NPDES facilities in 2004-2005 ranged from 0.02 to 3.4 ng/L (see TMDL Report Chapter 6). Because of the variety of treatment and management measures utilized by facilities discharging low concentrations of methylmercury, identifying means of control and quantifying effectiveness will take time. For some Delta facilities, significant changes in treatment processes may be needed to achieve the allocations. Possible treatment additions include advanced filtration, ultraviolet radiation, extended aeration, and chemical enhancement of primary treatment. Facilities may opt to discharge a portion of their effluent to land to comply with the allocations (see Appendix C).

Similarly for MS4s, the solution for achieving methylmercury allocations must be tailored to particular urban areas. Possible actions include: (1) pollution prevention, which includes a range of public education, product exchange, and enhancement of waste collection, recycling, and disposal activities; (2) modification of storm water collection and retention systems,

including aeration and sediment removal; and (3) other actions identified by the Phase 1 studies.

The fifteen-year period after the Phase 1 studies are completed provides the maximum time that is expected to be needed for planning, acquiring funding, environmental review, design, construction of facilities or implementation of programs, and for the actions to show compliance with the allocations. Specific compliance schedules will be determined for each NPDES permit and will be based on the individual permittee's need for time to construct facilities or infrastructure, implement programs, and secure funding, within the maximum time period.

Does the Schedule Require Compliance As Soon As Possible? The two-phase (eight plus fifteen years) compliance schedule is appropriate for the Delta methylmercury control program because of the difficulty in controlling methylmercury.

Phase 1 of the implementation plan is needed in order to generate more information about controlling methylmercury. The California Bay-Delta Program and other entities are funding studies of factors controlling methylmercury production. The CalFed studies will provide information about methylmercury in some wetlands and agricultural operations, but more data will be needed. In particular, control options for some sources will need additional investigation during the Phase 1 study period. For example, some municipal wastewater treatment facilities in the Central Valley have effluent with methylmercury concentrations below the TMDL's methylmercury goal for ambient Delta waters. Studies are needed to determine the treatment factors responsible for low methylmercury levels and whether the factors can be replicated elsewhere. Rather than postpone adopting water quality objectives and methylmercury allocations for the Delta, the Delta implementation plan includes a study period that will facilitate production of the information necessary to reduce methylmercury.

An objective of the Phase 1 characterization and control studies is to identify the most effective methods of reducing methylmercury. These methods will need to be applied, tested, and likely for some sources, adjusted, in order to comply with the methylmercury allocations. It will take time for the municipal and industrial wastewater facilities and urban runoff systems to adequately control their methylmercury inputs.

The Delta TMDL implementation plan requires control of two water quality constituents, methylmercury and inorganic ("total") mercury. By addressing both forms of mercury, it is expected that, overall, the methylmercury water quality objectives will be reached more quickly than if only one form of mercury were controlled under the TMDL implementation plan. However, it will take more time and effort at the beginning of the overall implementation period to implement controls for both methylmercury and total mercury, versus controlling just one constituent.

Federal regulations and the Basin Plan require that final compliance dates for NPDES permittees to comply with waste load allocations be as soon as possible (Basin Plan language is "shortest practicable time"; CVRWQCB, 2007). The compliance schedule in each NPDES permit that is set to achieve the proposed waste load allocations should be as short as possible.

What are the Interim Schedules and Requirements? Municipal and industrial wastewater NPDES facilities are assigned the following interim requirements:

- By three months after the effective date of the Basin Plan amendments, facilities must begin monitoring methylmercury and total mercury in their effluent, calculate annual average concentrations, and report the data and calculations annually to the Central Valley Water Board.
- Six months after the effective date of the Basin Plan amendments, facilities must submit a mercury evaluation plan for total mercury and maintain compliance with a USEPA-approved pretreatment program, as applicable, which requires that industry and other non-domestic wastewater sources treat their discharge that enters a municipal sewer system. By two years after the effective date of the Basin Plan amendments, facilities must submit a mercury minimization plan for Executive Officer approval and begin implementation of mercury minimization actions.
- Beginning in the January of the third year after the effective date of these amendments, all facilities in the Delta/Yolo Bypass and large facilities expected to grow in the tributary watersheds downstream of major dams shall maintain Phase 1 methylmercury concentration limits throughout the duration of Phase 1. The Phase 1 methylmercury concentration limits also shall apply in Phase 2 until facilities achieve their methylmercury wasteload allocations or other effluent limits established for Phase 2. As necessary, the NPDES permit may include a compliance time schedule to achieve the Phase 1 limit, not to exceed ten years after the effective date of the amendments.
- Facilities must complete methylmercury characterization and control studies, either individually or in collaboration with others. Milestones in this process in terms of years after the effective date of the Basin Plan amendments are: report how the facility will conduct studies (one year after effective date); submit a work plan for the studies (two years); submit a study progress report that includes interim results and plans for additional studies (four years); submit final study report including analysis of results, a plan for the facility's preferred method of meeting its methylmercury allocation, and proposed time schedule (seven years).

NPDES-permitted MS4s are assigned the following interim requirements:

- By three months after the effective date of the amendments, the three largest MS4 service areas in the Delta region must begin monitoring methylmercury and total mercury at their compliance points and report results annually to the Central Valley Water Board.
- After 2012, the three largest MS4 service areas in the Delta must achieve and maintain compliance with methylmercury concentration limits.
- The three largest MS4s must complete total mercury and methylmercury characterization and control studies under the same schedule as described for municipal and industrial wastewater facilities.
- During Phase 1, the three largest MS4s must implement pollution prevention measures and best management practices to the maximum extent practicable to control total mercury discharges, and all MS4s in the Delta/Yolo Bypass region must implement best management practices to control erosion and sediment discharges. Because mercury is primarily particle-bound, erosion control also prevents mercury loading.

Requirements for Avoiding Wetland Loss

Under Clean Water Act Section 404 and the Rivers and Harbors Act of 1899 Section 10, alteration of waterways, including wetlands, that affect navigable waters requires a permit from the Federal government and assurance that impacts will be avoided or mitigated. The U.S. Army Corps of Engineers operates the 404 permit program with a goal of achieving "no net loss" of wetlands. For projects proposing unavoidable impacts on wetlands, compensatory mitigation in the form of replacing the lost aquatic functions is generally required. Under authority of Clean Water Act Section 401, the State also reviews projects affecting water bodies. The State may require compensatory mitigation for wetlands impacts not under the jurisdiction of the Federal government, e.g., for wetlands not contiguous with navigable waters.

Compensatory mitigation may have schedule requirements during Phase 1 (in the proposed implementation plan) or location requirements within the Delta/Yolo Bypass boundary (in the proposed Basin Plan amendments). The agencies involved in determining compensatory mitigation for specific projects – the USACE, USFWS, and Central Valley Water Board 401 Certification unit – should coordinate decision-making to ensure that replacement wetlands do not create a new nuisance in the form of high methylmercury levels exposed to wildlife or discharged from the site.

6.1.3 Federal & State Endangered Species Acts

The Federal Endangered Species Act of 1973 (50 CFR *et seq*.) was established to identify, protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the Interior Department's U.S. Fish and Wildlife Service (USFWS) and the Department of Commerce's National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater organisms, while the NMFS has primary responsibility for marine species such as salmon and whales. In addition, the State of California enacted the California Endangered Species Act (California Fish and Game Code, Sections 2050-2116 *et seq*.), which is administered by the California Department of Fish and Game and similarly maintains State lists of rare, threatened and endangered species. Of the piscivorous wildlife species in the Delta, the California least tern, western snowy plover, bald eagle,[35] and peregrine falcon are listed as either threatened or endangered by the State of California or by the USFWS.

Therefore, water quality objectives must protect the aquatic life in the Delta, particularly endangered and threatened species and the food web on which they depend. The proposed fish tissue objectives are expected to fully protect wildlife species that consume Delta fish. The proposed objectives are either equal to or more protective than wildlife-specific safe fish tissue concentrations derived with guidance from the USFWS to protect all piscivorous wildlife species

[35] The bald eagle was removed from the Federal List of Endangered and Threatened Wildlife in the lower 48 States on 9 July 2007 (50 CFR 17). This rule will become effective on 8 August 2007 (50 CFR 17). The bald eagle will continue to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act after the species is de-listed. In addition, the bald eagle is still listed as endangered in California (CDFG, 2005).

(including threatened and endangered species) feeding in the Delta (see Table 4.9 in the TMDL Report).

The purpose of the proposed Basin Plan amendments is to restore the beneficial uses that are not currently being met, including wildlife habitat. The recommended implementation plan based on the proposed fish tissue objectives is designed to improve the water quality of the Delta with respect to mercury concentrations and the food supply for wildlife foraging in the Delta. The proposed Basin Plan amendments are not expected to adversely affect endangered species. Indeed, habitat and prey on which piscivorous wildlife species depend are expected to improve as the proposed water quality objectives are implemented. Therefore, the proposed Basin Plan amendments are consistent with the Federal and State Endangered Species Acts.

The Federal Endangered Species Act also affects regulation under the Clean Water Act. For example:

- A USACE Section 404 permit for depositing dredged or fill material will not be issued if the discharge takes or jeopardizes threatened or endangered species (33 CFR §323.4(a)(ix));
- Solid waste disposal facilities or practices are not allowed to cause or contribute to the taking of an endangered or threatened species (40 CFR §257.3-2); and
- Sewage sludge may not be placed where it is likely to adversely affect a threatened or endangered species (40 CFR §503.24).

In early 1999 USEPA, FWS, and NMFS published a draft Memorandum of Agreement regarding enhanced coordination under the Clean Water Act and the ESA (64 FR 2741-57, January 15, 1999). Moreover, the USEPA has been negotiating agreements with states that issue NPDES permits for the discharge of water pollutants, requiring the states to take steps to enforce the ESA through their permit programs. As a result, any actions taken by dischargers and other entities to comply with Basin Plan amendment requirements (e.g., requirements included in NPDES permits or CWA 401 certifications) also must comply with the ESA. As described in Chapters 4 and 7, there are reasonably foreseeable methods of compliance that would ensure implementation projects do not conflict with the ESA.

6.2 Consistency with State Water Board Policies

The following State Water Board policies are relevant to the proposed Basin Plan amendments:

- Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy) (Resolution No. 68-16)
- Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Resolution No. 74-43)
- Sources of Drinking Water Policy (Resolution No. 88-63)
- Pollutant Policy Document (Resolution No. 90-67)
- Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 (Resolution No. 92-49)
- Consolidated Toxic Hot Spots Cleanup Plan (Resolution No. 99-065 and 2004-0002)

- Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Resolution No. 99-114 and 2004-0030)
- Water Quality Enforcement Policy (Resolution 2002-0040)
- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Resolution No. 2005-0019)
- Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (Resolution No. 2005-0050)
- Mercury Fish Tissue Objectives and Total Maximum Daily Load for Mercury in San Francisco Bay (Resolution No. 2007-0045)

These policies and their relevance to the proposed water quality objectives and implementation plan are described in the following sections.

6.2.1 Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy)

The Antidegradation Implementation Policy includes the following statements:

> "1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies.
>
> "2. Any activity which produces or may produce a waste or increase volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

This policy incorporates the Federal antidegradation standards for surface waters (Section 6.1.1).

The proposed Basin Plan amendments do not specifically authorize any new or existing discharges, and therefore, are not expected to result in any further degradation of Delta waters. The proposed Basin Plan amendments are intended to improve an impaired water body (the Delta) by implementing a program to achieve the proposed water quality objectives through methyl and total mercury source reductions, and to maintain the water quality objectives should new methylmercury or total mercury discharges occur.

6.2.2 Resolution No. 74-43: Water Quality Control Policy for the Enclosed Bays and Estuaries of California

This policy was adopted by the State Water Board in 1974 and provides water quality principles and guidelines for the prevention of water quality degradation in enclosed bays and estuaries to protect the beneficial uses of such waters. The Regional Water Boards must enforce the policy and take actions consistent with its provisions.

The Delta flows into the San Francisco Bay to form the Bay-Delta Estuary. Because improvements in water quality in the Delta will result in improvements in overall Bay-Delta water quality, the actions taken to implement the Basin Plan amendments are also consistent with this policy.

6.2.3 Resolution No. 88-63: Sources of Drinking Water Policy

This policy states that all waters of the state are to be protected as existing or potential sources of municipal and domestic supply water. The proposed Basin Plan amendments are consistent with this policy because they are expected to result in improvements in Delta water quality.

6.2.4 Resolution No. 90-67: Pollutant Policy Document

This policy requires, in part, that the Central Valley and San Francisco Bay Water Boards use the Pollutant Policy Document (PPD) as a guide to update portions of their Basin Plans. The PPD requires that the Central Valley Water Board develop a Mass Emissions Strategy (MES) for limiting loads of mercury, among other pollutants, from entering the Delta. The purpose of the MES is to control the accumulation in sediments and the bioaccumulation of pollutant substances in the tissues of aquatic organisms in accordance with the statutory requirements of the state Porter-Cologne Water Quality Act and the Federal Clean Water Act. The proposed Basin Plan amendments are consistent with this policy and further the milestones of the MES by specifically developing and proposing methylmercury fish tissue objectives, an area of concern in the PPD, and by including a monitoring and implementation program to measure reduction and regulate mass emissions of this pollutant.

6.2.5 Resolution No. 92-49: Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304

This policy contains procedures for the Central Valley Water Board to follow for oversight of cleanup projects to ensure cleanup and abatement activities protect the high quality of surface and groundwater. To attain the proposed fish tissue objectives, the proposed Basin Plan amendments include an implementation plan to reduce methyl and total mercury loading to the Delta and its tributaries. The proposed implementation plan requires that methyl and total mercury discharges from existing and future sources be evaluated and controlled and is consistent with this policy.

6.2.6 Resolution No. 99-065 & Resolution No. 2004-0002: Consolidated Toxic Hot Spots Cleanup Plan

In June 1999, the State Water Board adopted the Consolidated Toxic Hot Spots Cleanup Plan (Cleanup Plan), as required by California Water Code Section 13394. The Cleanup Plan identifies the entire Delta as a hot spot for mercury due to elevated mercury levels in fish and contains cleanup plans for mercury in the Delta. The Cleanup Plan requires the development of a phased TMDL for mercury, with the initial emphasis on the Cache Creek watershed, a major source of mercury to the Bay-Delta Estuary. The Central Valley Water Board adopted the Cache Creek, Bear Creek, and Harley Gulch Basin Plan amendment and mercury TMDL in October 2005.

The Delta mercury TMDL and the implementation program through the proposed Basin Plan amendments further address the phased mercury control strategy described in the Cleanup Plan. The Cleanup Plan discusses elements that should be included in a Delta methylmercury TMDL implementation program: establishment of a mercury task force; identification of fish tissue targets to protect humans and wildlife consuming local fish; evaluation of mercury and methylmercury sources; quantification of the amount of load reductions from each source; development of an implementation plan and a monitoring program; and requirements for additional studies needed to identify sources, quantify fish tissue mercury concentrations, and determine mercury bioavailability to provide resource managers with recommendations on how to minimize mercury bioaccumulation. The proposed amendments include the elements identified in the Cleanup Plan. In addition, the proposed amendments also are consistent with California Water Code Section 13392, which requires the Regional Water Boards to amend Basin Plans to incorporate strategies to prevent the creation of new toxic hot spots and further pollution of existing hot spots.

6.2.7 Resolution No. 99-114 & Resolution No. 2004-0030: Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program

In December 1999, the State Water Board adopted the Plan for California's Nonpoint Source (NPS) Pollution Control Program (NPS Program Plan) and in May 2004, the State Water Board adopted the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy). The NPS Policy explains how State and Regional Water Boards will use their planning and waste discharge regulation authority under the Porter-Cologne Act to implement and enforce the NPS Program Plan. The NPS Policy requires all nonpoint source discharges to be regulated under waste discharge requirements, waivers of waste discharge requirements, a Basin Plan prohibition, or some combination of these administrative tools. The NPS Policy also describes the key elements that must be included in a nonpoint source implementation program.

The proposed Basin Plan amendments do not prescribe specific control actions to reduce nonpoint sources; however, they provide total mercury limits and methylmercury allocations that will guide the development and implementation of control actions. At this time, more information is needed on the factors that control methylmercury production in the Delta and its tributaries

before effective management practices for nonpoint methylmercury sources can be implemented. The proposed Basin Plan amendments provide regulatory requirements by using the Porter-Cologne Water Quality Control Act and other authorities to ensure that parties responsible for those sources obtain this information, evaluate management practices to control methylmercury, and implement technically and economically feasible control actions. The proposed Basin Plan amendments require that the responsible parties complete the characterization and control studies by 2015 (or within seven years after the effective date of the Basin Plan amendments). At that time, the information needed for the development of a methylmercury nonpoint source control program will be available. The Central Valley Water Board will evaluate the studies and feasible management practices and determine whether methylmercury allocations and total mercury limits should be modified and a revised implementation program incorporated into the Basin Plan by 31 December 2016 (or within eight years after the effective date of the Basin Plan amendments). The nonpoint source allocations and limits, characterization and control studies, and resulting implementation actions are consistent with this policy.

6.2.8 Resolution No. 2002-0040: Water Quality Enforcement Policy

The State Water Board adopted this policy to ensure enforcement actions are consistent, predictable, and fair. The policy describes tools that the State and Regional Water Boards may use to determine the following: type of enforcement order applicable, compliance with enforcement orders by applying methods consistently, and type of enforcement actions appropriate for each type of violation. The State and Regional Water Boards have authority to take a variety of enforcement actions under the Porter-Cologne Water Quality Control Act. These include administrative permitting authority such waste discharge requirements (WDRs), waivers of WDRs, and Basin Plan prohibitions.

The proposed Basin Plan amendments include implementation provisions that allow Central Valley Water Board staff to use, where applicable, the enforcement tools provided in the Water Quality Enforcement Policy. Therefore, the Basin Plan amendments are consistent with this policy.

6.2.9 Resolution No. 2005-0019: Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (a.k.a. State Implementation Plan or SIP) applies to discharges of toxic pollutants into the inland surface waters, enclosed bays, and estuaries of California subject to regulation under the Porter-Cologne Water Quality Control Act and the Federal Clean Water Act. Regulation of priority toxic pollutants may occur through the issuance of National Pollutant Discharge Elimination System permits or other regulatory approaches. The goal of the SIP is to establish a statewide, standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters.

The SIP is a tool to be used with watershed management approaches and, where appropriate, the development of TMDLs to ensure achievement of water quality standards (i.e., water quality

criteria or objectives, and the beneficial uses they are intended to protect). The SIP was effective on 28 April 2000 with respect to the priority pollutant criteria promulgated by the USEPA through the National Toxics Rule and to the priority pollutant objectives established by Regional Water Boards in their Basin Plans. If a water quality objective and a CTR criterion are in effect for the same priority pollutant, the more stringent of the two applies.

The TMDL Report analyzed total mercury sources and reductions to ensure the proposed TMDL implementation program complies with the CTR. The proposed Basin Plan amendments establish limits and control actions for total mercury that require the reduction of total mercury loading to the Delta, using, as appropriate, the tools and implementation provisions in the SIP. These limits are designed to comply with the CTR criterion of 50 ng/l total recoverable mercury in the water column. Therefore, the proposed Basin Plan amendments are consistent with the Policy.

6.2.10 Resolution No. 2005-0050: Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options

The State Water Board's Impaired Waters Policy incorporates the following:

- CWA Section 303(d) identification of waters that do not meet applicable water quality standards and prioritization for TMDL development;
- CWC Section 13191.3(a) requirements to prepare guidelines to be used by the Water Boards in listing, delisting, developing, and implementing TMDLs pursuant to CWA Section 303(d) of the [33 United States Code (USC) Section 1313(d)]; and
- CWC section 13191.3 (b) requirements that State Board considers consensus recommendations adopted by the 2000 Public Advisory Group when preparing guidelines.

The Impaired Waters Policy includes the following statements:

> "A. If the water body is neither impaired nor threatened, the appropriate regulatory response is to delist the water body.
>
> B. If the failure to attain standards is due to the fact that the applicable standards are not appropriate to natural conditions, an appropriate regulatory response is to correct the standards.
>
> C. The State Board and Regional Boards are responsible for the quality of all waters of the state, irrespective of the cause of the impairment. In addition, a TMDL must be calculated for impairments caused by certain EPA designated pollutants.
>
> D. Whether or not a TMDL calculation is required as described above, impaired waters will be corrected (and implementation plans crafted) using existing regulatory tools.
>
> D1. If the solution to an impairment will require multiple actions of the regional board that affect multiple persons, the solution must be implemented through a Basin Plan amendment or other regulation.

D2. If the solution to an impairment can be implemented with a single vote of the Regional Board, it may be implemented by that vote.

D3. If a solution to an impairment is being implemented by a regulatory action of another state, regional, local, or federal agency, and the Regional Board finds that the solution will actually correct the impairment, the Regional Board may certify that the regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program.

D 4. If a solution to an impairment is being implemented by a non-regulatory action of another entity, and the Regional Board finds that the solution will actually correct the impairment, the Regional Board may certify that the non-regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program."

As described in the TMDL technical report, methylmercury levels in Delta fish exceed levels safe for human and wildlife consumption; therefore, this impairment needs to be corrected through a Regional Board action.

The Basin Plan for the Sacramento and San Joaquin River Basins does not contain numeric water quality objectives for fish tissue methylmercury within the legal Delta boundary. However, fish tissue methylmercury concentration is considered an appropriate objective (Chapter 3). As discussed in the Beneficial Uses and Existing Conditions section of this report (Chapter 2), the beneficial uses that are sensitive to mercury include: warm and cold freshwater habitat, wildlife habitat, and human consumption of aquatic organisms (covered by the commercial and sport fishing beneficial use designation). A safe fishery (for consumption of aquatic organisms) is the foremost, unmet beneficial use of the Delta. Hence, the addition of the commercial and sport fishing beneficial use, the refinement of the current narrative water quality objective into a numeric water quality objective, and a pollution reduction program are an the appropriate strategy to ensure standards are appropriate for Delta waterways.

Methyl and total mercury are toxic pollutants, and are technically suitable for TMDL calculation in the Delta. Therefore, a TMDL must be calculated to comply with the Impaired Waters Policy. The proposed Basin Plan amendments contain all of the necessary elements of a TMDL: the loading capacity, allocations, and consideration of seasonal variations and a margin of safety. To correct the methylmercury impairment in the Delta waterways, the proposed amendments would use existing regulatory tools, including of discharge, Clean Water Act 401 Water Quality Certification requirements, NPDES permit requirements, waste discharge requirements, and waivers of waste discharge requirements.

As discussed in Chapter 4, correcting the methylmercury impairment in the Delta will likely require multiple actions of the Central Valley Water Board to gain compliance from the dischargers to the Delta and its tributary watersheds; therefore, a Basin Plan amendment or other regulation is necessary. In addition, a regulatory action that would correct the methylmercury impairment in the Delta waterways is not being implemented by another agency, and no solution is being implemented through a non-regulatory action by another entity. Therefore, the adoption of a Basin Plan amendment is appropriate.

For the reasons stated above, a Basin Plan amendment is the appropriate means to address the methylmercury impairment of Delta waterways. The proposed Basin Plan amendments follow the process outlined in the Impaired Waters Policy and therefore are consistent with the policy.

6.2.11 Resolution No. 2007-0045: Mercury Fish Tissue Objectives and Total Maximum Daily Load for Mercury in San Francisco Bay

On 15 September 2004, the San Francisco Bay Water Board adopted Resolution R2-2004-0082 amending the San Francisco Bay Basin Plan to incorporate a mercury TMDL implementation plan for San Francisco Bay. On 9 September 2005, the State Water Board adopted Resolution No. 2005-0060 remanding the TMDL to the San Francisco Bay Water Board for reconsideration. In its Remand Order, the State Board requested specific revisions to the TMDL and associated implementation plan designed to:

- Accelerate achievement of water quality objectives for mercury in the Bay;
- Be more protective of fish and other wildlife;
- Ensure the maximum practical pollution prevention by municipal and industrial waste water dischargers; and
- More clearly incorporate risk reduction measures addressing public health impacts on subsistence fishers and their families.

On 9 August 2006, the San Francisco Bay Water Board adopted Resolution R2-2006-0052 amending the Basin Plan to address the remand-required revisions and establish Bay-specific fish tissue objectives for mercury for the protection of wildlife and human health. On 17 July 2007, the State Water Board approved the Basin Plan amendment (Resolution No. 2007-0045). Following approval by OAL and USEPA, the amendment will be incorporated into the San Francisco Bay Basin Plan.

The San Francisco Bay mercury TMDL implementation program (a.k.a. mercury control program) assigned the Central Valley a five-year average total mercury load allocation of 330 kg/yr or a decrease of 110 kg/yr. The implementation plan expects the Central Valley to meet its total mercury load allocation within twenty years of the adoption of a Delta TMDL implementation program and has an interim milestone of half the allocation in ten years. Attainment of the allocation can be measured two ways: measuring mercury in water and flow in the inputs to the Delta or measuring the concentration of mercury per unit suspended sediment passing the compliance point of Mallard Island and multiplying by the suspended sediment loads.

The proposed mercury control program for the Delta described in Chapter 4 complies with the allocation requirement and timeline. A total mercury load decrease of 110 kg/yr represents about a 28% decrease in the 20-year average annual loading from the Delta tributaries and would enable Delta waters to maintain compliance with the CTR criterion of 50 ng/l (see Section 7.4 in the TMDL Report). Such a decrease is a reasonable goal for the Delta mercury control program because staff has estimated that, if the reduction of inorganic mercury in

sediment were the only method used to reduce methylmercury in Delta water and fish, mercury loading to the Delta would need to be reduced by substantially more than 110 kg/yr (see Section 8.2 in the TMDL Report).

6.3 Central Valley Regional Water Quality Board Policies

The following Central Valley Water Board policies are relevant to the proposed Basin Plan amendments:

- Urban Runoff Policy
- Controllable Factors Policy
- Water Quality Limited Segment Policy
- Antidegradation Implementation Policy
- Application of Water Quality Objectives Policy
- Watershed Policy

These policies and their relevance to the proposed water quality objectives and implementation plan are described in the following sections.

6.3.1 Urban Runoff Policy

On page IV-14.00 of the Basin Plan, the Central Valley Water Board's Urban Runoff Policy states:

> "a. Subregional municipal and industrial plans are required to assess the impact of urban runoff on receiving water quality and consider abatement measures if a problem exists.
>
> "b. Effluent limitations for storm water runoff are to be included in NPDES permits where it results in water quality problems."

The proposed Basin Plan amendments are consistent with this policy. The proposed amendments require MS4s in the Delta and Yolo Bypass to:

- Implement best management practices to the maximum extent practicable to control erosion and sediment discharges in order to control mercury; and
- Achieve methylmercury allocations by 2030.

The three largest MS4s in the Delta area would also be required to:

- Conduct methyl and total mercury characterization and control studies;
- Develop an implementation plan within seven years after the effective date of the Basin Plan amendment for achieving the proposed methylmercury allocations;
- Begin maintaining methylmercury limits in 2012; and
- Implement pollution prevention measures and BMPs to control mercury.

The Central Valley Water Board, upon review of the study results, may adopt total mercury load limits that apply to large and small MS4s in the Delta that could be implemented through NPDES stormwater permits.

6.3.2 Controllable Factors Policy

On page IV-15.00 of the Basin Plan, the Central Valley Water Board's Controllable Factors Policy states:

> "Controllable water quality factors are not allowed to cause further degradation of water quality in instances where other factors have already resulted in water quality objective being exceeded. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the State, that are subject to the authority of the State Water Board or Regional Water Board, and that may be reasonably controlled."

Currently, the proposed fish tissue methylmercury objectives developed for the protection of humans and wildlife that consume Delta fish are exceeded throughout much of the Delta. Sources important in net methylmercury production that are potentially controllable include: WWTP and MS4 discharges; agricultural irrigation runoff; amount and kind of inorganic mercury present in the sediment; amount of permanent or seasonally flooded wetland in a watershed; water rights and salt standards in the Delta; flood conveyance; and creation of new water impoundments.

The proposed Basin Plan amendments are consistent with the Controllable Factors Policy because the Delta methylmercury TMDL and associated implementation program seek to bring an impaired water body into compliance with water quality objectives. The proposed Basin Plan amendments include an implementation plan with actions outlined to (a) control inorganic mercury loading to the Delta and (b) characterize methylmercury sources and evaluate and implement feasible methylmercury controls. No additional discharges are being proposed by, or are expected as a result of, the proposed Basin Plan amendments.

6.3.3 Water Quality Limited Segment Policy

On page IV-15.00 of the Basin Plan, the Central Valley Water Board's Water Quality Limited Segment Policy states:

> "Additional treatment beyond minimum federal requirements will be imposed on dischargers to Water Quality Limited Segments. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment."

The proposed Basin Plan amendments establish methylmercury allocations for dischargers to Delta waterways that are included in the CWA Section 303(d) List of Water Quality Limited Segments. Therefore, the proposed Basin Plan amendments are consistent with this policy.

6.3.4 Antidegradation Implementation Policy

The Central Valley Water Board's Antidegradation Implementation Policy incorporates State Water Board Resolution No. 68-16 and the Federal antidegradation standards for surface

waters (see Sections 6.1.1 and 6.2.1). On pages IV-15.01 and IV-16.00, the Central Valley Water Board's Antidegradation Implementation Policy includes the following statements:

> "… Implementation of this policy [State Water Board Resolution No. 68-16] to prevent or minimize surface and ground water degradation is a high priority for the Board. … The prevention of degradation is, therefore, an important strategy to meet the policy's objectives.
>
> The Regional Water Board will apply 68-16 in considering whether to allow a certain degree of degradation to occur or remain. In conducting this type of analysis, the Regional Water Board will evaluate the nature of any proposed discharge, existing discharge, or material change therein, that could affect the quality of waters within the region. Any discharge of waste to high quality waters must apply best practicable treatment or control not only to prevent a condition of pollution or nuisance from occurring, but also to maintain the highest water quality possible consistent with the maximum benefit to the people of the State.
>
> Pursuant to this policy, a Report of Waste Discharge, or any other similar technical report required by the Board pursuant to Water Code Section 13267, must include information regarding the nature and extent of the discharge and the potential for the discharge to affect surface or ground water quality in the region. This information must be presented as an analysis of the impacts and potential impacts of the discharge on water quality, as measured by background concentrations and applicable water quality objectives. The extent of information necessary will depend on the specific conditions of the discharge. For example, use of best professional judgment and limited available information may be sufficient to determine that ground or surface water will not be degraded. In addition, the discharger must identify treatment or control measures to be taken to minimize or prevent water quality degradation."

The proposed Basin Plan amendments do not authorize any new or existing discharges and therefore are not expected to result in further degradation of Delta waters. In addition, the proposed amendments include actions to address potential new sources of methylmercury and total mercury so that further degradation of Delta waters does not occur. The proposed amendments include water quality objectives and an implementation plan to improve the Delta through methyl and total mercury source reductions. As a result, the proposed amendments are consistent with this Central Valley Water Board policy.

6.3.5 Application of Water Quality Objectives Policy

Excerpts from Policy for Application of Water Quality Objectives are presented below. The full text can be found on page IV-16.00 of the Basin Plan.

> "Water quality objectives are defined as 'the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water, or the prevention of nuisance within a specific area.'… Water quality objectives may be stated in either numerical or

narrative form. Water quality objectives apply to all waters within a surface or ground water resource for which beneficial uses have been designated…

"The numerical and narrative water quality objectives define the least stringent standards that the Regional Boards will apply to regional waters in order to protect beneficial uses.

"Where compliance with narrative objectives is required, the Regional Board will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives."

The proposed Basin Plan amendments are consistent with this policy. The numeric water quality objectives in the proposed Basin Plan amendments are specific to surface waters in the Delta and Yolo Bypass and will be used to determine compliance with the narrative objective. The proposed Basin Plan amendments establish, as necessary, a combination of studies and implementation actions to control the sources of methyl and total mercury (see Chapter 4). Regulatory permits or orders will include requirements to comply with the implementation plan for the proposed objectives and time schedules. The proposed implementation plan will provide a time schedule for the local entities, State agencies, and Federal agencies to develop and submit to the Central Valley Water Board plans for methylmercury and total mercury management.

6.3.6 Watershed Policy

On page IV-21.00 of the Basin Plan, the Central Valley Water Board's Watershed Policy states:

"The Regional Water Board supports implementing a watershed based approach to addressing water quality problems. The State and Regional Water Boards are in the process of developing a proposal for integrating a watershed approach into the Board's programs. The benefits to implementing a watershed based program would include gaining participation of stakeholders and focusing efforts on the most important problems and those sources contributing most significantly to those problems."

The proposed Basin Plan amendments are consistent with the Watershed Policy. Chapter 6 of the TMDL Report includes a source analysis that identified the following methylmercury sources: tributary inflows from upstream watersheds; within-Delta sources such as sediment flux; municipal and industrial wastewater; agricultural drainage; and urban runoff. Approximately 58% of identified methylmercury loading to the Delta comes from tributary inputs while approximately 42% of the load comes from within-Delta sources; in contrast, more than 98% of total mercury loading to the Delta comes from tributary inputs (see Tables 6.2 and 7.1 in the TMDL Report). Therefore, the proposed Basin Plan amendments take a comprehensive watershed approach to establishing methylmercury allocations and total mercury limits. Additionally, the adaptive management approach for the implementation program provides an opportunity to better identify sources that contribute most significantly to the impairment and effective technologies and management practices for controlling those sources.

The Central Valley Water Board has conducted and will continue to conduct outreach to the stakeholders in the area encompassed by the proposed Basin Plan amendments. Staff held a CEQA scoping meeting, two public workshops, two Board workshops, and numerous stakeholder meetings to receive comments and information from local, State and Federal agencies, dischargers, and other stakeholders during the preparation of the proposed Basin Plan amendments (see Table 8.1 in Chapter 8). As part of the Delta methylmercury TMDL implementation program, staff will continue to inform entities responsible for studies and control actions and to solicit stakeholder participation. For these reasons, the proposed amendments are consistent with the Watershed Policy.

6.4 Review of Other Laws, Policies, and Programs

The following laws, policies, and programs are relevant to the proposed Basin Plan amendments:

- California Mercury Reduction Act
- DTSC Universal Waste Rule
- CALFED Bay-Delta Program
- Delta Protection Act of 1992
- California Wetlands Restoration Policy
- Habitat Conservation Plans and Natural Community Conservation Plans

6.4.1 California Mercury Reduction Act

The Mercury Reduction Act of 2001 (Senate Bill 633) limits the use of mercury in household products, schools, and vehicle light switches in California. Major components of the Act and effective dates are:

- Schools are prohibited from purchasing most mercury-containing items for classrooms and laboratories (January 2002);
- Sale or distribution of mercury fever thermometers without a prescription is prohibited (July 2002);
- Manufacture and sale of mercury-containing novelty items is banned; (January 2003); and
- Sale of new motor vehicles with mercury-containing light switches is prohibited (January 2005).

The Act directs the State's Department of Toxic Substances Control (DTSC) to provide technical assistance to local agencies and businesses, such as auto dismantlers, for the safe removal and proper disposal of mercury switches from vehicles and large appliances (starting January 2002). The DTSC also provides information to the public regarding options to replace mercury switches.

By limiting the manufacture and sale in California of certain mercury-containing products, the Mercury Reduction Act is expected to reduce the amount of mercury potentially available to enter the environment, particularly through urban runoff. The Act facilitates the proposed Basin

Plan amendments requirement that NPDES permittees implement pollution minimization programs (for wastewater treatment facilities) and best management practices (for stormwater systems) to control total mercury in their discharge.

6.4.2 DTSC Universal Waste Rule

The California Department of Toxic Substances Control (DTSC) establishes rules for handling and disposal of hazardous waste, including mercury. Under DTSC's Universal Waste Rule,[36] commercial and household products that contain mercury may not be discarded in regular solid waste landfills. Examples of these wastes are mercury-containing batteries, light bulbs and tubes, thermometers, dental amalgam, and some electronic devices.

All dischargers identified in the Delta Methylmercury TMDL must comply with the UWR requirements for their own operations (i.e., disposal of spent fluorescent light bulbs).

The proposed Basin Plan amendments assign methylmercury allocations to NDPES-permitted wastewater treatment facilities and stormwater systems. The proposed amendments also require that wastewater treatment plants implement pollution minimization programs to address total mercury in their discharge. Reasonably foreseeable methods to reduce methylmercury and/or total mercury in discharge include source control, such as disposing of mercury-containing items where they will not enter stormwater or sewer systems. Outreach by NPDES permittees to businesses, industry and the general public as part of pollution minimization and source reduction programs should be consistent with the Universal Waste Rule. The proposed Basin Plan amendments are consistent with hazardous waste regulations and mercury waste disposal procedures and guidelines developed by DTSC.

6.4.3 CALFED Bay-Delta Program

The CALFED Ecosystem Restoration Strategy includes the goal to:

> "Improve and/or maintain water quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed, and eliminate to the extent possible, toxic impacts to aquatic organisms, wildlife and people." (CALFED Bay-Delta Program Ecosystem Restoration Program Draft Stage 1 Implementation Plan, August 2001. Page 36, Strategic Goal 6 for Sediment and Water Quality.[37])

Because an improvement in Delta water quality should result in an overall improvement in Bay-Delta Estuary water quality, the proposed Basin Plan amendments are consistent with the above CALFED program goal.

[36] See: www.dtsc.ca.gov/HazardousWaste/Mercury.

[37] Available at: http://www.delta.dfg.ca.gov/erp/docs/reports_docs/DraftStage1ImplementationPlan.pdf.

The Record of Decision (ROD) for the California Bay-Delta Authority commits it to restore 30,000 to 45,000 acres of freshwater, emergent tidal wetlands, 17,000 acres of freshwater, emergent non-tidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CALFED Bay-Delta Program, 2000a & 2000c). However, many proposed sites are downstream of mercury-enriched watersheds. Extensive restoration efforts in the Delta have the potential to increase methylmercury exposure for people and wildlife (Chapter 3).

The proposed Basin Plan amendments support CALFED programmatic water quality goals and further support the programmatic ROD's CEQA requirements to develop mitigation strategies to address potentially significant adverse environmental impacts from CALFED projects. CALFED determined that the following adverse environmental impacts could result from CALFED projects:

- Potential exposure of mercury-laden sediments from activities related to dredging;
- Methylation of inorganic mercury to its bioavailable forms from the creation of shallow water habitat in areas that would receive mercury from source water; and
- Release of toxic substances (including methyl and total mercury) into the water column during dredging and construction of CALFED program actions such as levee demolition and disturbances to previously farmed soils.

To address potentially significant impacts that may result from CALFED projects, as indicated in CALFED's CEQA documents, CALFED is required to include mitigation measures in the ROD to reduce these impacts to a "less than significant" level (CALFED, 2000b, CEQA Findings of Fact, pp. 20-21). The proposed Basin Plan amendments are consistent with the CALFED ROD by providing requirements to study and develop management practices and control actions that would lessen adverse significant impacts resulting from CALFED programmatic projects.

Further, proposed Basin Plan amendments are consistent with CALFED programmatic water quality goals, particularly with the CALFED Water Quality Program Plan objective to "reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health" (Section 4.3 Water Quality Program Plan, July 2000, pp 4-2). Additionally, the proposed Basin Plan amendments' requirement to develop and perform methylmercury characterization and control studies promote existing Stage I, II, and III priority actions in CALFED's Water Quality Program Plan. Such actions include:

- Developing remediation options and projects effecting mercury loading, transportation, transformation, or bioavailability for different sections of the watershed;
- Evaluating and prioritizing remediation options, based on feasibility, cost, expected results, and time frame;
- Selecting and implementing a remediation project(s) with a short-term time frame for expected results; and
- Monitoring sources and loads of mercury, including mercury in water and sediment at sites during and after remediation (Section 4.5 Water Quality Program Plan, pp 4-9 to 4-12).

6.4.4 Delta Protection Act of 1992

As described in the Public Resources Code (§21080.22 and §29700-29780), the goals of the Delta Protection Act of 1992 are to:

"(a) Protect, maintain, and, where possible, enhance and restore the overall quality of the Delta environment, including, but not limited to, agriculture, wildlife habitat, and recreational activities.

"(b) Assure orderly, balanced conservation and development of Delta land resources.

"(c) Improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety."

Section 29735 of the Delta Protection Act established the Delta Protection Commission to administer the Act. The Act directed the Commission to prepare a comprehensive long-term regional plan for the "heart" (Primary Zone) of the Delta to address key land uses (e.g., agriculture, wildlife habitat, and recreation) and resource management for the Delta area. The Primary Zone includes approximately 500,000 acres extending over portions of five counties: Solano, Yolo, Sacramento, San Joaquin, and Contra Costa.

The Commission adopted its Land Use and Resource Management Plan for the Primary Zone of the Delta (Plan) in February 1995.[38] The policies within this Plan were adopted as regulations[39] in 2000. The Plan was then forwarded to the five counties within the Primary Zone for incorporation into their General Plans and Zoning codes and implementation in their day-to-day activities. The Delta Protection Commission has appeal authority over local government actions.

Central Valley Water Board staff evaluated the Plan's goals, policies, and recommendations (specifically in the Environment, Utilities and Infrastructure, Land Use, Agriculture, and Water categories) to ensure that the proposed Basin Plan amendments are not in conflict with the Plan. The Plan has a requirement that "adequate Delta water quality standards are set and met and that beneficial uses of State waters are protected consistent with the CALFED (see Water Code Section 12310 (f)) Record of Decision dated August 8, 2000." The Plan also requires that Delta projects not result in degration of water quality or result in increased nonpoint source pollution. The proposed Basin Plan amendments protect water quality and are consistent with the Plan.

The proposed Basin Plan amendments may necessitate that spoils from dredging operations be protected from erosion, so that dredge spoils do not enter the aquatic system. Depending on the management practice selected, this requirement may not coincide with the intent of the

[38] The Plan was revised and reprinted in May 2002 and can be accessed on the Commission's web site: www.delta.ca.gov.

[39] See Title 14, California Code of Regulations, Chapter 3, Regulations Governing Land Use and Resources Management in the Delta

Utilities and Infrastructure Recommendation 3 (R-3) which states: “Material excavated from the shipping channels should, *if feasible*, be used for maintenance of Delta levees or for wildlife habitat enhancement within the Delta and for other uses within the Delta.” However, dredge materials could be used for levee maintenance if erosion control management practices are implemented.

Actions taken to implement the proposed Basin Plan amendments would improve Delta water quality and consequently improve the quality of fish eaten by humans and wildlife, resulting in decreased fish advisory postings and increased recreational opportunities for sport fishing. Accordingly, local economic productivity would be enhanced. Hence, implementation of the proposed Basin Plan amendments is consistent with the land use and development goals of the Delta Protection Act.

6.4.5 California Wetlands Conservation Policy (August 23, 1993)

The goals of this policy are to:

> “ Ensure no overall net loss and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California in a manner that fosters creativity, stewardship and respect for private property.
>
> Reduce procedural complexity in the administration of State and Federal wetlands conservation programs.
>
> Encourage partnerships to make landowner incentive programs and cooperative planning efforts the primary focus of wetlands conservation and restoration.”

The goal of the proposed Basin Plan amendments is to improve the water quality of the Delta/Yolo Bypass waterways by decreasing fish mercury concentrations to levels that are protective of wildlife and humans who consume Delta/Yolo Bypass fish. This is expected to result in reductions in fish tissue mercury concentrations in fish in wetlands that are hydrologically connected to the Delta/Yolo Bypass waterways and thereby improve overall wetland quality for wildlife that consume fish in the wetlands. The proposed fish tissue objectives and associated implementation program would not result in the overall net loss of wetlands in the Delta and its tributary watersheds. However, as discussed in detail in Chapter 7, implementation of methylmercury management practices conceivably could affect the habitat function of wetlands. Even so, there are measures that would enable the Delta TMDL implementation program to minimize, mitigate, or possibly avoid altogether, negative effects on wetland function.

The proposed Basin Plan amendments would likely result in an increase in procedural complexity for the administration of State and Federal wetlands conservation programs because the proposed amendments require State and Federal wetland managers to participate in methylmercury studies and consider methylmercury control requirements for wetland restoration projects.

6.4.6 Habitat Conservation Plans and Natural Community Conservation Plans

The Federal and California Endangered Species Acts prohibit harming species listed as threatened or endangered. These laws require that entities that wish to conduct activities that might incidentally harm (or "take") such wildlife first obtain an incidental take permit from the U.S. Fish and Wildlife Service (for federally-listed species) or from the California Department of Fish and Game (for state-listed species).

Under Section 10 of the Federal ESA, to obtain a permit, the applicant must develop a Habitat Conservation Plan (HCP), designed to offset any harmful effects the proposed activity might have on the species. The HCP process allows the proposed activity to proceed while promoting conservation of listed species. An HCP also may be used as a tool to aid in restoring populations of listed wildlife species. The Federal Endangered Species Act Section 4(f) requires the development of recovery plans for listed species. Some recovery plans list specific HCPs (approved or in the planning stage) and acreage in the USFWS wetland easement program as part of the recovery strategy.

Analogous to the role of an HCP in the Federal process, a Natural Communities Conservation Plan (NCCP) approved by the California Department of Fish and Game allows take of listed species by participating entities as long as the NCCP provides conservation measures for that species. The Natural Communities Conservation Planning Program is a state program that incorporates protection of ecosystems into land use planning. The program seeks to anticipate and prevent the impacts that trigger the listing of species by the State as threatened or endangered by focusing on the long-term stability of wildlife and plant communities and including key interests. The program began with the 1991 Natural Communities Conservation Planning Act. Natural community conservation planning is a voluntary process that can facilitate early coordination to protect the interests of the State, Federal, and local public agencies, landowners, and other private parties.

The CDFG is developing a Bay Delta Conservation Plan (BDCP) that will allow water delivery and electricity generation to continue in the Delta while satisfying requirements of the federal and State ESAs. One method under consideration by authors of the BDCP to repopulate and protect threatened and endangered fish species in the Delta is to restore habitat, including wetlands, in the Delta. The BDCP framework and environmental analyses are expected to be released in 2009.

The proposed Basin Plan amendments do not conflict with provisions of adopted HCPs or NCCPs (e.g., CALFED's habitat restoration goals stated in its Multi-Species Conservation Strategy, which were adopted by the CDFG as an NCCP) because they do not prevent the future restoration and development of wetlands and other critical habitat. As described in Chapter 7, impacts to existing habitats resulting from implementation actions can be reduced to less then significant levels through careful project design and construction activities.

HCPs and NCCPs written to avoid or compensate for the incidental take of listed species should follow all applicable environmental regulations, including water quality objectives and other requirements of the Basin Plan. When these plans are cited as part of the recovery strategy for listed species, however, coordination between water quality and conservation planners may be

needed to develop both the conservation plans and implementation plans for water quality objectives. In particular, for wetlands restoration proposed in areas with elevated mercury concentrations in sediment, methylmercury effects on listed species that may use the new habitat should be evaluated. Both TMDL and HCP/NCCP planning efforts should be science-based and have provisions for adaptation when new information is received.

6.5 Implementation Authority

The State and Central Valley Water Boards have the following regulatory authorities and/or obligations to address the methylmercury impairment in the Delta.

6.5.1 Total Daily Maximum Loads

Section 303(d)(1)(A) of the Federal Clean Water Act requires that "Each State shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters." The CWA also requires states to establish a priority ranking for waters on the Section 303(d) list of impaired waters and to establish a TMDL for those listed waters.

Essentially, a TMDL is a planning and management tool intended to identify, quantify, and control the sources of pollution within a given watershed so that water quality objectives are achieved and beneficial uses of water are fully protected. A TMDL is defined as the sum of the individual waste load allocations to point sources, load allocations to nonpoint sources, and background loading. Loading from all pollutant sources must not exceed the loading (or assimilative) capacity of a water body, including an appropriate margin of safety. The loading (or assimilative) capacity is the amount of pollutant that a water body can receive without violating the applicable water quality objectives. The specific requirements of a TMDL are described in the United States Code of Federal Regulations Title 40, Sections 130.2 and 130.7 (40 CFR §130.2 and 130.7), and CWA Section 303(d).

In California, the authority and responsibility to develop TMDLs rests with the Regional Water Boards. The USEPA has federal oversight authority for the CWA Section 303(d) program and may approve or disapprove TMDLs developed by the State. If the USEPA disapproves a TMDL, the USEPA is then required to establish a TMDL for the water body.

In California, the Porter-Cologne Water Quality Control Act (CWC, Division 7, Water Quality) requires that an implementation program for a TMDL to be included into the Basin Plan (CWC §13050(j)(3)). This implementation program must include a description of actions to achieve Basin Plan water quality objectives, a time schedule for specific actions to be taken, and a description of monitoring to determine attainment of objectives.

6.5.2 National Pollutant Discharge Elimination System Permits

The federal Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) program, which in California is administered by the nine Regional Water Boards. The Central Valley Water Board issues NPDES permits to regulate point-source discharges to surface waters in the Central Valley, such as discharges from publicly owned wastewater treatment facilities or privately owned facilities that discharge at discrete locations.

6.5.3 Stormwater Permits

The Water Quality Act of 1987 added Section 402(p) to the Clean Water Act (CWA §1251-1387). This section requires the USEPA to establish regulations for NPDES requirements for stormwater discharges. Section 402(p) of the CWA states that an area-wide MS4 permit must "require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the USEPA Administrator or the State determines appropriate for the control of such pollutants." MS4 permittees are subject to Federal law, which requires them to implement a program to monitor and control pollutants in discharges to the municipal system from industrial and commercial facilities that contribute a substantial pollutant load to the MS4 (40 CFR 122.26(d)(2)(iv)(A) and 40 CFR 122.26(d)(2)(iv)(C)).

The State of California has in-lieu authority for the NPDES program, and the Porter-Cologne Water Quality Control Act authorizes the State Water Board through the Regional Water Boards to implement this authority.

6.5.4 Prohibition of Discharge and Waste Discharge Requirements

When necessary, the Central Valley Water Board can prohibit certain waste discharges (CWC §13243). These prohibitions can apply to types of wastes and/or to specific areas. Additionally, the Central Valley Water Board has the authority to issue individual or general WDRs that govern the amount of pollution that can be discharged to a water body (CWC §13260 *et seq*.). Any individual or entity discharging waste or proposing to discharge waste in the Central Valley is required to submit a report of waste discharge to the Central Valley Water Board. The Central Valley Water Board may also initiate the permit process by requesting a report of waste discharge from an individual or entity. The Board also has authority to require dischargers to prepare technical reports about a discharge and its impacts (CWC §13267).

Unlike NPDES permits, WDRs can be applied to waste discharges to land, groundwater, and to nonpoint source discharges to surface waters, including agricultural drainage. WDRs could have an important role in the implementation of a solution to the methylmercury impairment, as they are the primary regulatory mechanism available to the Board that can be used to address nonpoint source discharges. WDRs can be issued to parties discharging wastes, including individuals, agencies such as water districts, or companies. WDRs can specify the volume of discharge and set concentration and load limits on the constituents discharged. They can also

set receiving water limits, which are the allowable concentrations of a pollutant in the receiving water downstream of a discharge. The Central Valley Water Board can require ongoing discharger compliance monitoring as a permit requirement. Where discharge limits in WDRs cannot be met at the time of adoption, the Board adopts a Cease and Desist Order that specifies steps that must be taken and a timeline that must be followed to bring the discharge into compliance.

6.5.5 Clean Water Act, Section 401 Water Quality Certifications

The proposed Basin Plan amendments include methyl and total mercury requirements for CWA Section 401 water quality certifications for dredging operations in the Delta. Under the Federal CWA, an applicant must apply for Water Quality Certification under Section 401 of the CWA if the applicant applies for a Section 404 permit from the USACE for an in-stream activity that may affect water quality. In California, the Regional Water Boards are responsible for providing CWA Section 401 certifications (CWC §3830-3869), which are enforceable orders under California law. In order to issue a CWA Section 401 certification, the Central Valley Water Board must find that the project will, in accordance with the Basin Plan, protect beneficial uses, comply with numeric Basin Plan water quality objectives, and uphold the State Water Board's antidegradation policy. The Central Valley Water Board may impose conditions in a Section 401 certification to comply with the CWA, California Water Code, and other applicable laws, as necessary. All dredging activities and many marsh restoration actions in the Delta require a Section 401 certification from the Central Valley Water Board.

6.5.6 Porter-Cologne Water Quality Control Act, Section 13267 Requests

The Central Valley Water Board could issue a Section 13267 order to dischargers for the methyl and total mercury source characterization and control studies required by the proposed Basin Plan amendments. The Central Valley Water Board has the authority to require dischargers to prepare technical reports about a discharge and its impacts, as stated in the California Water Code Section 13267(b):

> "In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waters within its regions, or any citizen or domiciliary, or political agency or entity of the state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of water within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports."

6.5.7 Porter-Cologne Water Quality Control Act, Section 13146 Requests

As noted at the beginning of this chapter, CWC Section 13146 requires that, in carrying out activities that affect water quality, all state agencies, departments, boards and offices must comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the State Water Board in writing their authority for not complying with such policy. Therefore, under this policy, state agencies identified in the proposed Basin Plan amendments as responsible for methylmercury source characterization and control studies are required to either conduct the studies or indicate in writing to the State Water Board their authority for not complying.

7 CEQA ENVIRONMENTAL CHECKLIST AND DISCUSSION

Basin Plan amendments are projects subject to the California Environmental Quality Act (CEQA). The California Secretary for Resources certified the State Board's water quality planning process as functionally equivalent to the requirements of Section 21080.5 of CEQA for preparation of environmental documentation, such as an Environmental Impact Report. This Basin Plan amendment staff report contains documentation that supports the Central Valley Water Board's environmental decision.

This chapter includes the CEQA environmental checklist and a discussion of the potential environmental impacts of the proposed plan to control methylmercury in the Sacramento-San Joaquin Delta Estuary, including references to additional supporting documentation provided throughout the staff report. The CEQA environmental evaluation was prepared in compliance with CEQA requirements as they relate to certified regulatory programs. The evaluation is organized in five sections: (1) Project Description, (2) CEQA Issues Checklist, (3) Discussion of Potential Environmental Impacts and Mitigation Measures, (4) Statement of Overriding Considerations, and (5) Preliminary Staff Determination. The CEQA environmental evaluation refers to the proposed plan to control methylmercury in the Delta (a.k.a. proposed Basin Plan amendments") as "the proposed Project". The "CEQA Issues Checklist" and "Discussion of Environmental Impacts" sections are organized into 17 resource categories (a.k.a. "issues"):

I. Aesthetics
II. Agriculture Resources
III. Air Quality
IV. Biological Resources
V. Cultural Resources
VI. Geology/Soils
VII. Hazards & Hazardous Materials
VIII. Hydrology/Water Quality
IX. Land Use Planning
X. Mineral Resources
XI. Noise
XII. Population and Housing
XIII. Public Services
XIV. Recreation
XV. Transportation/Traffic
XVI. Utilities/Service Systems
XVII. Mandatory Findings of Significance

The threshold of significance for potential environmental impacts is defined in general terms at the beginning of Section 7.2 (CEQA Issues Checklist) and further defined for each resource category in the CEQA Issues Checklist and Discussion of Potential Environmental Impacts (Section 7.3). Section 7.3 also identifies mitigation measures that would reduce potential impacts to less than significant levels. The "Statement of Overriding Considerations" (Section 7.4) further reviews the benefits and potential impacts of the Project as a whole and identifies the potential impacts that, while individually limited, could be cumulatively considerable if appropriate mitigation measures are not incorporated in the overall implementation strategy for the Project.

7.1 Project Description

Project title:

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

Lead agency name and address:

California Regional Water Quality Control Board, Central Valley Region
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670

Contact person and phone number:

Patrick Morris, Senior Water Quality Engineer
(916) 464-4621

Project location:

The Sacramento – San Joaquin Delta Estuary (the Delta) as defined in Section 12220 of the California Water Code (CWC) and its tributaries downstream of major dams in the Sacramento and San Joaquin Basins.

Description of project:

The Project is defined as the Central Valley Water Board staff's proposal to amend the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) to address the fish tissue mercury impairment in the Delta. The Delta is on the Federal Clean Water Act (CWA) Section 303(d) List of Impaired Water Bodies because of elevated levels of mercury in Delta fish. The Delta has been identified under CWA Section 303(d) as impaired due to a fish consumption advisory for elevated concentrations of mercury in fish tissue, which pose a threat to humans. The elevated fish mercury concentrations also pose a threat to threatened and endangered wildlife species and other wildlife that consume Delta fish. In addition, the State Water Board established the Bay Protection and Toxic Cleanup Program (BPTCP) to implement the requirements of California Water Code Section 13390 *et seq.* and adopted the Consolidated Toxic Hot Spots Cleanup Plan (CWC §13394) that identified mercury in the Delta as a toxic hot spot, and the San Francisco Bay Water Board adopted a mercury control plan for San Francisco Bay that assigned mercury reductions to Central Valley outflows to the Bay to address the Bay's mercury impairment.

The goal of the proposed Basin Plan amendments and resulting actions is to lower fish mercury levels in the Delta so that the beneficial uses of fishing and wildlife habitat are attained. The proposed amendments (Project) include the:

- Addition of the commercial and sport fishing (COMM) beneficial use for the Delta;
- Establishment of numeric fish tissue objectives for methylmercury in Delta/Yolo Bypass fish and documentation of the assimilative capacity of ambient methylmercury in Delta/Yolo Bypass waters based on those objectives;
- Adoption of methylmercury load and waste load allocations and total mercury limits as required by Clean Water Act Section 303(d)(1)(C);

- Adoption of an implementation strategy to (a) reduce methyl and total mercury loading to the Delta and Yolo Bypass to enable compliance with the proposed fish tissue objectives for the Delta according to CWC Section 303(d) and the BPTCP, and with the total mercury allocation assigned to the Delta by the San Francisco Bay mercury control program; and (b) reduce methylmercury exposure to the fish-eating public;
- Adoption of a schedule for evaluating the progress of the implementation program and making changes as needed using an adaptive management approach; and
- Addition of a monitoring and surveillance program.

The Project boundary extends beyond the legal Delta boundary to include those portions of the Yolo Bypass outside the Delta because available information indicates that the Yolo Bypass is a substantial source of both total mercury and methylmercury to the Delta. In addition, the Project requires study and control actions for total mercury and methylmercury sources in the tributary watersheds upstream of the Delta and Yolo Bypass because almost all total mercury loading and about half of the methylmercury loading comes from tributary inputs.

The Project requires responsible entities that discharge total (inorganic) mercury or methylmercury to: conduct Phase 1 mercury and methylmercury characterization and control feasibility studies or to collaborate with those conducting the studies; develop applicable management practices and control measures; develop and submit a schedule for implementation; prepare and submit supporting documentation in such cases where achieving methylmercury allocations is considered by the discharger(s) as infeasible; and implement applicable management practices and control actions during Phase 2 of the proposed Project.

Possible approaches to controlling methylmercury and inorganic mercury inputs to the Delta and Yolo Bypass include developing and implementing management practices or control actions to reduce inputs of these constituents from: municipal storm water, water storage and management, NPDES wastewater treatment facilities, dredge material disposal, irrigated agriculture, and wetland restoration. In addition, the proposed Project has specific requirements to reduce mercury discharges from the Cache Creek Settling Basin.

The proposed Project also requires methylmercury dischargers to develop and implement a strategy to reduce mercury related risks to people who eat Delta fish and quantify risk reductions resulting from the risk reduction activities. The amendments recommend that the dischargers should coordinate these efforts with public health agencies and affected communities.

The beneficial uses of the Delta that are sensitive to elevated fish mercury levels are described in Chapter 2. Recommended and alternative fish tissue objectives are described in Chapter 3. Implementation alternatives, load and waste load allocations and reasonably foreseeable methods of compliance associated with each alternative, and the potentially responsible entities and compliance schedule are described in Chapter 4. The monitoring and surveillance program is described in Chapter 5 and a summary of existing Federal and State laws and policies that are relevant to the proposed water quality objectives and implementation plan is provided in Chapter 6.

7.2 CEQA Issues Checklist

Adopting the proposed Project (the proposed Basin Plan amendments) could result in agencies (e.g., cities, counties, WWTPs, and other dischargers) implementing site-specific projects to satisfy requirements included in the proposed Basin Plan amendments. These projects may physically change the environment and potentially result in environmental impacts. Potential environmental impacts were determined to be potentially significant if the reasonably foreseeable site-specific projects could, either directly or indirectly, cause a substantial loss of habitat or a substantial degradation of water quality or other resources compared to baseline conditions.

Some form of mitigation is possible for all of the potentially significant environmental impacts that staff identified. However, selection and performance of mitigation is within the responsibility and jurisdiction of agencies implementing the site-specific projects. Mitigation can and should be adopted by the implementing agencies. This evaluation assumes that implementing agencies will design, evaluate, and implement studies, pilot projects, management practices and controls in compliance with all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. As reviewed in Section 7.3, there are numerous standard measures for ensuring that commonly conducted activities, such as project site selection and construction-related earth-moving activities, have a less than significant impact on biological, cultural, and other environmental resources. These standard measures should be part of any approved or permitted project. Staff considered a potential environmental impact to be a "Less than Significant Impact" if readily-available standard measures could enable a site-specific project to avoid any impact or reduce impacts to less than significant levels.

Staff considered a potential impact to be "Potentially Significant Unless Mitigation Incorporated" if implementing agencies had to incorporate mitigation beyond standard measures associated with common construction activities to prevent substantial loss of habitat or a substantial degradation of water quality. Staff considered a potential impact to be a "Potentially Significant Impact" if available mitigation may not be adequate for implementing agencies to prevent a site-specific project, or the cumulative effects of multiple projects, from causing substantial loss of habitat or a substantial degradation of water quality.

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ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
I. AESTHETICS. Would the Project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	☐	☐	☒	☐
II. AGRICULTURE RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the Project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☒	☐
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☒	☐
c) Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☒	☐
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control the District may be relied upon to make the following determinations. Would the Project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐
IV. BIOLOGICAL RESOURCES. Would the Project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☒	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒	☐

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
V. CULTURAL RESOURCES. Would the Project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?	☐	☐	☒	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐
VI. GEOLOGY AND SOILS. Would the Project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
VII. HAZARDS AND HAZARDOUS MATERIALS. Would the Project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project result in a safety hazard for people residing or working in the Project area?	☐	☐	☐	☒
f) For a Project within the vicinity of a private airstrip, would the Project result in a safety hazard for people residing or working in the Project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
VIII. HYDROLOGY AND WATER QUALITY. Would the Project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that results in flooding on- or off-site?	☐	☒	☐	☐
e) Create or contribute runoff water that exceeds the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☒	☐	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
IX. LAND USE AND PLANNING. Would the Project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable Habitat Conservation Plan or Natural Community Conservation Plan?	☐	☐	☒	☐
X. MINERAL RESOURCES. Would the Project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒
XI. NOISE. Would the Project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?	☐	☐	☒	☐
d) A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?	☐	☐	☒	☐
e) For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the Project area to excessive noise levels?	☐	☐	☒	☐

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
f) For a Project within the vicinity of a private airstrip, would the Project expose people residing or working in the Project area to excessive noise levels?	☐	☐	☒	☐
XII. POPULATION AND HOUSING. Would the Project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIII. PUBLIC SERVICES.				
a) Would the Project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒
XIV. RECREATION.				
a) Would the Project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the Project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
XV. TRANSPORTATION / TRAFFIC. Would the Project:				
a) Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio to roads, or congestion at intersections)?	☐	☐	☐	☒
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion/management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒
XVI. UTILITIES AND SERVICE SYSTEMS. Would the Project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	POTENTIALLY SIGNIFICANT UNLESS MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
d) Have sufficient water supplies available to serve the Project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider, which serves or may serve the Project, that it has adequate capacity to serve the Project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the Project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒
XVII. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the Project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b) Does the Project have impacts that are individually limited but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐
c) Does the Project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

7.3 Discussion of Potential Environmental Impacts and Mitigation Measures

The following is an evaluation of potential environmental impacts of the proposed Basin Plan amendments. The evaluation is based on the reasonably foreseeable methods of compliance with the proposed Basin Plan amendments described in Section 4.3 of this report.

The proposed Basin Plan amendments, also referred to as "the proposed Project", establish water quality objectives for fish tissue mercury and define an implementation program to achieve the objectives. The proposed Basin plan amendments include methylmercury allocations for methylmercury discharges to the Delta and Yolo Bypass and reduction requirements for total mercury discharges to the Delta and its tributary watersheds downstream of major dams. The proposed amendments also require: mercury characterization and control feasibility studies; development and implementation of management practices and control measures for reducing methyl and total mercury sources; and monitoring of source and ambient conditions to evaluate compliance with the implementation program. Implementation activities are expected to encompass a variety of site-specific studies and source control projects throughout the Delta and its tributary watersheds downstream of major dams, a geographic scope that includes about 20,000 square miles of urban, agricultural and undeveloped terrains – roughly one third of the entire Central Valley.

The goal of the proposed Project and resulting implementation actions is to lower fish mercury levels in the Delta and San Francisco Bay so that the beneficial uses of fishing and wildlife habitat are attained; in other words, make it safer for humans and wildlife to consume Bay-Delta fish. However, a variety of implementation activities have the potential to cause direct and indirect negative effects. Most implementation activities would have no impact or insignificant impacts, but some have the potential for significant impacts if mitigation measures are not included in the site-specific projects' construction and operation.

CEQA requires lead agencies to review the potential for their actions to result in adverse environmental impacts and to adopt feasible measures to mitigate potentially significant impacts. Analyzing the potential adverse impacts of adoption of an environmental policy or plan is considerably different in nature than the analysis of actions described in a more typical, public facility or private development environmental impact report. The environmental effects of a policy or plan do not occur directly as a result of the action (i.e., adoption of the plan document), but as an indirect consequence of the practices used to comply with the plan.

Consistent with Public Resources Code (PRC) Section 21159, this evaluation does not engage in speculation or conjecture, but rather considers the reasonably foreseeable environmental impacts of the reasonably foreseeable methods of compliance with the proposed Basin Plan amendments and mitigation measures that would avoid or reduce the identified impacts. Any potential environmental impacts associated with the proposed Project depend upon the specific compliance methods and mitigation selected by the entities responsible for implementing site-specific projects, most of which are public agencies subject to their own CEQA obligations. The Central Valley Water Board does not specify the actual means of compliance by which responsible entities (e.g., dischargers, agencies or other persons responsible for total mercury and/or methylmercury sources) choose to comply with the proposed Basin Plan amendments. Therefore, the following discussion provides a program-level evaluation of the potential impacts

to each environmental resource described in the Environmental Checklist that could result from reasonably foreseeable methods of compliance. Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. Responsible entities may select among the methods of compliance identified in this evaluation, or they may propose another method so long as it complies with Basin Plan requirements in a lawful manner.

Many aspects of the proposed Project overlap with existing requirements established by other permitting programs, environmental program plans, and State and Federal regulations. Such existing requirements, and remediation practices that already take place to comply with them, will be referred to as "baseline" requirements and practices. The Porter-Cologne Water Quality Control Act and associated Basin Plan numeric and narrative water quality objectives and implementation plans vest extensive existing authority in the State and Central Valley Water Boards. As a result, many of the requirements included in the proposed Basin Plan amendments have already been implemented and will continue regardless of whether the proposed amendments are adopted by the Central Valley Water Board. In addition, other State agencies' programs already require several of the compliance activities that could result from the implementation of the proposed amendments. For example:

- The programmatic Record of Decision CEQA documentation for the CALFED Bay-Delta Program commits the California Bay Delta Authority to developing mitigation strategies to address potentially significant adverse environmental impacts resulting from CALFED projects, including the potential exposure of mercury-laden sediments from activities related to dredging activities, and the methylation of inorganic mercury from wetlands restored as part of its Ecosystem Restoration Program.
- The USACE and DWR require certain construction and earth-moving activities as part of their operations and maintenance plan for the Cache Creek Settling Basin, and they already evaluated the potential adverse impacts and mitigations in earlier environmental documentation.

For the sake of clarity and completeness, the following discussion reviews the potential impacts and mitigations that could result from compliance with the baseline and beyond-baseline requirements included in the proposed Basin Plan amendments. Baseline requirements are noted as applicable in the discussion of each environmental resource identified in the Environmental Checklist. However, the Determination, Environmental Checklist, Mandatory Findings of Significance, and Statement of Overriding Considerations are all based on those reasonably foreseeable methods of compliance likely to be undertaken to comply with those aspects of the proposed Basin Plan amendments that extend beyond baseline requirements.

This evaluation assumes that all responsible entities will conduct appropriate environmental analyses to evaluate potentially adverse, project-level environmental impacts, and mitigation measures once their preferred methods of achieving compliance with the proposed Basin Plan amendments have been determined. This evaluation also assumes that responsible entities will design, evaluate, and implement studies, pilot projects, management practices and controls in compliance with all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices.

The following sections of this report describe the potentially significant adverse physical impacts – both direct and indirect – that could result from the proposed Project to each resource delineated by Roman numerals in the Checklist. For each resource, the potential environmental effects of the reasonably foreseeable methods of compliance with both Phase 1 and Phase 2 of the proposed mercury control program are reviewed. Many of the potential Phase 2 control actions are more speculative because the proposed Phase 1 methylmercury characterization and control studies are needed to further develop and evaluate the feasibility and efficacy of methylmercury management practices to be implemented in Phase 2. This evaluation addresses foreseeable mitigation measures for potential impacts resulting from foreseeable compliance methods. The proposed Phase 1 characterization and control studies would further assess the potential impacts of newly developed methylmercury and total mercury control actions and evaluate mitigation measures. The Phase 1 methylmercury characterization and control studies are expected to increase the number of both possible methylmercury control options and possible measures to mitigate potential impacts. The environmental effects of new control options will be evaluated during future Basin Planning efforts at the end of Phase 1.

The proposed Project includes guidelines for voluntary mercury and methylmercury pilot offset projects but does not require offset projects to take place nor prescribes specific offset projects. The proposed Project includes a schedule for development of an offset program for Central Valley Water Board consideration by the end of Phase 1, such that a Phase 2 offset program can be guided by the results of the proposed Phase 1 methylmercury characterization and control studies and any voluntary pilot offset projects. A program-level evaluation of the potential environmental impacts of a Phase 2 mercury offset program will be conducted when the offset program is brought before the Board. However, if a voluntary pilot offset project involves construction, agriculture land or wetland modification, hazards or hazardous material, changes to hydrology or water quality, land use, or modification to utilities, then the following environmental analysis and potential mitigation measures could apply to the project. In addition, the environmental analysis addresses the use of credit accrued by pilot offset projects and early implementation of total mercury reduction efforts by NPDES permittees.

I. Aesthetics

The Phase 1 characterization and control studies and pilot projects are unlikely to alter any scenic vistas, damage scenic resources, degrade the visual character of any site, or adversely affect day or nighttime views. Control actions and management practices implemented to maintain Phase 1 NPDES facility and urban runoff methylmercury concentration limits, to improve the sediment and mercury trapping efficiency of the Cache Creek Settling Basin, and to achieve and maintain the methylmercury allocations during Phase 2 are similarly unlikely to affect aesthetics because any physical changes to the aesthetic environment as a result of their implementation would be small in scale. However, in the unlikely event that construction activities or structural controls potentially create aesthetically offensive impacts, these can be addressed with screening and other construction best management practices (BMPs), standard architectural and landscape architectural practices such as the inclusion of landscape vegetation to serve as a visual buffer, use of building materials that do not create a source of glare, and direction of lighting away from residential and roadway areas. As a result, any potential impacts from the implementation of the proposed Project would be less than significant.

II. Agricultural Resources

Phase 1 of the proposed Project requires studies to evaluate the sources of methylmercury in agricultural drainage to surface waters and to develop management practices to reduce the methylmercury sources. Such studies would not require conversion of any farmland to non-agricultural use nor conflict with existing zoning for agricultural use or a Williamson Act contract.

Phase 1 also requires improvements to the sediment and total mercury trapping efficiency of the Cache Creek Settling Basin. As described in Section 4.3.6, reasonably foreseeable methods to comply with the basin improvement requirements include structural modifications to increase the trapping efficiency (raise the outlet weir early, excavate the basin, and/or expand the size of the basin) and periodic removal of contaminated sediment to maintain the trapping efficiency. USACE's draft sediment management plan includes the following activities to maintain an average 50% trapping efficiency over the 50-year (1993 to 2042) life of the basin: construction and maintenance of a training channel and levee, incremental removal of the existing training levee, and raising of the outlet weir in year 25 (2018) of the basin project. In addition, the 1979 Environmental Statement prepared by the USACE described expected maintenance activities, which included annual removal of sediments. As a result, raising the weir and excavating sediment from the basin may be considered baseline requirements under existing basin management practices. Even so, possible impacts resulting from raising the weir and excavating sediment as well as expanding the basin are evaluated below.

Portions of the Cache Creek Settling Basin are farmed during periods when the basin is not flooded. During any given year, about 1,900 acres (53%) of the 3,600-acre basin may be farmed (CDM, 2006). The 2004 Farmland Mapping and Monitoring Program data for Yolo County was obtained as a GIS layer (CDOC, 2004) and overlain with the outline of the basin to determine farmland designations within and adjacent to the basin. About 0.2% (7 acres) of the basin is designated as "Prime Farmland" and about 56% (2,004 acres) of the basin is designated as "Unique Farmland". In addition, about 83% of the Cache Creek Settling Basin is zoned as Agricultural General Zone (A-1) and 17% is zoned as Agricultural Preserve (A-P) (CDM, 2006). A-P zoned lands are contracted as Williamson Act lands with Yolo County; principal uses can include agricultural use, public parks, and rural recreation. The A-P zoned land occurs in the western portion of the basin where Cache Creek enters the basin and is bound by the training channel and levee. The A-P zoned land supports native vegetation; it is not currently farmed (CDM, 2006).

If parties responsible for the Cache Creek Settling Basin choose to dredge the basin sediments as a control measure to improve its trapping efficiency, landowners who typically grow crops during the dry season will not be able to farm that year or may need to shift their planted areas to another part of the basin. It is anticipated that excavation activities would focus on areas where the most sediment has accumulated; therefore, sediment removal would not take place over the entire basin during any one year. Therefore, all land within the basin would not need to be out of production at any one time. Sediment removal would not remove the land from long-term agricultural production. Historically, there have been sediment removal projects by private landowners in the basin while farming continued in other portions of the basin; farming resumed in areas that experienced these sediment removal projects. In addition, the State has easements on land within the basin to impound water, excavate sediment, and make other

improvements related to flood control including vegetation removal. Therefore, when the basin is flooded, some or all of the basin is temporarily (e.g., one growing season) removed from agricultural production. The 1979 Environmental Statement prepared by the USACE evaluated expected maintenance activities including annual removal of sediments, which would have impacted agricultural practices to the same degree as the proposed Basin Plan amendments. The effects of sediment removal would be temporary in nature and the impacts to agriculture less than significant.

Another potential option for improving the sediment and total mercury trapping efficiency of the Cache Creek Settling Basin that may affect agricultural practices is the expansion of the basin. Initial modeling results (CDM, 2004b) indicate that a basin trapping efficiency of about 55% could be accomplished through a basin expansion of about 1,500 acres along the northeastern border of the basin. The majority of the acreage that would be encompassed by the expansion is designated as "Prime Farmland" (CDOC, 2004) and is currently zoned as A-P (CDM, 2006). Land within the expansion area could be farmed with like crops and practices that are currently employed within the existing basin perimeter. However, the expansion of the basin could involve permanently removing some agricultural land (about 36 acres) from production for the construction of new perimeter levees for the expansion area. If portions of the existing levee were removed during the expansion progress (those sections of levee that would now be in the interior of the expansion area and would no longer be necessary), an additional 27 acres would be available for farming. Hence, there would be net loss of about 9 acres. This potential impact is considered to be less than significant.

Current operations of the Cache Creek Settling Basin result in some portions of the southern part of the basin remaining too saturated for planting crops during some years. Increasing the outlet weir could decrease the time available for planting crops in the southern half of the basin due to the soils being too saturated from the additional time the basin is flooded. A potential mitigation would be to modify the low flow outlet structure and downstream channel to increase the volume of water passing through the low flow structure after high flows have receded. This would allow the basin to drain more quickly after the basin has flooded and minimize the impact to agriculture. Because raising the Cache Creek Settling Basin outlet weir is part of the basin's sediment management plan and was evaluated by previous environmental documentation for the basin's construction and management, there would be no new impact to biological resources from this action as a result of the proposed Basin Plan amendments.

Although the proposed project could require improvements to the Cache Creek Settling Basin not previously planned by the USACE and DWR, new easements for the improvements will not be required. Land within the Cache Creek Settling Basin was condemned for the purposes of managing sediment from the Cache Creek watershed as documented in a settlement between the State of California and the landowners (Final Order of Condemnation, 14 July 1995). The State has easements in the basin to flow and impound water and sediment, excavate and remove sediment, and clear and remove any obstructions or vegetation for operations and maintenance of the basin. In addition, the landowners acknowledged that the State may modify, enlarge, or implement future modifications and improvements to the basin that may cause additional flood flows, material deposition, and other physical changes, and the Final Order of Condemnation allows the modifications, enlargements, and improvements to be implemented.

Phase 2 of the proposed Project requires that management practices be implemented to reduce identified agricultural sources of methylmercury that discharge to areas of the Delta and Yolo Bypass where fish mercury levels exceed the proposed fish tissue objectives. Compliance methods could include, but not be limited to, modifying agriculture return water discharge patterns to decrease the methylmercury concentration of the return water entering the receiving waters, and utilizing drip irrigation systems or other water-efficient systems to curtail or limit irrigation runoff and discharge volume to the receiving waters. These management practices have already been developed and are readily implemented to manage other pollutants such as pesticides and to conserve water. The effects and costs associated with these management practices have been previously evaluated (e.g., Karkoski *et al.*, 2003; Beaulaurier *et al.*, 2005; McClure *et al.*, 2006; and Hann *et al.*, 2007) and are not expected to adversely impact agricultural practices, the environment, or management practices used to control other pollutants. Growers should be able to choose an approach appropriate to their crop and field that will minimize costs and allow them to continue farming while achieving and maintaining the proposed fish tissue objectives. Potentially, some water quality management practices such as buffer strips and constructed wetlands may need to be evaluated and, if needed, modified or limited to reduce or at least not increase methylmercury production. However, there are other water management practices available that address the same goals as buffer strips and constructed wetlands.

The Phase 1 methylmercury characterization and control studies are expected to increase the number of possible control options for agricultural sources of methylmercury and possible measures to mitigate potential impacts. The environmental effects of new control options would be evaluated during future Basin Planning efforts at the end of Phase 1. If the potential methods of compliance described above and developed by the Phase 1 studies are unable to adequately achieve the proposed methylmercury allocations, growers may be able to participate in an offset program (if one is approved by the Water Board; see Section 4.3.9) to reduce total mercury or methylmercury in the irrigation water obtained from surface water sources or otherwise offset methylmercury from agricultural sources.

III. Air Quality

Because the proposed Project would not increase population or employment in the Delta or its source region, it would not generate ongoing, permanent traffic-related emissions. In addition, the proposed Project would not involve the construction of any permanent emissions sources. For these reasons, no permanent change in air emissions would occur.

However, Phase 1 requirements to increase and maintain the sediment and total mercury trapping efficiency of the Cache Creek Settling Basin and to implement BMPs to minimize total mercury discharges from urban runoff will almost certainly require construction and maintenance activities that could be potential sources of air emissions that may adversely affect ambient air quality. Other methylmercury and total mercury control projects undertaken during Phases 1 and 2 could similarly adversely affect ambient air quality as a result of construction activities, mine cleanups, and periodic maintenance activities.

Dust and motor emissions could result from several construction and maintenance activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and

vehicle and equipment exhaust. Measures are available to reduce potential impacts to ambient air quality due to increased traffic and construction equipment operation during construction and maintenance activities to less then significant levels. These are common practices to mitigate the adverse effects of motor emissions. Measures could include, but are not limited to, the following:

- Use construction and maintenance vehicles with lower-emission engines.
- Limit the unnecessary idling of construction equipment.
- Use soot reduction traps or diesel particulate filters.
- Use emulsified diesel fuel.
- Design structural devices to minimize the frequency of maintenance trips.
- Properly maintain vehicles so that they operate cleanly and efficiently.

The generation of dust and particulate matter during construction and maintenance activities also could impact ambient air quality. There are several mitigation measures that would reduce the transfer of particulates and dust to air and mitigate this potential impact, including but not limited to the following:

- Use water trucks to water active construction areas (e.g., at least twice daily).
- Cover stockpiles of soil, sand and other materials.
- Cover trucks hauling debris, soil, sand, or other material.
- Pave, apply water, or apply soil stabilizers to unpaved areas.
- Sweep surrounding streets and paved areas during construction (e.g., once per day).
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 miles per hour.
- Initiate landscaping and re-vegetation as soon as construction tasks allow in order to minimize wind erosion.

A project-specific operations plan for construction and/or maintenance activities could be completed to address the variety of available measures to limit the ambient air quality impacts. The emission of air pollutants during short-duration construction and maintenance activities associated with reasonably foreseeable methods of compliance with the proposed Project is unlikely to change long-term ambient air conditions because such emissions would cease after short-duration activities are completed.

Yolo County and a portion of Solano County are part of the Sacramento region designated by USEPA as a Serious Ozone non-attainment area for the federal 8-hour ozone standard. The Yolo-Solano Air Quality Management District developed attainment strategies and handbooks to guide projects that may contribute to air quality problems. Actions taken by responsible agencies to comply with the proposed Basin Plan amendments that may affect air quality (such as using heavy equipment to remove mercury-contaminated sediments) will most likely require a permit that would include a separate environmental review for implementation of specific projects. Projects must mitigate their emissions as described therein.

Phase 1 of the proposed Project also requires WWTPs to maintain existing effluent methylmercury concentrations and to implement total mercury evaluation and minimization

programs. As noted in Section 4.3.12.1, mercury control is an existing (baseline) requirement for many municipal WWTPs. (Indeed, controlling effluent total mercury and methylmercury will prevent additional mercury releases to the air.) As a result, the proposed Project is unlikely to increase air emissions above those existing from baseline activities.

Phase 2 improvements to NPDES-permitted WWTPs and urban storm water systems to comply with methylmercury allocations may require some facilities to upgrade their treatment processes and/or BMPs. Construction activities related to the upgrades are expected to result in some increase in local air pollutants at the project location; however, such construction activities are temporary and not expected to have long-term air quality impacts. Site-specific construction projects must control their emissions as described in previous paragraphs in compliance with local ordinances and State regulations.

The proposed Basin Plan amendments require dredging projects to minimize total mercury and methylmercury discharges from dredging and dredge material disposal (DMD) sites. As described in Section 4.3.12.4, reasonably foreseeable methods of compliance include, but are not limited to, the following: use a pipeline hydraulic suction dredge or 'sealed' or 'environmental' clamshell bucket dredge to reduce the amount of turbidity in the water column and the amount of water produced during the dredging operation; increase DMD return water hold time to remove suspended material from the return flow to the maximum extent practicable; control erosion at upland DMD, levee maintenance and improvement projects through such practices as re-vegetation, hard bank stabilization, biotechnical bank stabilization, and/or placement of dredge material at locations that have no discharge to surface water. These compliance methods are unlikely to cause significant impacts to air quality. Mitigation measures for construction activities related to the protection of dredge materials from erosion are the same as those discussed above for the Cache Creek Settling Basin improvement activities and urban stormwater BMP implementation. In addition, these compliance methods or similarly-approved methods are already required under Waste Discharge Requirements and CWA Section 401 Certifications for dredging operations to prevent exceedances of water quality objectives for turbidity. As a result, these compliance methods, associated impacts, and mitigations measures for those impacts are considered baseline conditions.

Phase 2 methyl and total mercury control actions and management practices for existing and new wetlands and new water management projects (e.g., new water diversion, salinity control, or flood control projects) are unlikely to adversely impact air quality. Construction and maintenance activities resulting from Phase 2 requirements should incorporate the mitigation measures described earlier in this section.

Construction activities and the installation and maintenance of BMPs associated with both Phases 1 and 2 of the proposed Project may result in objectionable odors and expose sensitive receptors to emissions or dust pollutants in the short-term due to exhaust and dust from construction equipment and vehicles. However, the construction activities are not expected to affect a substantial number of people. In addition, as discussed above, there are several mitigation measures that address emissions and dust. Objectionable odors due to engine exhaust would be temporary and dissipate once a vehicle has passed through the area. Objectionable odors from exhaust could be reduced if gasoline or propane engines were used instead of diesel engines. Additionally, construction and maintenance activities could be

scheduled to be performed at times when these activities have lower impacts, such as periods when there are fewer people or sensitive receptors in the area.

It is anticipated that a memorandum of understanding (MOU) will be developed between the USEPA, the State Water Board, and the Air Resources Board to conduct studies to evaluate local and statewide mercury emissions and deposition patterns and to develop and implement load reduction programs. Mercury is a toxic air contaminant. Development of mercury load reduction programs from air sources should result in air and water quality improvements.

IV. Biological Resources

The Delta is rich in biological resources. It encompasses more than 20,000 acres of wetlands and marsh, and more than two hundred species of birds and fifty species of fish inhabit the Delta (Figure 6.4 and Table 2.1 in the TMDL Report). Seasonal wetlands and rice fields in the Delta provide habitat for migratory birds of the Pacific Flyway, such as the State-listed Greater sandhill crane. In addition, several anadromous species such as American shad, salmon, steelhead trout, striped bass, and sturgeon reside in the Delta during at least part of their life cycle or pass through the Delta on their way upstream to spawn. Many of the species that reside or migrate through the Delta's wetland and upland areas are Federally- or State-listed as endangered, threatened, rare, or candidate species.

The purpose of the proposed Project is to benefit biological resources in the Delta by making it safer for humans and wildlife, including rare and endangered species, to consume Delta fish. Fish mercury levels throughout much of the Delta currently are elevated such that they pose a threat to wildlife and humans who consume Delta fish. Delta wildlife species that are primarily or exclusively piscivorous and therefore most likely at risk for mercury toxicity include: American mink, river otter, bald eagle, kingfisher, osprey, western grebe, common merganser, peregrine falcon (by eating waterfowl), double crested cormorant, California least tern, and western snowy plover (USEPA, 1997; CDFG 2002). Bald eagle, California least tern, Western snowy plover, and peregrine falcon are listed by the State of California and/or by the U.S. Fish and Wildlife Service as either threatened or endangered species.

Compliance with the proposed Project's requirements for a monitoring and surveillance program and a total mercury and methylmercury control program could encompass a variety of activities throughout the Delta, Yolo Bypass and tributary watersheds. To identify specific biological resources that could be affected by these activities, specific sites must be identified. However, precise locations for projects are not known because, as noted at the beginning of Section 7.2, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. What follows is a program-level review of potential impacts on biological resources that could result from the implementation of the proposed Project's requirements.

Monitoring activities associated with the proposed surveillance and monitoring program and Phase 1 characterization and control studies would not be continuous, occurring most frequently on a monthly or quarterly basis, and would be conducted in an environmentally sensitive

manner (e.g., in compliance with USFWS and CDFG regulations and permits). As a result, the impacts associated with monitoring activities, if any, would be less than significant.

However, site-specific pilot projects and long-term implementation projects to control total mercury and methylmercury could involve a variety of construction activities, control structures, and management practices that potentially could modify habitats, adversely affect special-status species, disturb riparian habitat or sensitive natural communities, or interfere with migratory fish movement. There are also potential impacts from the use of credit accrued by voluntary pilot offset projects and early implementation of total mercury reduction efforts by NPDES permittees. Section 4.3.9 in Chapter 4 provides recommended guidelines for a voluntary Phase 1 pilot offset program and credit strategy for early total mercury discharge reduction, and Sections 4.3.10 through 4.3.12 describe reasonably foreseeable methods of compliance with methylmercury allocations and Phase 1 methylmercury concentration limits. The potential impacts and mitigation measures associated with each of these aspects of the proposed Project are discussed in the following paragraphs.

A. Habitat Disturbance and Loss

The implementation of specific methylmercury and total mercury control projects throughout the Delta, Yolo Bypass and tributary watersheds to comply with the proposed Basin Plan amendments could have the potential to disturb or remove critical wetland and upland habitats that support special status species, either through the permanent construction of controls that change existing land uses, or through short-term construction and periodic maintenance activities. CEQA requires lead agencies for specific projects to review the potential for their actions to result in adverse environmental impacts and to adopt feasible measures to mitigate potentially significant impacts. All control projects and their associated construction and maintenance activities would be required to adhere to local, State, and Federal ordinances and regulations to avoid and/or minimize impacts to biological resources and to mitigate unavoidable impacts. Examples of such regulations include, but are not limited to, the following:

- USFWS ESA Section 7 Consultation for Threatened and Endangered Species;
- USACE Section 404 Permit for filling or dredging waters of the United States;
- CDFG 1601 Agreement for Streambed Alteration;
- California Water Quality Control Board Waste Discharge Permits;
- General Plan conservation requirements; and
- City and/or county tree ordinances.

In general, the implementation of specific methylmercury and total mercury control projects is expected to result in less then significant levels of habitat loss if projects are carefully designed, constructed, and maintained in accordance with the above-mentioned regulations and any required mitigation measures. Examples of methods for specific projects to avoid significant habitat disturbance and loss include, but are not limited to, the following:

- Contract qualified botanists, wildlife biologists and arborists to develop biological assessments of project site alternatives. At a minimum, assessments should include project area-specific literature searches, reviews of CDFG's *California Natural Diversity Data Base* and the California Native Plant Society's *Inventory of Rare and Endangered*

Plants of California, and field surveys of all potential project sites and their surrounding areas to identify and map existing plant communities, wildlife habitat, and heritage trees and to identify wildlife species that currently occur, have occurred in the past (e.g., resident and migratory wildlife species that have been documented as foraging or nesting at the site), or have the potential to occur at the site due to the presence of suitable habitat. Field surveys should follow protocols established by CDFG and should be conducted during the appropriate time(s) of year (e.g., during the blooming period of potentially occurring plant species).

- If there are alternative project sites, select a project site that does not contain critical habitat. If there is only one project site possible, locate project facilities outside the boundaries of critical habitat areas.
- If it is determined, based on the biological assessment and evaluation of the final project site and design, that an impact on special-status species population(s) would occur, then develop a mitigation and management plan in coordination with CDFG/USFWS to implement all measures included in the Biological Opinion resulting from the USFWS ESA Section 7 consultation and to satisfy any other local, State, and Federal requirements for achieving a no net loss of wetlands or other critical habitat, or take of wildlife species of concern. The plan should be submitted to the local city/county environmental planning department, USACE, USFWS, CDFG and/or other oversight agencies as applicable for approval prior to its implementation.
- Develop a re-vegetation plan. The re-vegetation plan should be prepared by a qualified restoration ecologist and reviewed by the appropriate agencies. The plan should specify sites where re-vegetation should take place, the planting stock appropriate for the region, appropriate designs (e.g., plant arrangements that, when mature, replicate the natural structure and species composition of similar habitats in the region), planting techniques, monitoring frequency, and success criteria (e.g., sapling trees no longer require active management).
- Establish temporary construction buffers for drainages, wetlands/vernal pools, and other sensitive habitat in the project area that could be affected by construction activities. The outer edges of the buffer zones should will be demarcated using flagging or temporary orange mesh construction fencing before initiation of construction activities and based on site-specific conditions, seasonal restrictions for wildlife, local planning department specifications, and resource agency (e.g., USFWS and CDFG) requirements.
- Require a qualified biologist to:
    - Perform required pre-construction surveys to determine the current presence of, and demarcate the boundaries of construction buffers around, sensitive habitats and submit survey reports according to CDFG and local agency guidelines for approval prior to construction.
    - Provide USFWS-approved worker environmental awareness training that informs all construction personnel about sensitive plant and wildlife species and habitats.
    - Observe major excavation and other construction activities, with the authority to stop construction activities until appropriate corrective measures have been completed.
    - Report to the USFWS any incidental take.

- Periodically re-inspect the project site (e.g., every week) during construction activities or whenever a substantial lapse in construction activity (e.g., >2 weeks) has occurred.

- Locate temporary access roads and staging areas outside the boundaries of critical habitat areas, restrict movement of heavy equipment to and from the project site to established roadways and areas designated for construction and staging, and do not allow parking of vehicles or storage of potentially-toxic chemicals near/up-gradient of drainages or sensitive habitats or under heritage trees.
- Implement measures to control dust, erosion and noise (see Sections III, VI, and XI, respectively).
- During construction and maintenance activities, properly contain or remove all trash that may attract predators to the worksite.
- After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions according to the before-mentioned re-vegetation plan.
- Provide compensation for unavoidable degradation or loss of critical habitat due to project construction to ensure no net loss of that habitat. Compensation should be provided at a minimum ratio (e.g., 3:1, three acres of restored wetlands for every one acre affected, or three native oak trees planted for every native oak tree eliminated) that ensures long-term replacement of habitat functions and values and complies with local, State and Federal requirements. Compensation could include, but is not limited to, the following:
  - Construct replacement habitat as close as possible to the previous habitat location at the project site (e.g., locate replacement riparian and wetland habitats along the same drainage affected by the project construction).
  - If site limitations prevent on-site habitat replacement, construct replacement habitat as near the project site as possible.
  - Provide payment on a per-acre basis to an approved restoration or mitigation bank or other trust fund.

As noted earlier, precise locations for projects are not known and the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. However, staff identified several examples of particular reasonably foreseeable methods of compliance that have the potential to result in habitat loss if protective measures are not incorporated in their selection, design and implementation. The following paragraphs provide a program-level review of these examples and possible mitigation measures. This review should not be considered a replacement for project-level evaluations required of future, site-specific project proponents.

1. Actions to Comply with Proposed Total Mercury Evaluation and Minimization Requirements and Methylmercury Allocations for WWTP and MS4 Discharges. As described in Section 4.3.10 in Chapter 4, the proposed Project (Implementation Alternative 3) would require eight of the sixteen WWTPs in the Delta/Yolo Bypass to reduce their effluent methylmercury loads. These facilities have several reasonably foreseeable methods of compliance with their methylmercury allocations, including but not limited to the following:

- Implement minimization programs for total mercury discharges;

- Treat effluent to Title 22 levels and use it to irrigate recreational areas such as golf courses and parks and landscape areas in mall complexes and residential communities (such treatment and reuse is already regulated under existing programs to prevent environmental impacts) to decrease discharges to surface water;
- Implement additional secondary or advanced treatment processes to further reduce particle-bound methyl and total mercury, for example, increase retention in aeration tanks, increase retention in the primary and secondary clarifiers, and/or employ tertiary processes (e.g., reverse osmosis and multimedia filtration);
- Increase effluent disposal to land; and/or
- Participate in an offset program (if one is approved by the Central Valley and State Water Boards; see Section 4.3.9).

The proposed Phase 1 studies are expected to determine the efficacy of the above methods in reducing effluent methylmercury discharges to surface waters and to develop and evaluate additional methods.

WWTPs that need to reduce their methylmercury discharges to comply with the proposed methylmercury allocations could elect to expand their current land use footprint to include additional treatment processes and/or additional effluent disposal to land. Increasing their land use footprint could result in the loss of critical habitat, depending on the characteristics of the land available for expansion of a given facility. However, WWTPs are typically constructed in urbanized areas; expansion of WWTPs in urbanized areas is expected to have limited or no impact on critical habitats. Also, as noted earlier, there are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs that may not require the expansion of their land use footprint or other significant negative effects on habitat. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant environmental impact. Rather, it is foreseeable that agencies would avoid such compliance measures in lieu of other compliance measures.

Similarly, the proposed Project would require 11 MS4s that discharge to the Delta/Yolo Bypass to implement BMPs to reduce their methylmercury loads to comply with methylmercury allocations and three MS4s to implement pollution prevention measures and BMPs to control total mercury discharges to the maximum extent practicable. As described in Section 4.3.10, total mercury and methylmercury BMPs could potentially include, but are not limited to:

- Implementation of additional BMPs to reduce erosion and sediment transport. Because mercury and methylmercury are typically particle-bound, BMPs to control erosion and sediment transport would be effective in reducing mercury discharges.
- Modification of storm water collection and retention systems to reduce methylmercury production (e.g., installation of aerators in basins may potentially promote degradation of methylmercury in the water column).
- Regular removal of sediment from retention basins to reduce the supply of inorganic mercury available for methylation.
- Pollution prevention measures such as thermometer exchange and fluorescent lamp recycling programs, enhancement of household hazardous waste collection programs,

and implementation of public and industry education and outreach on disposal of household mercury containing products and replacement with non-mercury alternatives and on proper removal, storage, and disposal of mercury switches in autos and other industrial equipment.

- Participation in an approved offset program (if one is approved by the Central Valley and State Water Boards; see Section 4.3.9).

As with the WWTPs, the proposed Phase 1 studies conducted by the large MS4s are expected to determine the efficacy of the above potential methods to reduce methylmercury loading and to develop and evaluate additional mercury control methods. BMPs implemented by the MS4s to comply with the methylmercury allocations and other Phase 1 requirements are expected to be implemented within the existing footprint of the MS4 conveyance systems and therefore have limited or no environmental impact, aside from the possible hazards potentially associated with collecting and transporting mercury as part of pollution prevention activities discussed in "VII. Hazards and Hazardous Materials", and the potential for localized flooding discussed in "VIII. Hydrology and Water Quality".

However, it is possible that MS4s may elect to implement BMPs that would require them to expand their current land use footprint to include additional treatment processes (e.g., construction of sediment basins; see Section 4.3.10.2). Increasing their land use footprint could cause habitat loss, depending on the characteristics of the land available for expansion of a given MS4 system, although this is expected to be minimal because the MS4 conveyance systems are typically in urbanized areas. In addition, modifying the design of existing stormwater basins and/or removing accumulated sediment could cause habitat loss in basins where, either by design or lack of maintenance, wetland habitats have developed. Potential mitigation measures include designing stormwater basins that can be cleaned without removing all of the habitat that has been established (e.g., construct a pre-sediment basin that can be periodically cleaned and leave the downstream basin natural) and identifying and remediating upstream sources of mercury that may enter the basins so that vegetation in the basins do not need to be cleared to reduce methylmercury production. In addition, as noted earlier, there are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from MS4s. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant impacts to existing habitat. Rather, it is foreseeable that agencies would avoid such compliance measures in lieu of other compliance measures, or re-design such compliance features to avoid the impact.

Existing NPDES permits require 15 of 40 municipal WWTPs that discharge greater than 1 mgd in the Delta and its tributary watersheds downstream of major dams to implement total mercury pollution prevention plans in accordance with CWC §13263.3 or other similar mercury minimization programs. Hence, the proposed Project's requirement for the implementation of mercury evaluation and minimization programs by municipal WWTPs that discharge greater than 1 mgd is a new requirement for only 25 WWTPs. The requirement for total mercury pollution prevention measures would be a new requirement for one of the three MS4s required to implement mercury pollution prevention measures. The proposed Basin Plan amendment requirements for total mercury control for many of the NPDES permittees are baseline requirements, the potential environmental impacts of which are not new to the proposed Project.

Any adverse impacts from implementation of total mercury and methylmercury control projects by WWTPs and MS4s beyond baseline requirements are not expected to be cumulatively considerable because:

- WWTPs and MS4s are typically constructed in urbanized areas; therefore, their expansion is expected to have limited or no impact on critical habitats.
- There are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs and MS4s that may not require the expansion of their land use footprint or other significant negative effects on habitat; therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant environmental impact.
- The proposed Basin Plan amendment requirements for total mercury control for many of the WWTPs and MS4s are baseline requirements, the potential environmental impacts of which are not new to the proposed Project.

2. Improvements to the Cache Creek Settling Basin and Yolo Bypass. As discussed in Sections 4.3.6 and 4.3.10.6, there are several reasonably foreseeable methods of compliance for controlling total mercury and methylmercury discharges from the Cache Creek Settling Basin:

- Potential methods to comply with the Cache Creek Settling Basin requirements to increase and maintain its sediment/total mercury trapping efficiency include structural modifications (raise the outlet weir, excavate the basin, and/or expand the size of the basin) and periodic removal of contaminated sediment.
- The reduction of methylmercury production in the Cache Creek Settling Basin possibly could be accomplished through the reduction of the total mercury concentration of suspended sediment entering the basin from the Cache Creek watershed. Additional actions beyond those required by the Basin Plan Amendment for control of mercury in Cache Creek adopted by the Central Valley Water Board in October 2005 could include, but not be limited to, the select removal, remediation or stabilization of sediments in lower Cache Creek streambeds and banks where mercury sediment concentrations are enriched (greater than 0.4 mg/kg).

Raising the outlet weir of the Cache Creek Settling Basin is part of the basin's sediment management plan and was evaluated by previous environmental documentation for the basin's construction and management. Therefore, raising the outlet would be part of baseline conditions and there would be no new impact to biological resources from this action as a result of the proposed Basin Plan amendments.

Early plans for the basin's maintenance and sediment management plans call for the periodic removal of sediment accumulated within the basin, removal of sections of the internal training levee as the basin fills in with sediment, and clearing of channels to maintain flow capacities. The latest draft O&M plan does not mention sediment removal. As documented by the State

Clearinghouse's "CEQAnet" database,[40] past basin and levee maintenance activities such as vegetation removal, flood channel maintenance, and levee repairs were categorically exempt from CEQA (Title 14 CCR §15301); future sediment removal activities may similarly be categorically exempt. Even so, possible impacts resulting from excavating sediment as well as expanding the basin are evaluated below.

The following State- and/or federally-listed species and/or their habitat may exist adjacent to or within the basin: Swainson's hawk, Western snowy plover and Palmate-bracted bird's-beak (CDM, 2004b & 2006). Since the basin was modified in 1993, some areas within the basin have established vegetation and trees (both native and invasive species) that may be suitable habitat for special status species. As a result, enlarging the Cache Creek Settling Basin and/or removing accumulated sediment from the basin could involve removing trees and other native vegetation and disturbing or removing wildlife and special status species' nesting and foraging habitat. However, it is expected that project proponents will be able to implement mitigation measures to reduce these biological resources effects to less than significant levels (CDM, 2004b).

Possible methods to avoid or minimize sediment removal-related impacts to sensitive habitats or species include:

- Remove sediment from areas where there are known non-native invasive species rather than from areas in which native habitat may be suitable for special status species (e.g., riparian areas along the training channel).
- Remove sediment from the center of the basin where vegetation has not become established. Preliminary modeling by CDM suggests that sediment removal would not need to occur evenly across the basin, but instead could focus primarily near the center of the basin, and therefore not necessarily affect the riparian zone near the Cache Creek channel (CDM, 2004b).

In addition, DWR Flood Maintenance Division performed an extensive vegetation removal project in the Cache Creek Settling Basin in 2005 (Bencomo and Marchand, 2006), and DWR has done other maintenance activities in the settling basin including vegetation clearing, levee maintenance, and minor sediment removal projects in prior years. If improvements were made to the basin before the vegetation in those removal areas became established again, or if DWR were funded to provide regular basin maintenance activities, then habitat disturbance or removal would be minimized. No matter the status of baseline maintenance activities, the measures listed at the beginning of this section ("A. Habitat Disturbance and Loss") could be employed to avoid significant habitat disturbance and ensure no net loss of habitat from either excavation or basin enlargement activities. Unavoidable habitat loss from basin enlargement or sediment excavation would need to be mitigated by the construction of replacement habitat or payment on a per-acre basis to an approved restoration or mitigation bank or other trust fund.

[40] The State Clearinghouse within the Governor's Office of Planning and Research maintains an online searchable environmental database, "CEQAnet", that contains key information from all CEQA documents submitted to the State Clearinghouse for State review. CEQAnet is accessible at: http://www.ceqanet.ca.gov/.

The proposed Project requires that agencies that propose changes to the Yolo Bypass flood conveyance evaluate and minimize new methyl and total mercury inputs resulting from the changes. As discussed in Section 4.3.12.4, potential implementation options to minimize methylmercury production in the Yolo Bypass flood control system could include:

- Modifying the flow regimes within the Yolo Bypass;
- Modifying the channel geometry to route more water down the eastern side where the sediment is less contaminated by mercury; and
- Removing mercury contaminated sediment from within the Yolo Bypass downstream of the Cache and Putah Creek watersheds.

Removing mercury-contaminated sediment from within the Yolo Bypass downstream of the Cache and Putah Creek watersheds and other earth-moving activities related to routing water down the eastern side of the bypass could result in similar impacts as those described for excavation of sediment from the Cache Creek Settling Basin. However, such impacts could be reduced to less than significant levels if the methods described in the previous paragraphs and the measures listed at the beginning of this section ("A. Habitat Disturbance and Loss") could be employed to avoid significant habitat disturbance and ensure no net loss of habitat. The potential impacts from modifying the flow regimes and water routes within the Yolo Bypass are evaluated in the next section.

B. Habitat Modification Due to Phase 2 Methylmercury Management Changes

Methylmercury Management Practices for Existing and New Wetlands. There are about 21,000 acres of freshwater emergent wetlands in the Delta and Yolo Bypass. The Record of Decision (ROD) for the California Bay-Delta Authority commits it to restore 30,000 to 45,000 acres of freshwater, emergent tidal wetlands, 17,000 acres of freshwater, emergent non-tidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CALFED Bay-Delta Program, 2000a & 2000c). This represents about a three to four times increase in wetland acreage from current conditions. Much of the restoration is expected to take place in the Yolo Bypass, Cosumnes/Mokelumne, Marsh Creek and San Joaquin subareas, areas that require substantial reductions from existing methylmercury sources to achieve the proposed fish tissue objectives. These areas are also downstream of major sources of mercury-contaminated sediment. The goal of the TMDL program and Basin Plan amendment is to improve the water quality of the Delta/Yolo Bypass waterways by decreasing fish mercury concentrations to levels that are protective of wildlife and humans who consume Delta/Yolo Bypass fish, which would also be a benefit for wetland habitats and the species they support.

Research conducted in the Delta and elsewhere has found that seasonally and permanently flooded wetlands are efficient sites for methylmercury production and that wetlands could act as a potentially substantial methylmercury source to the Delta (see Chapters 3 and 6 in the TMDL Report). As a result, the proposed Project includes the requirements for Phase 1 characterization and control studies to evaluate feasible methods to address methylmercury produced by permanent and seasonal wetlands in the Delta region, for existing managed wetlands in the Delta/Yolo Bypass that act as a methylmercury source to reduce their methylmercury discharges during Phase 2, and for new wetland restoration projects to minimize their methylmercury discharges. As discussed in a later section, "E. Coordination with HCPs,

NCCPs and Other Plans", many of these requirements are baseline requirements for wetlands constructed under the CALFED Bay-Delta Program, which recognized in its programmatic ROD CEQA documentation that potential methylmercury production by its wetland restoration projects is a potentially adverse environmental impact that requires the development and implementation of mitigation strategies.

As described in Section 4.3.2, the proposed Basin Plan amendments do not assign methylmercury allocations to every individual wetland in the Delta/Yolo Bypass, but instead assign "subarea allocations." For example, all inputs from existing wetlands within the Central Delta would be grouped into a single Central Delta wetlands allocation; methylmercury inputs from new wetland restoration projects completed after the effective date of the Basin Plan amendments would be incorporated in the subarea allocations for existing wetlands. It is speculative to guess where and which methylmercury reduction management practices would be incorporated at existing managed wetland sites and future restoration projects during Phase 2 within the Delta/Yolo Bypass subareas that require reduction. However, as discussed in Section 4.3.10.3, methods of compliance for existing managed wetlands could include, but not be limited to, the following:

- Modify managed wetlands' design, e.g., water depth, flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands), vegetation types, and vegetation density (dense cover versus more open water).
- Modify managed wetlands' discharge patterns, e.g., hold irrigation water onsite longer at seasonal wetlands to allow methylmercury concentrations to decrease before discharging the water or otherwise transfer and re-use the water at another marsh to decrease the amount of discharge.

In addition, as noted in Section 4.3.12.4, new wetland restoration projects may have the opportunity to consider their location, for example, not create new wetlands directly downstream sources of mercury-contaminated sediment. The Phase 1 characterization and control studies are expected to determine the efficacy of the above potential methods to reduce methylmercury loading and to develop and evaluate additional methylmercury management practices. Although several stakeholders have stated that the proposed Basin Plan amendment requirements would result in the removal of existing wetlands and/or prevention of new wetland restoration projects, staff does not consider such actions to be reasonably foreseeable methods of compliance with the proposed Basin Plan amendments. Foreseeable compliance methods for new wetland projects could be altering their location or design.

Until the Phase 1 studies are completed, it is speculative to evaluate how individual wetland habitats could be impacted by the implementation of methylmercury management practices. It is not anticipated that all existing managed wetlands in the Delta/Yolo Bypass will need to implement methylmercury management practices. Preliminary results from ongoing wetland studies (see Chapter 3 in the TMDL Report) indicate that seasonal wetlands may be overall net producers of methylmercury, while permanent wetlands may be overall less productive of methylmercury or even net sinks (that is, more methylmercury enters the wetlands than leaves). If a similar pattern is observed by the Phase 1 characterization and control studies, Phase 2 management practices to reduce methylmercury production may focus on seasonal wetlands with substantial methylmercury discharges in the Delta/Yolo Bypass subareas that require

source reductions. Subareas that require methylmercury source reductions to protect humans and wildlife that consume local fish include the Yolo Bypass, Sacramento, San Joaquin, Mokelumne, and Marsh Creek subareas. According to the USFWS National Wetlands Inventory (USFWS, 2006), about 11,800 acres of the 14,500 acres (81%) of seasonal wetlands in the Delta/Yolo Bypass occur in these subareas, about 10,300 acres (71%) of which occur in the Yolo Bypass subarea. More of the Delta/Yolo Bypass's 6,400 acres of permanent wetlands occur in the Central and West Delta subareas (3,800 acres, 59%) than the subareas that require methylmercury source reductions (2,600 acres, 41%).

Even so, in general, modifying wetland vegetation and/or hydrology to reduce methylmercury loading to surface waters has the potential to affect the function and attractiveness of a given wetland to target species. There are foreseeable ways to minimize or avoid negative effects on wetland function:

- Implement only those onsite management practices that do not change the desirable wetland functions. The Phase 1 studies are expected to develop measures to reduce methylmercury discharges and resulting bioaccumulation while still optimizing management of the wetlands as habitat for desired species.
- If implementation of such onsite management practices within a given Delta/Yolo Bypass subarea is not adequate to achieve the subarea methylmercury allocation, participate in an offset program (if one is approved by the Central Valley and State Water Boards; see Section 4.3.9) to reduce upstream methylmercury sources and/or sources of mercury-contaminated sediment that supply the wetland sites in that subarea.

If no technically valid and legally defensible offset program can be developed, and the Phase 1 studies indicate that it is not feasible for wetlands in the Delta/Yolo Bypass to fully achieve their subarea allocations without affecting desirable wetland functions, then the Central Valley Water Board could adjust the allocation strategy so that greater reductions were required from other methylmercury source types within a given subarea and its upstream watershed that have feasible methylmercury reduction methods. However, there are a couple scenarios under which re-allocation of source controls may not be adequate to achieve the proposed fish tissue objectives:

- Wetlands may be a substantial source of methylmercury, for which other feasible source controls may not be able to compensate. It is conceivable that the proposed fish tissue objectives may not be achievable in some areas of the Delta/Yolo Bypass if methylmercury discharges from wetlands are not substantially reduced.
- Restored wetlands may have the potential to create an attractive nuisance if they generate methylmercury that is locally bioaccumulated to unsafe levels by the fish and wildlife species attracted to the wetland.

Fish tissue mercury levels – especially in the Yolo Bypass and Cosumnes/Mokelumne subareas – exceed safe levels established by USFWS for the protection of wildlife species that consume fish, such as the special-status California least tern and bald eagle. One of the goals of the proposed Basin Plan amendments is to control methylmercury such that its threat to wildlife is reduced. As a result, some existing managed wetland sites and proposed restoration projects may need to modify their management practices to avoid becoming an attractive nuisance, even if such modifications alter the function of the habitat.

If it is necessary to implement methylmercury management practices that alter the function of existing wetlands, it may be possible to compensate for that alteration by constructing mitigation wetlands away from mercury-contaminated areas or areas that are not otherwise impaired by methylmercury (e.g., possibly the Central Delta and other Delta and tributary areas upstream of major mercury-contaminated sediment inputs). However, it is conceivable that some existing wetland habitats may support special-status species that are endemic to a particular area of the Delta and as a result mitigation habitat constructed elsewhere would not be an adequate replacement. CDFG's "Wildlife Species Matrix"[41] indicated that no such species are endemic to freshwater or saline emergent wetland habitats in the Delta region, and only two species, Delta smelt and Sacramento splittail, are endemic to estuarine and riverine habitats in the Delta region.

Delta smelt is a State- and federally-listed threatened species that is endemic to the upper Bay-Delta Estuary, principally Suisun Bay and the western Delta, primarily below Isleton on the Sacramento River side and below Mossdale on the San Joaquin River side (Moyle, 2002). Only the eastern-most range of the Delta smelt occurs in the Sacramento, Yolo Bypass and San Joaquin subareas where methylmercury source reductions are needed and methylmercury management practice likely to be implemented. In addition, according to the USFWS National Wetlands Inventory (USFWS, 2006), most seasonal wetland acreage in the Delta/Yolo - where methylmercury management practices may most likely be needed - occurs upstream of the Delta smelt's range.

Sacramento splittail is a State- and federally-listed species of special concern because it may be experiencing a decline in population and potential threats from habitat loss (USFWS, 2007; CDFG, 2005). During most years, except when they are spawning, Sacramento splittail are largely confined to the Delta, Suisun Bay, Suisun Marsh, lower Napa River, lower Petaluma River, and other parts of the San Francisco Estuary (Moyle, 2002). In wet years they may migrate as far as Salt Slough on the San Joaquin River (Merced County), Red Bluff Diversion Dam (Tehama County) on the Sacramento River, and into the lower Feather and American Rivers. Adult splittail migrate upstream during winter and spring months to forage and spawn in vegetated floodplain areas; the Yolo and Sutter Bypasses "are apparently important spawning areas today" (Moyle, 2002). As a result, management practices implemented to reduce methylmercury discharges from existing Yolo Bypass wetlands have the potential to affect an important splittail spawning area. One foreseeable method of compliance with wetland allocations is to reduce methylmercury discharges from existing managed wetlands by modifying their discharge patterns. Such modifications have the potential to directly or indirectly affect critical splittail spawning habitat, depending on whether those wetlands have shallow, open-water areas that are used by splittail for spawning and whether the modification interferes with or acts as a barrier to their access to open-water areas in the wetlands.

It is anticipated that methylmercury management practices would be implemented only at those wetland sites that act as substantial sources of methylmercury to those Delta/Yolo Bypass subareas, and that only a fraction of those, if any, would require the implementation of

[41] The CDFG "Wildlife Species Matrix" allows the public to query information about California's species at risk via an Internet-accessible database. Available at: http://www.dfg.ca.gov/wildlife/WAP/. Accessed: 5 September 2007.

methylmercury management practices that have the potential to result in unavoidable impacts to habitat sites that support an endemic species. If wetland habitats were evenly distributed across the Delta and Yolo Bypass, there would be little chance for substantial or otherwise cumulative impacts to endemic species. However, more than half of all wetlands in the Delta/Yolo Bypass occur in the central Yolo Bypass area. Further, most of the Yolo Bypass wetlands are seasonal; the ambient water methylmercury levels in the Yolo Bypass will require substantial reductions (~80%) to achieve safe fish mercury levels; and the bypass receives direct inputs from the Cache Creek, Putah Creek and Feather River watersheds, which are major sources of mercury-contaminated sediment.

As a result, achieving safe fish mercury levels in the Yolo Bypass may potentially require both very aggressive total mercury and methylmercury source reductions in the tributary watersheds and widespread implementation of methylmercury management practices in the Yolo Bypass, which increases the potential for there to be significant cumulative adverse effects to wetland habitats that support endemic species in the Yolo Bypass. For this reason, staff checked the "Potentially Significant Impact" box on the Environmental Checklist for "a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a … special status species …". Until the proposed Phase 1 characterization and control studies have been completed, it is not possible to know whether wetlands that act as substantial source of methylmercury to the Yolo Bypass also act as critical habitat for endemic species, and whether it will be possible to mitigate any potential impact to less than significant levels.

It is expected that, in general, potentially cumulative adverse impacts to existing wetlands throughout other areas of the Delta region could be mitigated to less then significant levels through careful site evaluation and selection of management practices.

Methylmercury Management Practices for New Water Management Projects. The proposed Project requires that agencies that propose changes to the Yolo Bypass flood conveyance and other water management projects evaluate and minimize to the extent practicable any new methyl and total mercury inputs resulting from the changes. Changes in flood conveyance and other water management projects could include new or modified weirs in the Yolo Bypass, new or expanded reservoirs upstream of the Delta, and changes in the *Central Valley Project – Operations Criteria and Plan, 30 June 2004* (CVP-OCAP) that result in alterations to the to currently permitted water storage or release schedules (e.g., increased flows, flood frequency, or flood duration in the Yolo Bypass).

As discussed in Section 4.3.12.4 in Chapter 4, ways to minimize new methylmercury inputs resulting from new flood conveyance and water management projects could include, but are not limited to, the following:

- Modifying the flow regimes, water routes and channel geometry within the Yolo Bypass.
- Locating new water storage reservoirs outside of mercury-contaminated watersheds and developing engineered controls to minimize methylmercury production (e.g., aeration) or to minimize discharges from methylmercury-enriched zones within the reservoir.

Several of these potential methods of compliance could change the water depth and flooding frequency and/or duration of open-water, floodplain and wetland habitats within or downstream of the Yolo Bypass and other areas affected by new water management projects, and as a

result potentially affect the desirable functions of those habitats, beyond those impacts already caused by the new water projects themselves. One way to avoid negative effects on open-water, floodplain and wetland habitat function could be to implement only those methylmercury reduction-related modifications that do not conflict with desirable water management and habitat functions. Another way would be to mitigate increases in methylmercury production resulting from new water management projects by participating in an offset program to reduce upstream sources of methylmercury or mercury-contaminated sediment. In addition, as noted in the previous section, if it is necessary to implement methylmercury management practices that alter habitat function at some individual sites, it may be possible to compensate for that alteration by constructing mitigation wetlands away from mercury-contaminated areas or areas that are not otherwise impaired by methylmercury. However, there is the potential for adverse impacts to habitat that supports endemic species such as Sacramento splittail, which may not be adequately compensated by constructing mitigation habitat away from mercury-contaminated areas. As noted in previous paragraphs, until the proposed Phase 1 characterization and control studies have been completed, it is not possible to know whether it will be possible to mitigate this potential impact to less than significant levels.

As described in "II. Agricultural Resources" and Chapter 4 (Section 4.3.10.4), the proposed Project may require some irrigated agricultural areas in the Delta to reduce their methylmercury discharges. Compliance methods could include, but not be limited to, the following: modifying agriculture return water discharge patterns to decrease the methylmercury concentration of the return water entering the receiving waters; and utilizing drip irrigation systems or other water-efficient systems to curtail or limit irrigation runoff and discharge volume to the receiving waters. These management practices have already been developed and are readily implemented to manage other pollutants such as pesticides and to conserve water. The environmental effects associated with these management practices have been previously evaluated (e.g., Hann *et al.*, 2007) and are not expected to adversely impact biological resources. Even so, some stakeholders have voiced the concern that utilizing drip irrigation systems or other water-efficient systems to curtail or limit irrigation runoff and discharge volume would reduce the in-stream water flow available for open-water habitats. While this conceivably could be a concern for upland areas in the tributary watersheds that obtain irrigation water predominately from groundwater sources, it is not a concern for agricultural areas in the Delta (where the proposed methylmercury allocations apply) because essentially all areas within the Delta are irrigated with water from nearby Delta channels (DWR, 1995). Any decrease in water consumption would have corresponding decreases in water withdrawals from the nearby channels, resulting in no net decrease in in-stream water flow available for open-water habitats.

C. Impediments to Migratory Fish

In fall 2000, migrating salmon were observed upstream of the Cache Creek Settling Basin, after having passed through the basin via the low flow outlet structure (Moyle and Ayers, 2000). Because this occurred during low flow conditions, the basin's low flow outlet apparently did not act as a barrier to the salmon migration.

The proposed Basin Plan amendments require that improvements to the Cache Creek Settling Basin's sediment and total mercury trapping efficiency be made. One reasonably foreseeable

method of complying with this requirement would be to raise the basin's outlet weir earlier than planned.

Raising the outlet weir of the Cache Creek Settling Basin could interfere with the movement of migratory fish such as salmon. Currently the outlet weir is about 12 feet higher than ground level in the Yolo Bypass. The weir is designed to be raised by an additional six feet, which would make the overall height of the weir 18 feet above the Yolo Bypass. During low flows, water from the basin flows through an outlet structure, the spill elevation of which is managed by DWR. Raising the outlet weir another six feet could potentially interfere with or act as an additional barrier to the movement of migratory fish into Cache Creek during high flows. (As noted earlier, the basin outlet structure does not appear to act as a barrier to the salmon migration during low flows.) A potential mitigation measure could be to install a fish ladder adjacent to the weir.

As noted earlier in this section, existing maintenance plans for the Cache Creek Settling Basin call for raising its outlet weir in 2018; hence, raising the weir would not be a new requirement. Compliance with the proposed Basin Plan amendments could result in the weir being raised several years ahead of schedule. However, no additional adverse impacts to migratory fish are expected as a result of raising the weir earlier than planned, other than an earlier impact to fish passage. The long-term effect of raising the weir would be the same.

D. Use of Credit Accrued by Voluntary Pilot Offset Projects and Early Implementation of Total Mercury Controls

During Phase 1 of the proposed Project, mercury and/or methylmercury dischargers would be able to conduct voluntary pilot offset projects approved by the Central Valley Water Board and accrue total mercury and/or methylmercury mass credit for documented improvements. Voluntary pilot offset projects could include reducing within-Delta and upstream sources of methylmercury as well as upstream sources of total mercury. Effects on biological resources resulting from potential methylmercury management practices have been evaluated in previous paragraphs in this section. Total mercury reduction projects could include constructing additional settling basins in mercury-contaminated watersheds, reducing erosion from mercury-contaminated stream banks, and mine and dredge field remediation. Measures listed at the beginning of this section ("A. Habitat Disturbance and Loss") could be employed to avoid significant habitat disturbance and ensure no net loss of habitat from earth moving and other construction and maintenance activities associated with total mercury reduction projects.

In addition to credit for voluntary pilot offset projects, the Central Valley Water Board also may consider approving credit for dischargers that can demonstrate they have implemented early (e.g., between 2000 and 2008) mercury minimization programs and can document measurable improvements in their effluent quality with regards to the discharge of total mercury and/or methylmercury. Staff recommends that the methylmercury and total mercury credits accrued as a result of Phase 1 pilot offset projects and early effluent quality improvements be used to extend the compliance time schedules for methylmercury allocations to the extent sufficient credit was accumulated, not to exceed five years.

Implementation of Phase 1 pilot offset projects and early implementation of total mercury discharge reduction efforts could result in more immediate fish mercury reductions. However,

dischargers' use of their accrued credit has the potential to increase fish mercury levels downstream of their discharge if:

- They use accrued credit to offset long-term increases in their methylmercury discharges (versus a five year extension of allocation compliance schedules), and
- They conduct pilot projects in other watersheds that do not result in improvements at their points of discharge.

Even so, use of accrued credit is expected to have no or less than significant environmental impacts for several reasons:

- Limiting credit use to extending allocation compliance schedules by no more than five years prevents the use of the credit for offsetting long-term increases in methylmercury discharges.
- Facilities are required to (1) implement programs to minimize total mercury discharges and (2) maintain Phase 1 methylmercury concentration limits until their methylmercury allocations are achieved. This will minimize the potential for existing methylmercury discharges to increase during Phase 1 and is expected to result in net long-term environmental benefit regardless of whether dischargers use accrued credit to extend their allocation compliance period by up to five years.
- Implementation of total mercury minimization programs is expected to enable some facilities to achieve their methylmercury allocations and therefore not need to use any of their accrued credit towards methylmercury allocation compliance schedules.
- Because Title 40 CFR §122.47 requires NPDES programs to compel compliance with effluent limits (e.g., the methylmercury wasteload allocations) as soon as possible, it is expected that compliance schedules for Delta/Yolo Bypass and upstream facilities assigned methylmercury allocations will be staggered, further limiting the potential for negative environmental effects if one or more facilities extend their compliance schedule.

The Central Valley Water Board could choose to consider allowing dischargers to use credit accrued during Phase 1 to offset long-term increases in their discharge. However, to comply with Clean Water Act requirements for TMDLs, the Board must then reduce allocations for other methylmercury sources upstream of the discharge to ensure that fish tissue objectives are achieved and maintained.

E. Coordination with HCPs, NCCPs and Other Plans

The proposed Basin Plan amendments require managers for existing wetlands and new wetland restoration projects to participate in Phase 1 methylmercury characterization studies to identify wetlands that act as methylmercury sources, develop and evaluate practices to minimize methylmercury discharges from those wetlands, and implement newly developed management practices as feasible. The proposed Basin Plan amendments do not conflict with provisions of adopted Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) because they do not prevent the future restoration and development of wetlands and other critical habitat, and as described in earlier sections, impacts to existing habitats can be reduced to less then significant levels through careful project design and construction activities.

A perceived conflict may exist regarding the Wetland Conservation Policy, also known as the "no-net loss of wetland policy". To reduce methylmercury discharges from existing or new wetlands that act as methylmercury sources, project proponents may need to change the design and management of existing managed wetlands and new restoration projects and/or change the location of proposed wetland projects to avoid creating habitat that would increase ambient methylmercury and the bioaccumulation of methylmercury in the local and downstream aquatic ecosystems. However, the proposed Basin Plan amendments do not require the removal or fill of existing wetlands, wetlands removal is not considered a reasonably foreseeable method of compliance with the proposed methylmercury allocations, and, as described earlier in this section, there are numerous measures available to ensure there is no net loss in wetland acreage as a result of the construction and maintenance of projects to comply with the Basin Plan amendments. As a result, there is no actual conflict with the Wetland Conservation Policy.

Requirements in the proposed Basin Plan amendments do not conflict with CALFED's habitat restoration goals stated in its Multi-Species Conservation Strategy (adopted by the CDFG as the NCCP), are consistent with CALFED programmatic water quality goals, and further support the CALFED programmatic ROD's CEQA requirements to develop mitigation strategies to address potentially significant adverse environmental impacts (i.e., disturbing mercury-laden sediment and methylation of mercury through habitat creation) from CALFED program projects (see Chapter 6.4). Under CEQA, CALFED is required to address potentially significant impacts resulting from project actions. To address CEQA requirements, CALFED included mitigation strategies in the ROD to reduce these impacts to a "less than significant" level (CALFED, 2000b). The proposed Basin Plan amendments are consistent with the CALFED ROD mitigation strategies, the Water Quality Program Plan priority actions, and other mitigation strategies proposed in other CALFED Program Plans by providing requirements to study and develop management practices and control actions that fulfill CALFED mitigation measures.

Implementation of the proposed Basin Plan amendments could result in delays for planned wetland restoration projects due to the need for reallocating existing resources towards performing the studies. However, CALFED and CDFG have several studies underway to determine the impact of wetland restoration projects on mercury methylation. In addition, the cumulative impact of redirected resources for studies can be minimized if wetland managers throughout the Delta region choose to work collaboratively on the studies.

HCPs and NCCPs developed to avoid or compensate for the incidental take of listed species by urban development and other activities are required to follow all applicable environmental regulations, including water quality objectives and other existing requirements in the Basin Plan. When HCPs and NCCPs are cited as part of the recovery strategy for listed species, however, coordination between water quality and conservation planners may be needed in development of both the conservation plans and implementation plans for water quality objectives. Both planning efforts should be science-based and have provisions for adaptation when new information is received.

V. Cultural Resources

A historical resource is a resource listed in or eligible for listing in the California Register of Historical Resources. The California Register includes resources on the National Register of Historic Places, as well as California State Landmarks and Points of Historical Interest. Properties that meet the criteria for listing also include districts that reflect California's history and culture, or properties that represent an important period or work of an individual, or yield important historical information. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified as local historical resources are also included in the California Register (COHP, 2001).

An archeological site may be considered a historical resource if it is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California (PRC §5020.1(j)), or if it meets the criteria for listing on the California Register (14 CCR §4850). If an archeological site is not a historical resource, but meets the definition of a "unique archeological resource" as defined in PRC Section 21083.2, then it should be treated in accordance with the provisions of that section (COHP, 2001).

Compliance with the proposed Basin Plan amendments will entail a variety of construction activities to implement total mercury and methylmercury controls and management practices. To identify known cultural resources, specific project sites must also be identified. However, precise locations for projects are not known because, as noted at the beginning of Section 7.2, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments.

Even so, no significant adverse impacts to known cultural resources – historical resources, sites of archeological or paleontological significance, or human burial sites – are expected as part of Phase 1 or Phase 2 of the proposed Project because construction activities are already required to adhere to CEQA and local ordinances to evaluate potential project sites for cultural resources through a search of historical records and databases (such as those described in the previous paragraphs) and published literature and to avoid substantial change or damage to identified resources. If potential impacts are identified, mitigation measures could include project redesign, such as the relocation of facilities outside the boundaries of archeological or historical sites. When avoidance is infeasible, a data recovery plan should be prepared which adequately provides for recovering scientifically consequential information from the site and deposits reports resulting from excavations with the California Historical Resources Regional Information Center (COHP, 2001). No impact is anticipated after mitigation.

It is possible that construction activities that involve excavation or other ground disturbances where disturbances have not previously occurred could uncover previously undiscovered cultural resources. However, it expected that this would result in less-than-significant impacts because there are standard measures that could be implemented as part of the projects' designs to avoid or minimize impacts to newly discovered resources, many of which are required by local policies and ordinances. Possible measures include:

- Require a professional trained to identify evidence of cultural resources to observe major excavation and earth-moving activities.
- If any archaeological, paleontological, or historical resources are discovered during construction activities, construction should stop within a 100-foot radius of the site, and a qualified archaeologist should be brought on site within 24 hours. If the find is determined to be significant, a full archaeological survey takes place. Construction activities in the area resumes once the survey is completed and all cultural resources are recovered.
- If any human remains are discovered during construction activities, no further excavation or other site disturbance takes place. The local coroner is notified and makes a determination as to whether the remains are of Native American origin, or whether an investigation into the cause of death is required. If the remains are determined to be Native American, the coroner notifies the Native American Heritage Commission (NAHC) within 24 hours, and once the NAHC identifies the most likely descendents, the descendents make recommendation regarding proper burial. If no satisfactory agreement can be reached regarding the disposal of the human remains, the landowner re-inters the remains and any items associated with the Native American burials on the property in a location not subject to subsurface disturbance.

VI. Geology and Soils

As with the cultural resources discussed in the previous section, project-level analysis of site geology and soil conditions will take place once entities responsible for complying with the proposed Basin Plan amendments select their methods of compliance and potential project sites. Special Publication 42 (Interim Revision 2007, Table 4) lists cities and counties affected by Earthquake Fault Zones as of August 16, 2007. None of the cities listed by the publication are in the Delta or its tributary watersheds downstream of major dams; however, several counties are. Counties in the Delta's tributary watersheds downstream of major dams affected by Earthquake Fault Zones include: Alameda, Butte, Contra Costa, Fresno, Merced, Solano, Stanislaus and Yolo Counties. As a result, a licensed geologist should conduct site-specific geologic and soil investigations to evaluate the potential for the presence of an active fault or other seismic risks, differential compaction, expansive soils, and landslides for projects implemented to reduce methylmercury and total mercury sources (e.g., mine cleanup actions and improvements to the Cache Creek Settling Basin, WWTPs and urban stormwater systems).

No significant impact due to exposure of people to, or property to, geologic hazards such as rupture of a known earthquake fault, strong seismic ground shaking, liquefaction, or landslides is anticipated. Although areas of the watershed are subject to geologic hazards, compliance with existing regulations, building codes, standards specifications, and the recommendations of geotechnical studies prepared at the project level would reduce the risk of damage from seismic and other geological hazards. Furthermore, it is not reasonably foreseeable that responsible agencies would choose to comply with the proposed Basin Plan amendments through structural means in areas where doing so would result in exposure of people or the environment to geologic hazards. Rather, it is foreseeable that localities would avoid such compliance measures in lieu of other compliance measures.

The proposed Project requires the implementation of management practices and other control actions to reduce or prevent the discharge of mercury-contaminated sediments from the Cache

Creek Settling Basin, the mercury-contaminated watersheds that discharge the most mercury-contaminated sediment to the Delta and Yolo Bypass (Cache and Putah Creeks and the American and Feather Rivers), MS4 service areas, and dredging and dredge material disposal projects. Compliance with this requirement will have a net benefit by reducing sediment and mercury loading to the Delta and Yolo Bypass. Also, erosion control and sediment management are already baseline requirements in the Basin Plan. Any activities that may disturb soils or sediments undertaken to comply with the proposed Project's requirements to control total mercury and methylmercury inputs to the Delta and Yolo Bypass must incorporate erosion control measures to comply with existing Basin Plan requirements for erosion and turbidity control.

In addition, construction activities are regulated by the NPDES General Permit for Storm Water Discharges Associated with Construction Activity or through the construction program of the applicable MS4 permit, both of which are already designed to minimize or eliminate erosion impacts on receiving water. Erosion control/sediment management requirements are not new requirements for construction activities in the Delta and its source region and therefore erosion control/sediment management actions and their potential for environmental effects are considered baseline conditions, the potential environmental impacts of which are not new to the proposed Project. Also, waste discharge requirements or CWA 401 certification, which would entail project-specific environmental review, will likely be required for individual projects with the potential to cause erosion or otherwise increase turbidity. Finally, there are many measures available to control erosion and sediment transport. As a result, it is expected that there will not be substantial soil erosion resulting from the implementation of the proposed Project, and indeed, a net reduction in erosion and sediment transport is an expected outcome of the Project.

Typical erosion and sedimentation control measures, include, but are not limited to, the following:

- Evaluate the project site, and up- and down-gradient areas, for erosion potential. Design the project and implement construction and maintenance activities to prevent erosion and sedimentation. Design stormwater runoff control systems to fit the hydrology of the project area once its fully developed, to have adequate capacity to transport the flow from all upland/upstream areas, to be non-erosive, and to conduct runoff to a stable outlet. Install systems prior to the rainy season.
- Remove vegetation only when necessary and make every effort to conserve topsoil for reuse in re-vegetation of disturbed areas.
- Develop land in increments of workable size, such that construction can be completed during a single construction season, and coordinate erosion and sediment control measures with the sequence of grading and construction operations.
- Stabilize and re-vegetate all disturbed soil surfaces before the rainy season.
- Restrict stockpiling of construction materials to the designated construction staging areas and exclusive of habitats and their buffer zones.
- Employ control measures that prevent soil or sediment from leaving construction sites, monitor them for effectiveness, and maintain them throughout the construction operations and between construction seasons. Standard measures include installation of sediment

basins and traps in conjunction with grading operations; development of slope drains; stabilization of stream banks; use of hydraulic mulch, hydroseeding, straw mulch anchored with a tackifier, polyacrylamide, rolled erosion control products (e.g., blankets and mats), earth dikes, drainage swales, and velocity dissipation devices; and installation of silt fences, fiber rolls, gravel bag berms, sandbag barriers, storm drain inlet protection, and check dams.

- Contain runoff from truck and cement equipment wash-down.
- Limit to the dry season any construction activities within an area of the Ordinary High Water (OHW) line of drainages and lakes.
- Limit any construction activities within a floodplain, but above an OHW line, to those actions that can adequately withstand high river flows without resulting in the inundation of and entrainment of materials in flood flows.
- Have a professional hydrologist or licensed engineer develop an erosion control and water quality protection plan to avoid habitat degradation and ensure compliance with local and State erosion- and sedimentation-related requirements.

To the extent that the project-specific activities could result in ground instability, potential impacts could be avoided or mitigated by locating projects away from areas with unsuitable soils or steep slopes, design and installation in compliance with existing regulations, standard specifications and building codes, ground improvements such as soil compaction, and groundwater level monitoring to ensure stable conditions.

VII. Hazards and Hazardous Materials

Implementation of the proposed Project is not expected to create a hazard to the public or the environment through the transport, use or disposal of hazardous materials, or the accidental release of hazardous materials to the environment because several measures are available to prevent impacts.

Compliance with the implementation plan outlined by the proposed Project will entail a variety of construction and maintenance activities to implement total mercury and methylmercury controls and management practices. There is the potential for human health hazards associated with the installation, operation, and maintenance of heavy equipment. Unprotected sites also may result in accidental health hazards for people. Once constructed, mercury controls and management practices are not expected to entail any onsite use of hazardous materials other than small quantities of janitorial products and possibly oil and fuel for emergency generators, with two exceptions. First, improvements to WWTPs may require some facilities to upgrade or otherwise change their treatment processes, which could result in an increase or change in the types of chemicals used onsite. In addition, a potential manner of compliance with the WWTP and urban runoff total mercury minimization requirements is source control, i.e., the prevention of mercury from entering the wastewater or stormwater collection systems. This could include the collection and handling of mercury-containing items such as thermometers, medical equipment, automotive switches, and other devices containing mercury, as well as the collection of mercury amalgam from dental offices. Thus some dischargers may be collecting and transporting a hazardous waste.

Implementation of these and other mercury control actions and management practices will create no create significant hazards to the public or environment because there are several measures available to minimize or prevent impacts:

- Provide hazardous materials and worksite safety training for construction workers and those who maintain the projects in accordance with local, State and Federal requirements including, but not limited to the Occupational Safety and Health Act, Title 9 of the Code of Federal Regulations, and Title 8 of the California Code of Regulations.
- Provide hazardous materials accidental spill response plans and training that would outline methods, materials, and responsibilities for the response to, and clean-up of, and an accidental hazardous material spill during construction or long-term maintenance of the project. At a minimum, the plans should include provisions for immediate response, containment, and cleanup of a spill, including excavation and disposal of contaminated soil and notification responsibilities. Materials needed for potential clean-up activities should be kept onsite.
- Provide a health and safety plan for construction workers and those who maintain the projects that: is prepared by a certified industrial hygienist; complies with all appropriate local, State and Federal regulations; and identifies specific safety measures to be followed during all phases of construction and long-term operation.
- Obtain hazardous waste storage and transport permits and associated required training for the collection and transport of recovered mercury.
- Conduct careful surveys of mine sites and prepare written reports and guidance in compliance with applicable State and Federal requirements before commencing cleanup actions to identify and characterize: safety concerns; potential for erosion during and after cleanup actions; potentially recyclable materials (e.g., sediment/soil for fill, scrap steel, processing equipment, brick, wood, mercury and gold); and major waste streams for disposal in onsite or offsite landfills.
- Implement dust-suppression and other measures available to prevent risks associated with inhaling dust and exhaust during construction and maintenance activities (see “III. Air Quality”).
- Label all hazardous materials onsite to inform users of potential risks and train users in appropriate handling, storage and disposal procedures.
- Protect sites from unmonitored access with fencing and signs to prevent accidental health hazards to the nearby residents.
- To control vector (e.g., mosquito) production, design projects so that they do not increase the area and/or duration of standing water; selectively install systems that are prone to standing water away from high-density areas and away from residential housing; and/or incorporate measures to mitigate vector creation (e.g., install netting over devices and/or employ vector control agencies to mitigate vector production). Design projects to comply with local vector/mosquito control agencies’ requirements.

As with the resources discussed in the previous sections, project-level analysis will take place once entities responsible for complying with the proposed Basin Plan amendments select their methods of compliance and potential project sites. It is not reasonably foreseeable that responsible agencies would choose to comply with the proposed Basin Plan amendments

through structural means in areas where doing so would place a project at a site included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. Rather, it is foreseeable that localities would avoid such compliance measures in lieu of other compliance measures. Mine cleanup actions are an exception, but as described above, there are many measures available to prevent impacts from mine cleanup actions.

Although increased pollution prevention efforts, such as mercury amalgam collection from dental offices and mercury thermometer collection programs, would increase the transport of mercury-containing items, if the mercury were properly handled and disposed, the pollution prevention efforts would be a benefit by preventing the mercury from improperly ending up in sewers and non-hazardous waste landfills. Because many common consumer products, such as fluorescent light bulbs, contain mercury, these wastes could be handled within 0.25 mile of a school or near an airport or airstrip. However, properly handled mercury waste near such sites would not create a significant public or environmental hazard beyond the hazards already inherent in the use of the mercury-containing consumer products.

The Cache Creek Settling Basin is about four miles from the Sacramento International Airport and therefore is not located within the airport's Master Plan area.[42] Basin improvement construction activities will not pose a hazard to the airport.

Construction activities could result in the temporary interference of emergency response or evacuation plans if construction equipment, road closures, or traffic interfered with emergency vehicles traveling through the installation area. To prevent such interference, traffic control plans could be used to manage traffic through construction zones.

Implementation of some mercury control projects could expose people or structures to risk of loss, injury, or death involving wildland fires. It is expected that construction of WWTP controls and urban runoff BMPs would be located in urbanized areas, and therefore it is not reasonably foreseeable that their installation would expose people to wildland fires. However there may be other projects that take place in fire-prone areas, such as the Cache Creek Settling Basin and mine cleanup projects in the Sierra Nevada foothills and the Coast Range. To mitigate the risk of fire to people, property, and structures, all construction projects and ongoing O&M activities should have a site-specific health and safety plan. The health and safety plan should address the potential effects of fire threats due to construction equipment operations, maintenance, and employees smoking. The plan should include requirements that the worksite have an adequate number of fire extinguishers and personnel trained in their use. Workers should use extra caution when refueling and using equipment that can produce sparks when working near dry grass or trees. In addition, the worksite should be posted with signs for designated smoking areas to prevent accidental fires due to smoking.

Options for methylmercury and total mercury control include excavation of mercury-contaminated sediment from the Cache Creek Settling Basin, Yolo Bypass, and elsewhere in the Delta. Delta sediments evaluated by dredging projects contain levels of total mercury

[42] Draft Final Sacramento International Airport Master Plan Study, February 19, 2004. Available at: http://www.sacairports.org/int/planning/chronology.html

ranging from 0.01 to 0.33 mg/kg (dry weight) (see Table 6.17 in the TMDL Report). Mercury concentrations in Yolo Bypass surface sediments range from 0.09 to 0.58 mg/kg, and in the Cache Creek Settling Basin from 0.38 to 0.71 mg/kg (Heim *et al.*, 2003). It is unlikely that sediment from the Delta, Yolo Bypass or Delta will exceed hazardous waste levels (20 mg/kg; Title 22 of the California Code of Regulations, Section 66261.24(a)(2)(A)). Disposal options for removed sediment could include landfill cover, use as a building material, or for the construction of the land-side of levees, as long as the material was kept from contact with surface waters and protected from erosion. Dredge material is typically disposed to either disposal ponds on Delta islands or upland areas. Existing regulatory programs already require dredging and other earth-moving projects be protected from erosion. Sediment at or immediately downstream of mine sites could conceivably exceed 20 mg/kg and would need to be disposed at appropriately classified landfills or protected onsite by storage at appropriate upland waste management units.

VIII. Hydrology and Water Quality

Implementation of the proposed Project is not expected to violate any water quality standards or waste discharge requirements, deplete groundwater, interfere with groundwater recharge, create or contribute runoff water that exceeds the capacity of stormwater drainage systems, provide substantial additional sources of polluted runoff, place housing within a 100-year flood hazard area, or increase risk to inundation by seiche, tsunami, or mudflow. In fact, the Project should result in less erosion and less mercury-polluted runoff if adequate controls and management practices are developed and implemented to control mercury discharges.

Although construction and maintenance activities associated with the implementation of methylmercury and total mercury controls have the potential to increase erosion, all projects would be subject to existing requirements to comply with existing Basin Plan water quality objectives for turbidity and erosion control (e.g., through existing general and individual stormwater permits, waste discharge requirements, and CWA 401 certification requirements; refer to “VI. Geology and Soils”).

As noted earlier, precise locations for projects are not known and the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. However, staff identified several examples of particular reasonably foreseeable methods of compliance that have the potential to alter the existing drainage patterns of a particular site or area. The following paragraphs provide a program-level review of these examples and possible mitigation measures. This review should not be considered a replacement for project-level evaluations required of future project proponents.

Cache Creek Settling Basin. The primary purpose of the Cache Creek Settling Basin is to reduce sediment loads to the Yolo Bypass in order to maintain the Bypass’s ability to protect the Sacramento region from flooding. As the basin fills in with sediment, its ability to retain sediment is diminished and there is a corresponding loss in flood carrying capacity in the Yolo Bypass. Increasing the basin’s trapping efficiency will have positive effects for downstream flood control in the Yolo Bypass. However, it is possible that improvements to the Cache Creek Settling Basin (such as raising the outlet weir) may increase the risk of flooding upstream of the

basin (CDM, 2004b & 2007). The land directly west of the Cache Creek Settling Basin is already at risk from a 100-year flood event as it falls within the 100-year floodplain as mapped on both the 1981 and 2001 draft Flood Insurance Rate Map issued by the Federal Emergency Management Agency for the Woodland/Cache Creek area. The City of Woodland has zoning ordinances and building requirements to restrict building within the flood area. Even without the proposed Project, these portions of the City of Woodland are at risk of flooding due to the 100-year event.

As part of the current USACE O & M Manual sediment management plan, the basin outlet weir would be raised in about 2018. According to a USACE 1987 report, *"… improvements to the CCSB done for the current project would not increase maximum water surface elevations upstream from the CCSB, even for end-of-project-life conditions. However the 1997 maintenance analysis by the Corps showed that dredging deposited sediment in the training channel would be necessary during the life of the project to maintain the design flood control capacity upstream of the CCSB. According to a 2003 qualitative geomorphic study conducted by the Corps (Corps of Engineers 2003), future training channel bed aggradation due to sedimentation could significantly reduce flow capacity upstream of the CCSB unless aggressive sediment and vegetation maintenance is conducted."* (CDM, 2004a, page 37.) The proposed Project would require improvements to the basin's mercury/sediment trapping efficiency prior to 2018, which would likely entail raising the weir earlier than planned by the USACE. Therefore, the proposed Project would not increase the overall flooding potential for the upstream Cache Creek area, but would increase the number of years of exposure to increased flood risk by about three years. This risk could be mitigated by increased excavation in the basin to maintain its flood carrying capacity during the initial three years of the project.

Another adverse impact that possibly could result from improvements to the Cache Creek Settling Basin would be an increase in methylmercury production within the basin. As noted in the TMDL Report, the basin acts as a source of methylmercury. Raising the basin weir and enlarging the basin would increase the area of inundation in the basin and therefore potentially increase methylation of the mercury-laden sediment. As noted in the previous paragraph, raising the weir is a baseline requirement. The proposed Project would not cause a new impact with respect to potentially increased methylation, but would result in an increase in the number of years that the potential increase in methylation could occur if the responsible parties chose to comply with the proposed Basin Plan amendments by raising the weir earlier than previously planned by the USACE. Methods to mitigate an increase in methylation that could potentially result from the early weir raising or basin enlargement to less than significant levels include, but are not limited to, the following:

- Modify the low flow outlet structure and downstream channel to increase the volume of water passing through the low flow structure after high flows have receded. This would allow the basin to drain more quickly after the basin has flooded and minimize the extent and duration of basin inundation.
- Reduce the total mercury concentration of suspended sediment entering the basin from the Cache Creek watershed. Production of methylmercury in the Cache Creek watershed is positively correlated with the level of mercury in surficial sediment (Cooke and Morris, 2005). As a result, reducing total mercury loads transported to Cache Creek would reduce concentrations of mercury in sediment and is expected to reduce subsequent

methylmercury production in both Cache Creek and the Cache Creek Settling Basin. As described in Section 4.3.10.6 of this report, the Cache Creek watershed mercury control program adopted in 2005 entails mercury mine cleanup activities and other erosion control/remediation activities in mercury-enriched areas that would ultimately reduce the mercury concentration of sediment entering the Cache Creek Settling Basin. It is possible to conduct additional sediment mercury remediation efforts in the lower Cache Creek watershed to further stabilize or remove mercury-enriched channel sediment to further decrease sediment mercury concentrations, and associated methylmercury production, in the basin.

The proposed Phase 1 characterization and control study for the Cache Creek Settling Basin is expected to develop and evaluate additional methylmercury control options that would ensure impacts associated with improvements to the sediment trapping efficiency are reduced to less than significant levels.

Yolo Bypass. As described in Section 4.3.12, if new flood control projects in the Yolo Bypass were to increase ambient methylmercury levels, possible methylmercury management practices could include, but are not limited to: (a) modifying the flow regimes within the Yolo Bypass; (b) modifying the channel geometry to route more water down the eastern side where the sediment has less mercury contamination; (c) actively remediate or remove mercury contaminated sediment within the Yolo Bypass downstream of the Cache and Putah Creek watersheds; and (d) reduce total mercury loading from tributary sources. Options (a), (b) and (c) could affect floodwater conveyance. To mitigate negative effects, project proponents should carefully evaluate each option's potential to negatively affect flood conveyance and implement the management practices that have neutral or positive effects on flood conveyance and/or focus on reducing mercury loading from upstream sources.

Localized Hydrologic Modifications. Localized hydrological impacts may occur if managers of existing or new wetlands, water and salinity management projects, and MS4 conveyance systems choose to comply with methylmercury allocations by using structure-based management practices or modifying channel and vegetation characteristics to reduce or avoid methylmercury discharges. Localized hydrological impacts also could occur as a result of mine site cleanups and other total mercury control actions. However, such hydrologic impacts could be mitigated through careful design and construction, for example, by selecting compliance options that would not result in increased flood risk or by incorporating overflow/bypass structures, performing regular maintenance of the structures, or enlarging the storm drain upstream of the structure.

IX. Land Use and Planning

The proposed Project will not physically divide an established community nor conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect.

One foreseeable method of compliance with the methylmercury allocations would be for WWTPs to reduce their wastewater discharge to surface waters by expanded reclamation to land, which has the potential to result in a land use change. The existing Basin Plan has a wastewater reuse policy that requires dischargers to evaluate land disposal as a disposal option

for wastewater. Therefore, the evaluation of expanded reclamation to land is a baseline requirement. In addition, NPDES facilities have a variety of control options that may not require a change in land use, such as pollution prevention, implementing additional secondary or advanced treatment processes to further reduce particle-bound methyl and total mercury, incorporating ultraviolet radiation disinfection in coordination with advanced filtration, and, if an offset program is approved for Phase 2, conducting offset projects elsewhere in their watersheds. As result, it is expected that new impacts related to changes in land use plans to provide for expanded reclamation to land will be unlikely or minimal and therefore less than significant.

The proposed Project is founded on methylmercury source load estimates based on current land uses and requires that many methylmercury and total mercury sources be reduced. As a result, land use planners and other project proponents will need to evaluate future changes to their existing land use plans and any new plans or projects that propose to change land uses for consistency with these requirements. Land use planners and project proponents should ensure that zoning and land use changes do not have the potential to increase methylmercury or total mercury loading to the Delta and Yolo Bypass and, if increases are unavoidable, that any increase is minimized using feasible management practices identified by the proposed Phase 1 characterization and control studies. If a viable Phase 2 offset program is approved by the Central Valley and State Water Boards, OAL and USEPA, increased mercury loading that cannot be prevented by onsite management practices could be mitigated through offset projects elsewhere in the project's watershed.

The proposed Project's requirement to minimize, and if possible, avoid any increase in methylmercury or total mercury loading is not a new requirement in the Delta. As described in Section 6.4.2, the Delta Protection Commission's "Land Use and Resource Management Plan for the Primary Zone of the Delta" (Delta Land Use Plan), developed in accordance with Section 29735 of the Delta Protection Act, requires that adequate Delta water quality standards are set and met, that beneficial uses of State waters are protected consistent with the CALFED Record of Decision dated August 8, 2000, and that projects in the Delta not result in degration of water quality or result in increased nonpoint source pollution. These requirements are baseline conditions for the proposed Project. The Basin Plan amendments proposed by this Project support and are consistent with the requirements of the Delta Protection Commission's Delta Land Use Plan.

The proposed Basin Plan amendments require project proponents of future dredging activities and activities that reuse dredge material in the Delta/Yolo Bypass to minimize increases in any new methyl and total mercury loads to Delta/Yolo Bypass waterways. This requirement may not coincide with the intent of the Delta Land Use Plan's "Utilities and Infrastructure Recommendation 3 (R-3)", which states: "Material excavated from the shipping channels should, *if feasible*, be used for maintenance of Delta Levees or for wildlife habitat enhancement within the Delta and for other uses within the Delta." Using mercury-contaminated dredge spoils for levee maintenance and wetland habitat restoration may lead to increased total mercury discharge or increased methylmercury production and discharge, thus degrading water quality. However, as described in Sections 4.3.10 through 4.3.12 in Chapter 6, and in earlier sections of this Checklist discussion, there are reasonably foreseeable methods of compliance with the proposed Project's requirement to minimize increases in methyl and total mercury loading, and

foreseeable mitigation methods to prevent impacts to the environment that could be associated with these methods of compliance. Nonetheless, Section 29715 of the Delta Protection Act states "…*any conflict or inconsistency between this division and any provision of the Water Code, the provisions of the Water Code shall prevail*." Dredging and dredge material disposal activities are required to comply with existing Basin Plan requirements for erosion and turbidity control, and the Basin Plan narrative water quality objective for chemical constituents states, *"Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."* Hence, the proposed Project's requirements for new land use plans and projects to minimize increases in pollutant (methyl and total mercury) loading, and resulting compliance actions, can be considered baseline requirements under the California Water Code and Delta Protection Act.

Further, actions taken to implement the proposed Basin Plan amendments would improve the water quality in the Delta and consequently improve the quality of the local fish for consumption by humans and wildlife, resulting in a decrease in the number of fish advisory postings along Delta recreational areas. Decreasing the number of fish advisory postings would increase the recreational opportunities for sport fishing and enhance the local economic productivity associated with increased recreational activities. Therefore, implementation of the proposed Basin Plan amendments supports the land use and development goals of the Delta Protection Act.

As discussed in Section E of "IV. Biological Resources", the proposed Project does not conflict with any adopted Habitat Conservation Plans, Natural Community Conservation Plans, or other policies adopted for the purpose of avoiding or mitigating an environmental effect. Implementation of the proposed Basin Plan amendments could result in delays for planned wetland restoration projects due to the need for reallocating existing resources towards performing the studies. However, CALFED and CDFG have several studies underway to determine the impact of wetland restoration projects on mercury methylation. In addition, the cumulative impact of redirected resources for studies can be minimized if wetland managers throughout the Delta region choose to work collaboratively on the studies.

X. Mineral Resources

No adverse impacts to mineral resources are expected from the implementation of the proposed Basin Plan amendments.

XI. Noise

Compliance with the implementation plan outlined by the proposed Project will entail a variety of construction activities to implement total mercury and methylmercury controls and management practices. Use of heavy equipment, power tools, generators and other equipment during construction would increase noise in the construction areas. However, noise associated with construction activities would be temporary, isolated to the immediate construction site, and minimized by implementing standard noise reduction measures, many of which are already required by local City and/or County noise ordinances. These noise ordinances limit intrusive noise and establish sound measurements and criteria, and establish minimum ambient noise levels for different land use zoning classifications, sound emission levels for specific uses, hours of operation for certain activities (such as construction and trash collection), standards for

determining noise deemed a disturbance of the peace, and legal remedies for violations. If project-specific construction activities comply with local ordinances, they are not expected to result in exposure of persons to noise levels in excess of established standards. Such ordinances typically include measures such as:

- Limit construction work to the hours between 7:00 a.m. to 6:00 p.m. on weekdays and permit no work on Saturdays, Sundays or holidays unless appropriate City and County building officials grant prior approval. When possible, use noise-generating equipment during periods when fewer people are present near the construction area.
- Muffle or otherwise control all construction equipment with a high noise-generating potential, including all equipment powered by internal combustion engines.
- Shroud or shield all impact tools.
- Locate all stationary noise-generating equipment, such as compressors, as far as possible from adjacent occupied offices, residents, or sensitive habitats.
- Turn off mobile equipment and machinery when not in use to reduce noise from idling equipment.
- Use temporary noise barriers or curtains along installation boundaries or partial enclosures around continuously operating equipment.
- Use the shortest possible routes from construction sites to local freeways for truck delivery routes, except when selecting routes to avoid going through residential neighborhoods.
- Identify sensitive receptors (e.g., schools, religious institutions, residences, libraries, parks, hospitals and other care facilities, and sensitive wildlife habitats) within a quarter-mile vicinity of the construction site; characterize existing ambient noise levels at these sensitive receptors; determine noise levels of any and all installation and maintenance equipment; and adjust values for distance between noise source and sensitive receptor(s).
- Establish an active community liaison program that notifies landowners within 300 feet of construction areas of the construction schedule prior to construction in writing, keeps them informed of schedule changes, and designate a “disturbance coordinator” for the construction site. The disturbance coordinator would be responsible for responding to any local complaints regarding construction noise, determining the cause of the complaints, and requiring the implementation of reasonable measures to correct the problem. The telephone number of the disturbance coordinator could be conspicuously posted on the construction site fence and on the notification letter sent to neighbors adjacent to the site.
- Develop an operations plan for specific construction activities that documents maximum noise limits and addresses the variety of available measures to limit the impacts from noise to adjacent homes, businesses, or sensitive habitats.
- Regularly inspect equipment and monitor noise and vibration to ensure that all equipment on the site is in good condition and effectively muffled, and that contractors take all reasonable steps to minimize impacts, particularly when near sensitive areas. Modify and/or reschedule construction activities if monitoring determines that maximum limits are exceeded.

Earth moving and other construction activities could result in temporary groundborne vibration or noise. However, implementation of several of the above measures (e.g., restricting the hours

of operations and equipping earth-moving equipment with muffles) and other applicable measures required by local agencies would reduce groundborne vibration and noise to less than significant levels.

Long-term O&M of total mercury and methylmercury controls and management practices are not expected to result in significant noise impacts because, as noted at the beginning of this Checklist discussion, it is assumed that projects will be designed to comply with local City and/or County noise ordinances. Operations plans for specific O&M activities should be developed to address the variety of available measures to limit the impacts from noise to adjacent homes, businesses, or sensitive habitats. There is the potential for a mercury control project to take place in the vicinity of a public airport or private airstrip; however, for the reasons described previously, construction and long-term maintenance activities associated with such projects are not expected to expose people residing or working in the area to excessive noise levels.

XII. Population and Housing

The proposed Phase 1 characterization and control studies and Phase 1 and 2 construction and long-term operation and maintenance of total mercury and methylmercury controls and management practices implemented to comply with the proposed Basin Plan amendments are not expected to induce population growth in an area either directly or indirectly, displace substantial numbers of people or existing housing, or cause construction of replacement housing elsewhere.

It is conceivable that facility upgrades and new BMPs to control total mercury and methylmercury implemented by WWTPs and urban stormwater management agencies to comply with the proposed Basin Plan amendments could entail the displacement of available housing. However, as described in Section 4.3.10, there are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs and stormwater conveyance systems. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would require the displacement of available housing when other compliance methods are available.

XIII. Public Services

The proposed Phase 1 characterization and control studies will have no impact on public services such as fire protection, police protection, schools, parks and other public facilities. Construction activities associated with total mercury and methylmercury controls and management practices implemented to comply with Phases 1 and 2 of the proposed Project have the potential for temporary delays in response times of fire and police vehicles due to road closure/traffic congestion. However, it is expected that potential impacts would be minimized to less than insignificant levels by implementing standard measures. Measures could include, but are not limited to, the following:

- Adhere to applicable building and safety codes and permits, which would ensure that construction activities would result in less-than-significant delays in response times for fire and police vehicles.

- Coordinate with local fire and police providers to establish alternative routes and traffic control during the construction activities that could cause traffic congestion or road closures. Most jurisdictions have in place established procedures to ensure safe passage of emergency and police vehicles during periods of road maintenance, construction, or other attention to physical infrastructure, and there is no evidence to suggest that construction activities that could occur as a result of the proposed Project would create any more significant impediments than other such typical activities.

Because the implementation of methylmercury and total mercury controls and management practices will not result in development of land uses for residential, commercial, and/or industrial uses or increase growth, it is reasonably foreseeable that their implementation would not result in a need for new public services. In addition, Emergency Preparedness Plans could be developed in consultation with local emergency providers to ensure that the long-term operations and maintenance of methylmercury and total mercury controls and management practices will not contribute to an increase in the cumulative demand for fire and police emergency services.

Several public agencies – local, county, state, and federal – may be responsible for installation and long-term maintenance of the methylmercury and total mercury controls and management practices. Once the controls/management practices are installed and operating, there may be a need for increased maintenance and monitoring by those public agencies to verify that the controls/management practices are performing properly and as expected and to track compliance with the proposed Basin Plan amendments. The additional monitoring requirements may result in expanding their current monitoring programs currently in effect. However, cost alone is not an impact to the physical environment and not a matter for analysis under CEQA. Nonetheless, while complying with the proposed Project may result in increases in maintenance and monitoring costs, any increase will likely be outweighed by the resulting overall improvement in water quality and protection of human health. In addition, to the extent that these costs may be new costs for the implementing agencies, the costs of mercury-impaired waterways are already being borne by downstream communities and ecosystems. It is not unreasonable to require public agencies to address pollutants generated locally within their jurisdictions that otherwise ultimately burden downstream communities.

The proposed Project recognizes that, until the Delta beneficial uses are attained, activities need to be undertaken to help manage the health risk and reduce methylmercury exposure to people who eat Delta fish. Several State and local agencies serving the public may be involved with mercury risk reduction efforts. The proposed Basin Plan amendments recommend that OEHHA update and expand the list of fish advisories for the Delta. In addition, the proposed Project also requires methylmercury dischargers to develop and implement a strategy to reduce mercury related risks and quantify risk reductions resulting from the risk reduction activities. The amendment recommends that the dischargers should coordinate these efforts with public health agencies. The purpose of public outreach and education activities would be to reduce the risk of harmful effects of mercury exposure to people who eat Delta fish and to quantify the amount of risk reduction from those activities. The public would be informed about the health effects of mercury and about which local fish species to avoid or eat less frequently because of high mercury levels. Section 4.3.1 in Chapter 4 describes reasonably foreseeable methods to

reduce risk to people who consume Delta fish. Adverse environmental impacts are not expected due to human health risk reduction outreach programs.

XIV. Recreation

The proposed Phase 1 characterization and control studies would not increase the use of existing neighborhood and regional parks or other recreational facilities nor include recreational facilities. Because the implementation of Phase 1 and 2 methylmercury and total mercury controls and management practices will not result in development of land uses for residential uses or increase growth, it is reasonably foreseeable that neither their implementation, nor the conduct of Phase 1 studies, will require the construction or expansion of any recreational facilities.

The proposed Project's net impact on recreation is expected to be positive. Fishing is an important recreation activity in the Delta. OEHHA has issued fish consumption advisories for the Delta that warn consumers to limit the quantity of fish consumed. A potential benefit from the project could be increased recreational fishing and consumption of sport fish from the Delta if the fish had lower mercury concentrations. After the fish tissue methylmercury concentrations have decreased and the fish advisories are downgraded, there is the possibility that there will be an increase in the use of regional parks and other recreational facilities as people who previously were limited or discouraged by the fish advisories begin to catch more fish from the Delta. However, until the fish tissue objectives are attained, increased public awareness of the mercury problem may reduce fishing activities in the Delta.

XV. Transportation/Traffic

Because the proposed Project would not increase population or provide employment, none of the activities associated with the proposed Project are expected to (a) cause increases in traffic that are substantial in relation to existing traffic load and capacity of the street systems; (b) exceed – either individually or cumulatively – a level of service standard established by the county congestion/management agencies; (c) result in a change to air traffic patterns; (d) substantially increase hazards due to a design feature or incompatible use; (e) result in inadequate emergency access; (f) result in inadequate parking capacity, or (g) conflict with adopted policies or programs supporting alternative transportation.

As responsible agencies and dischargers conduct the Phase 1 characterization and control studies and implement expanded monitoring programs, there will be an increase in traffic at some sites as the researchers travel to collect samples and ship them to laboratories, but these increases would not be substantial compared to existing travel loads and capacity.

Implementation of Phase 1 and 2 total mercury and methylmercury control actions and management practices would result in additional vehicular movement during construction and, to the extent that site-specific projects entail excavation in roadways, such excavations could conceivably temporarily increase road hazards. However, activities undertaken pursuant to the proposed Project that may affect transportation and traffic would most likely require construction permits that would include a separate environmental review. In addition, project-specific increases in traffic load and/or hazards due to construction activities can be reduced to less than significant impacts by a variety of standard measures. For example:

- Use signage, striping, fencing, barricades and other physical structures to mark the excavated areas, promote safety, and minimize pedestrian/bicyclist accidents.
- Control traffic with signals or traffic control personnel in compliance with authorized local police or California Highway Patrol requirements.
- Develop and implement a project-specific construction management plan to minimize traffic impacts upon the local circulation system and ensure that construction activities adhere to local and State police and transportation requirements. A construction traffic management plan could address traffic control for any street closure, detour, or other disruption to traffic circulation; identify the routes that construction vehicles will use to access the site, hours of construction traffic, and traffic controls and detours; and include strategies for temporary traffic control, temporary signage and tripping, location points for ingestion and egress of construction vehicles, staging areas, and timing of construction activity that appropriately limits hours during which large construction equipment may be brought on or off site.
- Limit or restrict hours of construction so as to avoid peak traffic times.

It is not foreseeable that the proposed Project will result in significant increases in traffic loads or hazards to motor vehicles, bicyclists or pedestrians, especially when considered in light of those hazards currently endured in ordinary urbanized environments throughout the Delta and its tributary watersheds.

Improvements to the Cache Creek Settling Basin and subsequent maintenance will cause temporary increases in truck traffic on surface roads, more so if the sediment excavated from the basin is disposed of offsite. Insignificant impacts to traffic are expected if the sediment is moved to adjacent farmland. If the sediment is transported to the Yolo County Central Landfill or other projects in the region for use as fill material or other construction purposes, the resulting truck traffic is likely to result in no new impact because similar truck traffic would occur anyway if the landfill or other projects were hauling dirt from other locations in the region to use in their operations; the landfill and other projects are likely to select dirt sources that are nearby to be cost effective.

XVI. Utilities and Service Systems

The proposed Project would establish new requirements for discharges from NPDES-permitted wastewater treatment facilities and urban stormwater conveyance systems (a.k.a. MS4s) by setting methylmercury allocations and Phase 1 methylmercury concentration limits. During the first phase of the proposed Project, WWTPs and MS4s would be required to conduct methylmercury characterization and control studies, develop and evaluate control actions to reduce methylmercury discharges, and implement total mercury minimization measures. WWTPs and MS4s that do not comply with their methylmercury allocations would be required to implement methylmercury controls during Phase 2 of the proposed Project.

The Phase 1 studies would not have an impact on utilities and service systems. The proposed Project would not result in additional discharges to any WWTP or stormwater conveyance system, and actions taken to comply with total mercury discharge minimization requirements would not require the construction of new WWTPs. In addition, because the proposed Project would not increase population or provide employment, the proposed Project would have no

affect on drinking water facilities and would not result in the construction of new drinking water facilities or expansion of existing drinking water facilities. Proponents for specific projects would be required to coordinate with electric, gas, sewer and other utility companies that provide services in the proposed project area, as well as Underground Service Alert, before beginning any excavation or other construction activities to ensure that utilities are not impacted.

As noted earlier in "IV. Biological Resources", expansion of existing WWTPs and MS4 facilities could be one method of compliance with the proposed methylmercury allocations and Phase 1 methylmercury concentration limits. (See "1. Actions to Comply with Proposed Total Mercury Evaluation and Minimization Requirements and Methylmercury Limits for WWTP and MS4 Discharges" in Section IV for further discussion.) Any adverse impacts from implementation of total mercury and methylmercury control projects by WWTPs and MS4s beyond baseline requirements are not expected to be significant because:

- WWTPs and MS4s are typically constructed in urbanized areas; therefore, their expansion is expected to have limited or no adverse environmental impact.
- There are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs and MS4s that may not require the expansion of their land use footprint; therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant environmental impact.
- There are many measures available to avoid or minimize to less than significant levels any negative effects potentially associated with WWTP and MS4 improvement projects' construction and operations (refer to earlier sections).
- The proposed Basin Plan amendment requirements for total mercury control for many of the WWTPs and MS4s are baseline requirements, the potential environmental impacts of which are not new to the proposed Project.

It is not expected that implementation of the Project will result in significant impacts on landfill capacity for several reasons. First, it is assumed that projects implemented to comply with the proposed Basin Plan amendments would be designed and constructed in compliance with all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices regarding source reduction, recycling, and land disposal of solid waste. In addition, all sediment removed from the Cache Creek Settling Basin, stormwater basins, and mine cleanup sites would be evaluated for hazardous materials and disposed of appropriately (see "VII. Hazards and Hazardous Materials"). Materials collected by pollution prevention efforts (thermometers, fluorescent light bulbs, etc.) would be sent to landfill facilities that manage hazardous wastes. Maintenance of stormwater control structures may result in the periodic removal of accumulated sediments from sediment traps; however, if this material is disposed of at a landfill, the additional volume is considered to be insignificant and, as noted earlier, is a component of baseline conditions under the Basin Plan and existing stormwater permits. One of the alternatives to increase the mercury retention of the Cache Creek Settling Basin is to remove accumulated sediment from with the basin and deposit it elsewhere. A viable disposal location is the Yolo County Central Landfill. This landfill is near the basin and has a continuous need for soils for cover material, landfill units, and other construction purposes. The landfill would benefit from a readily available, nearby source of soils such as the Cache Creek Settling Basin material.

XVII. Mandatory Findings of Significance

The proposed Project is comprised of Basin Plan amendments that establish water quality objectives for fish tissue mercury and define an implementation program to achieve the objectives. The goal of the proposed Project and resulting implementation actions is to lower fish mercury levels in the Delta and San Francisco Bay so that the beneficial uses of fishing and wildlife habitat are attained; in other words, make it safer for humans and wildlife to consume Bay-Delta fish. The proposed Project is expected to have an overall beneficial impact on the environment.

The proposed Basin Plan amendments provide regulatory guidance for methylmercury reduction in the environment. Adoption of the proposed Basin Plan amendments will not by itself have a physical effect on the environment. However, implementation actions taken by responsible agencies to comply with the proposed implementation plan may affect the environment. The proposed amendments do not prescribe compliance methods. Responsible entities may select among the reasonably foreseeable methods of compliance identified in Chapter 4, or they may propose other methods so long as the methods comply with Basin Plan requirements in a lawful manner.

Implementation activities are expected to encompass a variety of site-specific studies and total mercury and methylmercury source control projects throughout the Delta and its tributary watersheds downstream of major dams, a geographic scope that includes about 20,000 square miles of urban, agricultural and undeveloped terrains – roughly one third of the entire Central Valley. Although the proposed Project is expected to have an overall beneficial impact on the environment, a variety of implementation activities have the potential to cause direct and indirect negative effects. Most implementation activities would have no impact or insignificant impacts, while some have the potential for significant impacts if mitigation measures are not included in the site-specific projects' design, construction, and operation.

Staff's evaluation indicated that reasonably foreseeable, site-specific implementation activities are expected to have no impact or insignificant impacts on 14 of the 17 environmental resource categories identified in the CEQA Checklist if standard measures associated with common construction practices are incorporated. Implementing agencies may be required to incorporate mitigation in addition to standard measures to ensure continued flood protection and to protect wetland and open-water habitat functions for native resident, migratory and special-status species, as identified in the discussion for the "Biological Resources", "Hydrology and Water Quality", and "Utilities and Service Systems" resource categories. Some form of mitigation is possible for all of the potentially significant environmental impacts that staff identified. However, selection and performance of mitigation is within the responsibility and jurisdiction of agencies implementing the site-specific projects. Mitigation can and should be adopted by the implementing agencies.

As specific implementation project proposals are developed, lead agencies would undertake environmental reviews and identify specific environmental impacts and appropriate mitigation measures. In cases where potential impacts could be significant, lead agencies would adopt readily available mitigation measures to ensure that potential impacts would be less than

significant. Project proponents would be required to develop and adhere to their respective environmental documents under CEQA, NEPA, and other State and local guidelines.

As described in previous sections, there are many standard measures associated with common construction practices and other mitigation available to ensure that potential impacts resulting from monitoring activities, short-term project construction activities, and long-term project operations – both local and cumulative – are reduced to less than significant levels. Therefore, the incremental effects of the proposed Basin Plan amendments and resulting implementation actions are expected to be negligible to human beings when viewed in the context of the overall environmental changes foreseeable in the Delta/Yolo Bypass and tributary watersheds as California's population grows and urban development occurs. The same is expected to be true for biological resources, with one potential exception. As described in "IV. Biological Resources", the implementation of management practices to reduce methylmercury discharges from existing wetland habitats in the Yolo Bypass has the potential for localized and cumulative impacts to habitats that support endemic species such as Sacramento splittail and Delta smelt.

It is anticipated that methylmercury management practices would be implemented only at those wetland sites that act as substantial sources of methylmercury to Delta/Yolo Bypass subareas that require source reductions to achieve the proposed subarea methylmercury allocations. It is speculative to guess where and which methylmercury reduction management practices would be incorporated at existing managed wetland sites and future restoration projects during Phase 2 within the Delta/Yolo Bypass subareas that require reduction. However, as discussed in Section 4.3.10.3, methods of compliance for existing managed wetlands could include, but not be limited to, the following:

- Modify managed wetlands' design, e.g., water depth, flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands), vegetation types, and vegetation density (dense cover versus more open water).
- Modify managed wetlands' discharge patterns, e.g., hold irrigation water onsite longer at seasonal wetlands to allow methylmercury concentrations to decrease before discharging the water or otherwise transfer and re-use the water at another marsh to decrease the amount of discharge.

In addition, as noted in Section 4.3.12.4, new wetland restoration projects may have the opportunity to consider their location, for example, not create new wetlands directly downstream sources of mercury-contaminated sediment. The Phase 1 characterization and control studies are expected to determine the efficacy of the above potential methods to reduce methylmercury loading and to develop and evaluate additional methylmercury management practices. Until the Phase 1 studies are completed, it is speculative to evaluate how individual wetland habitats could be impacted by the implementation of methylmercury management practices. Even so, in general, modifying wetland vegetation and/or hydrology to reduce methylmercury loading to surface waters has the potential to affect the function and attractiveness of a given wetland to target species. There are foreseeable ways to minimize or avoid negative effects on wetland function:

- Implement only those onsite management practices that do not change the desirable wetland functions. The Phase 1 studies are expected to develop measures to reduce

methylmercury discharges and resulting bioaccumulation while still optimizing management of the wetlands as habitat for desired species.

- If implementation of such onsite management practices within a given Delta/Yolo Bypass subarea is not adequate to achieve the subarea methylmercury allocation, participate in an offset program (if one is approved by the Central Valley and State Water Boards; see Section 4.3.9) to reduce upstream methylmercury sources and/or sources of mercury-contaminated sediment that supply the wetland sites in that subarea.

If no technically valid and legally defensible offset program can be developed, and the Phase 1 studies indicate that it is not feasible for wetlands in the Delta/Yolo Bypass to fully achieve their subarea allocations without affecting desirable wetland functions, then the Central Valley Water Board could adjust the allocation strategy so that greater reductions were required from other methylmercury source types within a given subarea and its upstream watershed that have feasible methylmercury reduction methods. However, there are a couple scenarios under which re-allocation of source controls may not be adequate to achieve the proposed fish tissue objectives:

- Wetlands may be a substantial source of methylmercury, for which other feasible source controls may not be able to compensate. It is conceivable that the proposed fish tissue objectives may not be achievable in some areas of the Delta/Yolo Bypass if methylmercury discharges from wetlands are not substantially reduced.
- Restored wetlands may have the potential to create an attractive nuisance if they generate methylmercury that is locally bioaccumulated to unsafe levels by the fish and wildlife species attracted to the wetland.

Fish tissue mercury levels – especially in the Yolo Bypass and Cosumnes/Mokelumne subareas – exceed safe levels established by USFWS for the protection of wildlife species that consume fish, such as the special-status California least tern and bald eagle. One of the goals of the proposed Basin Plan amendments is to control methylmercury such that its threat to wildlife is reduced. As a result, some existing managed wetland sites and proposed restoration projects may need to modify their management practices to avoid becoming an attractive nuisance, even if such modifications alter the function of the habitat.

If it is necessary to implement methylmercury management practices that alter the function of existing wetlands, it may be possible to compensate for that alteration by constructing mitigation wetlands away from mercury-contaminated areas or areas that are not otherwise impaired by methylmercury (e.g., possibly the Central Delta and other Delta and tributary areas upstream of major mercury-contaminated sediment inputs). However, it is conceivable that some existing wetland habitats may support special-status species that are endemic to a particular area of the Delta and as a result mitigation habitat constructed elsewhere would not be an adequate replacement.

As noted earlier, it is anticipated that methylmercury management practices would be implemented only at those wetland sites that act as substantial sources of methylmercury to those Delta/Yolo Bypass subareas, and that only a fraction of those, if any, would require the implementation of methylmercury management practices that have the potential to result in unavoidable impacts to habitat sites that support an endemic species. If wetland and floodplain

habitats were evenly distributed across the Delta and Yolo Bypass, there would be little chance for substantial or otherwise cumulative impacts to endemic species. However, more than half of all wetlands in the Delta/Yolo Bypass occur in the central Yolo Bypass area. In addition, when the Fremont, Sacramento and Cache Creek Settling Basin weirs spill, the Yolo Bypass itself acts as a massive floodplain that, along with the Sutter Bypass to the north, provides important spawning habitat for Sacramento splittail (Moyle, 2002). Further, most of the Yolo Bypass wetlands are seasonal; the ambient water methylmercury levels in the Yolo Bypass will require substantial reductions (~80%) to achieve safe fish mercury levels; and the bypass receives direct inputs from the Cache Creek, Putah Creek and Feather River watersheds, which are major sources of mercury-contaminated sediment.

As a result, achieving safe fish mercury levels in the Yolo Bypass may require both very aggressive total mercury and methylmercury source reductions in the tributary watersheds and potentially widespread implementation of methylmercury management practices in the Yolo Bypass, which increases the potential for significant local and cumulative adverse effects to aquatic habitats that support endemic species such as Sacramento splittail in the Yolo Bypass. Until the proposed Phase 1 characterization and control studies have been completed, it is not possible to know 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 mitigate any potential impact to less than significant levels.

It is expected that, in general, potentially cumulative adverse impacts to existing wetlands throughout other areas of the Delta region could be mitigated to less then significant levels through careful site evaluation and selection of methylmercury management practices.

7.4 Statement of Overriding Considerations

The Central Valley Water Board staff has evaluated the environmental and other benefits of this proposed mercury control program for the Delta against the unavoidable environmental risks in determining whether to recommend that the Central Valley Water Board approve this Project. Upon review of the environmental information generated for this Project and in view of the entire record supporting this Project, staff has concluded that the specific environmental and other benefits of this proposed Project outweigh the unavoidable adverse environmental effects, and that such adverse environmental effects are acceptable under the circumstances in order to protect the health of wildlife and humans who consume contaminated Delta fish.

Having a fishery with mercury-contaminated fish is an environmental justice issue. There are people in the Delta who consume local fish because of need or custom, or to supplement their diet. Mercury is a toxicant that can have lasting effects on the neurological development and abilities of persons exposed *in utero* and as children. Studies of people exposed to methylmercury through consumption of fish by their mothers and/or themselves showed deficits in memory, attention, language, fine motor control and visual-spatial perception that can be translated to decrements in intelligence quotient (IQ) (NRC, 2000; Trasande *et al.*, 2005). Under existing Delta conditions, consumption of some Delta fish species more than one or two times per month may cause adverse health effects, which affects peoples' livelihoods and standard of living.

The Delta fishery is a valuable resource (see Section 2.3). Although it is difficult to estimate the economic value of the Delta fishery, the Delta Protection Commission produced an economic report for the Delta in which expenditure estimates were calculated for recreational activities, including fishing, for the local economy in 1994. According to the report, anglers on average spent an estimated 186 million dollars inside the Delta and an estimated 206 million dollars outside of the Delta due to sport-fishing activities in the Delta (Goldman *et al.*, 1998).

The 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 over the long term by enabling humans and wildlife to safely consume Delta fish. Beneficial uses of the Delta that are impaired due to elevated methylmercury levels in fish are recreational fishing (REC-1), wildlife habitat (WILD), and human consumption of aquatic organisms. In addition, certain areas of the Delta (Yolo Bypass and Marsh Creek) may not support the municipal (MUN) beneficial use. Commercial and sport fishing (COMM) are a potential beneficial use that is currently unmet. Phases 1 and 2 of the mercury control program described by the proposed Basin Plan amendments are the primary steps required to fully protect these beneficial uses. Fully achieving these beneficial uses will have positive health benefits and social and economic effects by decreasing the exposure of methylmercury to humans. In addition, habitat carries a significant non-market economic value. Enhancement of habitat beneficial uses will not only be beneficial to wildlife species that consume Delta fish, but it also will have positive indirect economic and social benefits.

Specific projects employed to implement the proposed Basin Plan amendments may have the potential for significant impacts to the environment, but these impacts, with one exception discussed below, are expected to be mitigated to less than significant levels through careful planning, design, and implementation. This staff report and environmental analysis provide the necessary information pursuant to Public Resources Code Section 21159 to conclude that properly designed and implemented mercury control projects should mitigate and generally avoid foreseeable significant adverse effects on the environment. Potential impacts can be mitigated at the subsequent project level when site-specific projects are identified and evaluated. The Central Valley Water Board does not have legal authority to specify the manner of compliance with its orders (CWC §13360), and thus cannot specify particular implementation projects nor dictate that specific mitigation measures be implemented by any particular project. Project selection and mitigation measures are all within the jurisdiction and authority of the entities that will be responsible for implementing the Basin Plan amendments, and those entities can and should employ mitigation measures as necessary to reduce any impacts as much as feasible (14 CCR §15091(a)(2)). These mitigation measures in most cases are routine measures to ease the expected and routine impacts attendant with ordinary construction projects.

Actions needed to achieve fish mercury levels in the Yolo Bypass that are safe for wildlife and humans who consume the fish have the potential to impact wetland habitat that may support endemic species with limited geographic ranges. Until the proposed Phase 1 characterization and control studies have been completed, it is not possible to know whether 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 mitigate any potential impact to less than significant

levels. Potential impacts to such habitat in the Yolo Bypass would be reduced to the extent feasible by:

- Performing aggressive total mercury and methylmercury source reductions in the upstream tributary watersheds, particularly the Cache Creek Settling Basin; and
- Prioritizing implementation efforts such that they focus on (a) management practices that do not change desirable wetland functions and (b) wetlands that do not support geographically-limited endemic species. Implementing methylmercury management practices that would alter the function of wetlands that support endemic species with a limited geographic range would be considered only if other actions were not able to achieve fish mercury levels that are protective of wildlife.

Implementation of the proposed Project is both necessary and beneficial. If there were no project, the Delta fish tissue impairment would remain and likely worsen. Substantial population growth, extensive wetland restoration projects, and changes in water management practices are anticipated during the next twenty years and could cause Delta fish mercury levels to increase, placing more humans and wildlife that consume Delta fish at risk.

7.5 Preliminary Staff Determination

On the basis of this evaluation and staff report, which collectively provide the required information:

☐ The proposed project COULD NOT have a significant effect on the environment, and, therefore, no alternatives or mitigation measures are proposed.

☒ The proposed project MAY have a significant or potentially significant effect on the environment, and therefore alternatives and mitigation measures have been evaluated.

_____ _____

PAMELA C. CREEDON
Executive Officer
California Regional Water Quality Control Board
Central Valley Region

DATE

8 PUBLIC PARTICIPATION & AGENCY CONSULTATION

Staff sought public participation throughout the development of the proposed Basin Plan amendments through the following means:

- Notices of the public and Board workshops and availability of reports were mailed electronically and/or by postal system to more than 800 persons or entities. Interested persons contacted staff or responded through the Central Valley Water Board's website to be placed on the mailing list.
- Notices were also distributed through the email lists of groups interested in mercury issues, including the Delta Tributaries Mercury Council and Sacramento River Watershed Program.
- Staff reports and comment letters were posted on the Central Valley Water Board website. Paper copies of reports and electronic databases were provided upon request.
- Notices of public and Board workshops were placed in local papers at least 45 days prior to the event.

Staff has held a CEQA scoping meeting, two public workshops, two Board workshops, and numerous stakeholder meetings to receive comments and information from local, State and Federal agencies, dischargers, and other stakeholders during the preparation of the proposed Basin Plan amendments, and has received and responded to comments from scientific peer reviewers contracted by the State Water Board. In addition, many stakeholders submitted written comments on the various draft staff reports. Table 8.1 describes the timeline for obtaining input from the public, starting with release of the first draft technical TMDL Report.

Staff also sought input from the scientific community beyond the State Water Board's scientific peer review process. Staff gave oral and poster presentations about the TMDL and implementation alternatives at numerous conferences, including the 14th Annual NorCal SETAC annual meeting (May 2004), Seventh Biennial State of the Estuary Conference (October 2005), National Water Quality Monitoring Council's Fifth National Monitoring Conference (May 2006), and San Francisco Bay Mercury Coordination Meeting (February 2007). In addition, staff contracted with University of California, Davis, researchers to review the statistical methods for evaluating tributary total mercury and suspended sediment loads and their confidence intervals and subsequently updated the total mercury and sediment source analyses. Also, staff has prepared a framework for a technical advisory committee (TAC) to evaluate the proposed Phase 1 methylmercury characterization and control studies. The framework provides a preliminary outline for the charge of the TAC members, TAC qualifications, and expected work products. Staff will work with the State Water board and USEPA to form and fund a TAC.

Staff has revised substantial portions of the proposed Basin Plan amendment language based on written and verbal comments and data provided by the scientific peer reviewers, State and Federal agency staff, and numerous stakeholders throughout the TMDL development and Basin Planning process. Comments and information provided by the public have been very valuable in developing Basin Plan amendments.

Table 8.1: Timeline for Public Participation in the Basin Plan Amendment Process

August 2005	A technical mercury TMDL report for the Delta was submitted to the USEPA and posted on the Central Valley Water Board website. The technical TMDL described the rationale for fish tissue objective alternatives, provided data and calculations for total mercury and methylmercury load estimates and methylmercury allocations, and included a preliminary outline for how the methylmercury allocations could be implemented. The State Water Board remanded the San Francisco Bay mercury TMDL that was approved by the San Francisco Bay Water Board in August 2004 and required, among other things, provisions for limiting total mercury discharges and evaluating methylmercury discharges. Recent research (including Delta-specific research) has highlighted the importance of biotic exposure to aqueous methylmercury. Since the remand, staff from the two Regional Water Boards and State Water Board had numerous discussions about consistency between the two regions with respect to total mercury versus methylmercury concerns and selection of water quality objectives.
September 2005	Staff held a CEQA scoping workshop on 29 September 2005 to review potential environmental impacts that could be associated with a Delta mercury control program and to identify a range of implementation alternatives.
November 2005	Staff held a Central Valley Water Board workshop on 28 November 2005 that included stakeholder panel presentations to discuss the technical TMDL, a range of potential implementation alternatives, and the schedule for amendment development.
June 2006	Draft TMDL/Basin Plan amendment staff reports were forwarded to scientific peer reviewers and made available for public review. The cover letters to the peer reviewers and attached reports were posted on the Central Valley Water Board website and are attached to this report (Appendix D). These reports built upon the 2005 technical TMDL and included options and alternatives for an implementation plan. The proposed implementation plan incorporated elements that directly reflected input received from stakeholders. Written comments received on the draft TMDL/Basin Plan amendment staff reports were posted to the Central Valley Water Board and evaluated during the development of the next draft of the report.
July 2006 to February 2008	Staff met with numerous stakeholder groups to obtain feedback on the June 2006 draft TMDL/Basin Plan staff report and proposed Basin Plan amendments. Staff had meetings and conference calls with, or written comments from representatives from the following groups: - California Department of Public Health & representatives of Delta fish consumers - California Department of Water Resources - California Rice Commission - CALFED staff - Central Valley Clean Water Association - Central Valley Joint Venture Group - Clean Water Action - Delta Tributaries Mercury Council / Sacramento River Watershed Program - Delta Protection Commission - Delta Protection Commission - Delta Mercury TMDL Collaborative - Ducks Unlimited - Fish Mercury Project[43] Steering Committee - Local Stakeholder Advisory Group[44]

[43] The Fish Mercury Project is a CALFED-funded project to monitor sport fish, conduct outreach, and develop fish consumption advisories in the Central Valley.

[44] The Local Stakeholder Advisory Group conducts public outreach and provides guidance to CDHS.

Table 8.1: Timeline for Public Participation in the Basin Plan Amendment Process

	- Mercury Working Group[45] - Northern California Water Association - Sacramento Valley Water Quality Coalition - Northern Section of the Sacramento Valley California Water Environment Association - Sacramento Stormwater Quality Partnership - Sacramento Regional County Sanitation District - San Joaquin-Delta Water Quality Coalition - Sierra-Trinity Abandoned Mine Lands Agency Group - State and Federal wetland managers - State Water Board Division of Water Rights - Stockton MS4 Permittees - The Nature Conservancy - U.S. Army Corps of Engineers - U.S. Bureau of Reclamation - USEPA Region 9 Water Division (Dredging & Sediment Management Team and San Francisco Bay and Central Valley Regional TMDL Liaisons) and Superfund Emergency Response Program - Water Education Foundation - Wetlands interests in the Yolo Bypass and other wetland groups/managers
August to September 2006	Staff received scientific peer review comments on the draft TMDL/Basin Plan amendment reports (Appendix E) in August and September 2006. One peer reviewer did not directly address the questions outlined in the cover letters; as a result, staff requested and received additional review from that reviewer. The follow-up comments were received in September 2006. Staff prepared responses to written comments provided by the scientific peer reviewers (Appendix F). In response to comments and concerns expressed by the scientific peer reviewers and stakeholders during the before-mentioned stakeholder meetings, staff researched publicly available information to compile a database that describes the characteristics and management costs associated with existing managed wetland areas as well as completed, in-progress and anticipated habitat restoration efforts in the Sacramento-San Joaquin Delta Estuary and its upstream watersheds. Staff used the database to improve staff recommendations for Basin Plan amendment requirements for methylmercury characterization and control studies for Delta and Yolo Bypass wetlands. The database may be used in the future to enable State and Federal agency staff, public and private habitat managers and wetland project proponents to collaborate on methylmercury characterization and control studies. Information request letters to wetland managers and the resulting database are provided online.
September 2006	After scientific peer review comments were received, staff presented the Basin Plan recommendations and supporting analyses at staff workshops in Sacramento and Stockton on the 18th and 19th of September 2006, respectively, to (1) obtain further stakeholder input, particularly from groups not heard from previously, and (2) provide a forum where the different stakeholders could directly learn each others' concerns.
February 2007	Staff revised their recommendations for a Basin Plan amendment after considering comments and other information provided by the scientific peer reviewers, stakeholder meeting and workshop participants, and written comments from public reviewers. Staff made the revised amendment language recommendations available on the Board website for public review before the Board Workshop scheduled for March 2007. Several entities submitted written comments for the February 2007 amendment draft, which staff posted to the Board website.

[45] A multi-stakeholder group that gathered to discuss concerns related to wetlands, irrigated agriculture, wastewater treatment, urban stormwater, dredging, and water management.

Table 8.1: Timeline for Public Participation in the Basin Plan Amendment Process

March 2007	Staff coordinated a Central Valley Water Board Workshop on 16 March 2007 at the Board's office in Sacramento. Staff gave a slide presentation that summarized staff recommendations and remaining concerns. Panels of private and non-profit stakeholder groups and agencies provided oral summaries of their comments and concerns directly to the Board. The workshop lasted six hours, encompassing staff's presentation, panelist presentations, public comments, and ongoing questions and comments from the Board members addressed to the staff, panelists and other stakeholders. A 230-page workshop transcript was prepared by a court reporter and was added to the Administrative Record.
March 2007 to February 2008	Staff revised the June 2006 draft TMDL/Basin Plan staff report and proposed Basin Plan amendments based on comments made during the March 2007 Board Workshop; additional agency and stakeholder review of the February 2007 draft Basin Plan amendments; and staff's response to scientific peer review and stakeholder comments. Staff posted the revised report and proposed amendments for public review on the Board website and mailed a notice of the availability of report electronically and/or by postal system to more than 800 persons or entities. Staff will consider written comments submitted during the public review period in the final version of the TMDL/Basin Plan staff report and proposed Basin Plan amendments.
Spring 2008	Staff will revise the draft TMDL/Basin Plan staff report, address written comments submitted during the formal public review, prepare responses to comments, and submit the reports, comments and responses to the Central Valley Water Board for action during a public hearing.

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APPENDICES A THROUGH F

The appendices are available on the Central Valley Water Board website:

http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/