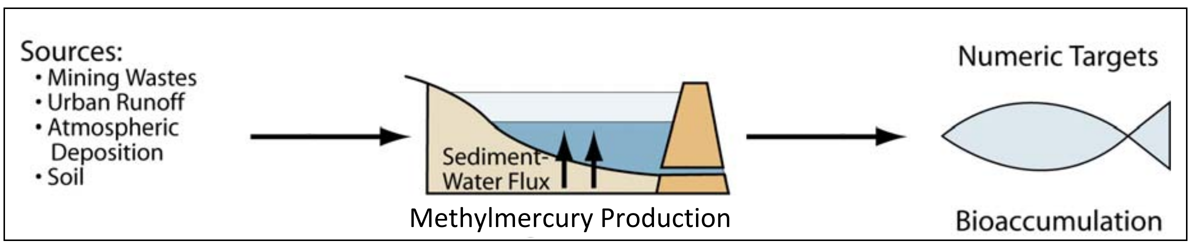
Guadalupe River Watershed

Mercury

Total Maximum Daily Load (TMDL) Project

PROPOSED BASIN PLAN AMENDMENT



California Regional Water Quality Control Board

San Francisco Bay Region

September 2008

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PROPOSED BASIN PLAN AMENDMENT

Amending Mercury Water Quality Objectives in
Waters of the Guadalupe River Watershed
and Incorporating a
Total Maximum Daily Load and Implementation Plan
to Reduce Mercury in Waters of the Guadalupe River Watershed

CHAPTER 2: BENEFICIAL USES

Table 2-1: Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region

COUNTY Waterbody	AGR	MUN	FRSH	GWR	IND	PROC	COMM	SHEL	COLD	EST	MAR	MIGR	RARE	SPWN	WARM	WILD	REC-1	REC-2	NAV
SANTA CLARA COUNTY																			
…																			
Guadalupe River									E			P		P	E	E	P	E	
…																			
Guadalupe Reservoir		E		E					E					E	E	E	E	E	
…																			

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Chapter 3. Water Quality Objectives

3.3.21 OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants for surface waters are given in Tables 3-3, 3-3A, 3-3B, 3-4, and 3-4A.

The Regional Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Regional Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. The objectives in Tables 3-3 and 3-4 apply throughout the region except as otherwise indicated in the Tables or when site-specific objectives for the pollutant parameter have been adopted. Site-specific objectives for copper and nickel, adopted for South San Francisco Bay south of the Dumbarton Bridge, are listed in Table 3-3A. Objectives for mercury that apply to San Francisco Bay are listed in Table 3-3B. Objectives for mercury that apply to Walker Creek, Soulajule Reservoir and their tributaries, and to waters of the Guadalupe River watershed, are listed in Table 3-4A.

Table 3-4: Freshwater[a] Water Quality Objectives for Toxic Pollutants for Surface Waters (all values in ug/l)

Compound	4-day Average	1-hr Average
Arsenic[b, c, d]	150	340
Cadmium[b, d]	e	e
Chromium III[f]		
Chromium VI[b, c, d, g]	11	16
Copper[b, c, d]	9.0[h]	13[h]
Cyanide[i]		
Lead[b, c, d]	2.5[j]	65[j]
Mercury[k]	0.025	2.4
Nickel[b, c, d]	52[l]	470[l]
Selenium[m]		
Silver[b, c, d]		3.4[n]
Tributyltin[o]		
Zinc[b, c, d]	120[p]	120[p]

Notes:

[a] Freshwaters are those in which the salinity is equal to or less than 1 part per thousand 95% of the time, as set forth in Chapter 4 of the Basin Plan. Unless a site-specific objective has been adopted, these objectives shall apply to all freshwaters except for the South Bay south of Dumbarton Bridge, where the California Toxics Rule (CTR) applies. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable objectives are the more stringent of the marine (Table 3-3) and freshwater objectives.

[b] Source: 40 CFR Part 131.38 (California Toxics Rule or CTR), May 18, 2000.

[c] These objectives for metals are expressed in terms of the dissolved fraction of the metal in the water column.

[d] These objectives are expressed as a function of the water-effect ratio (WER), which is a measure of the toxicity of a pollutant in site water divided by the same measure of the toxicity of the same pollutant in laboratory dilution water. The 1-hr. and 4-day objectives = table value X WER. The table values assume a WER equal to one.

[e] The objectives for cadmium and other noted metals are expressed by formulas where H = ln (hardness) as CaCO3 in mg/l: The four-day average objective for cadmium is $e^{(0.7852\ H\ -\ 3.490)}$. This is 1.1 µg/l at a hardness of 100 mg/l as CaCO3. The one-hour average objective for cadmium is $e^{(1.128\ H\ -\ 3.828)}$. This is 3.9 µg/l at a hardness of 100 mg/l as CaCO3.

[f] Chromium III criteria were promulgated in the National Toxics Rule (NTR). The NTR criteria specifically apply to San Francisco Bay upstream to and including Suisun Bay and Sacramento-San Joaquin Delta. Note: at the time of writing, the values are 180 ug/l (4-day average) and 550 ug/l (1-hr. average). The objectives for chromium III are based on hardness. The values in this footnote assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective for chromium III is $e^{(0.8190H+1.561)}$. The 1-hour average for chromium III is $e^{(0.8190\ H+3.688)}$.

[g] This objective may be met as total chromium.

[h] The objectives for copper are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective for copper is $e^{(0.8545H-1.702)}$. The 1-hour average for copper is $e^{(0.9422H-1.700)}$.

[i] Cyanide criteria were promulgated in the National Toxics Rule (NTR). The NTR criteria specifically apply to San Francisco Bay upstream to and including Suisun Bay and Sacramento-San Joaquin Delta. Note: at the time of writing, the values are 5.2 ug/l (4-day average) and 22 ug/l (1-hr. average).

[j] The objectives for lead are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective is $e^{(1.273H -4.705)}$. The 1-hour average for lead is $e^{(1.273H-1.460)}$.

[k] Source: U.S. EPA Quality Criteria for Water 1986 (EPA 440/5-86-001), which established a mercury criterion of 0.012 ug/l. The Basin Plan set the objective at 0.025 based on considerations of the level of detection attainable at that time. The 4-day average value for mercury does not apply to Walker Creek and Soulajule Reservoir and their tributaries, nor to waters of the Guadalupe River watershed listed in Table 3-4A; instead, the water quality objectives specified in Table 3-4A apply. The 1-hour average value continues to apply to waters specified in Table 3-4A.

[l] The objectives for nickel are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective is $e^{(0.8460H + 0.0584)}$. The 1-hour average objective is $e^{(0.8460H + 2.255)}$.

[m] Selenium criteria were promulgated for all San Francisco Bay/Delta waters in the National Toxics Rule (NTR). The NTR criteria specifically apply to San Francisco Bay upstream to and including Suisun Bay and Sacramento-San Joaquin Delta. Note: at the time of writing, the values are 5.0 ug/l (4-day average) and 20 ug/l (1-hr. average).

[n] The objective for silver is based on hardness. The table value assumes a hardness of 100 mg/l CaCO3. At other hardnesses, the objective must be calculated using the following formula where H = ln (hardness): The 1-hour average objective for silver is $e^{(1.72H – 6.52)}$. U.S. EPA has not developed a 4-day criterion.

[o] Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations. U.S. EPA has published draft criteria for protection of aquatic life (Federal Register: December 27, 2002, Vol. 67, No. 249, Page 79090-79091). These criteria are cited for advisory purposes. The draft criteria may be revised.

[p] The objectives for zinc are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective for zinc is $e^{(0.8473 H+0.884)}$. The 1-hour average for zinc is $e^{(0.8473 H+ 0.884)}$.

Table 3-4A: Freshwater Water Quality Objectives for Mercury in Walker Creek, Soulajule Reservoir, and Their Tributaries; and in Waters of the Guadalupe River Watershed, Except Los Gatos Creek and its Tributaries Upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake

Protection of Aquatic Organisms and Wildlife[a]	0.05 mg methylmercury per kg fish	Average wet weight concentration measured in whole trophic level 3 fish 5–15 cm in length
	0.1 mg methylmercury per kg fish	Average wet weight concentration measured in whole trophic level 3 fish >15–35 cm in length

Note:

[a] The freshwater water quality objectives for the protection of aquatic organisms and wildlife also protect humans who consume fish from the Walker Creek and Guadalupe River watersheds.

Chapter 7. Water Quality Attainment Strategies, Including Total Maximum Daily Loads

Total Maximum Daily Loads for Mercury in Waters of the Guadalupe River Watershed

The following sections establish TMDLs for mercury in impaired waters of the Guadalupe River watershed. These TMDLs and associated allocations implement the mercury water quality objectives in waters of the Guadalupe River watershed listed in Table 3-4A.

These TMDLs address seven mercury-impaired waters: five waters on the 2006 303(d) list of impaired waters, Guadalupe Reservoir, Calero Reservoir, Guadalupe Creek, Alamitos Creek, and the Guadalupe River upstream of tidal influence; and two additional waters, Almaden Reservoir and Lake Almaden, which are also impaired by mercury.

These TMDLs are closely integrated with the San Francisco Bay mercury TMDL, which addresses the lower portion of the watershed (from tidal influence to open Bay water, including the Guadalupe River below about Highway 237, both Guadalupe and Alviso sloughs, and the former salt ponds adjacent to these sloughs). Implementation actions in the Guadalupe River watershed TMDLs implementation plan implement the legacy mercury allocation of the San Francisco Bay mercury TMDL to the Guadalupe River watershed.

Problem Statement

Fish downstream of the New Almaden Mining District have extremely high concentrations of mercury in their tissues. As of 2004, Guadalupe Reservoir had the highest recorded fish mercury concentrations in California—about 20 times higher than the U.S. EPA methylmercury criterion. To protect the health of humans who consume fish that may be contaminated by mercury, in 1987 Santa Clara County issued a fish consumption advisory warning people not to eat any fish from Guadalupe, Almaden and Calero reservoirs, Guadalupe and Alamitos creeks, the Guadalupe River, and percolation ponds along the river and creeks.

Terrestrial wildlife that primarily or exclusively eat fish (such as piscivorous birds, the most sensitive wildlife species in the watershed) are at risk from mercury. Because mercury concentrations in fish in waters downstream of the New Almaden Mining District exceed both the narrative bioaccumulation objective (see Section 3.3.21) and the numeric aquatic organism and wildlife mercury water quality objectives (Table 3-4A) the health of piscivorous birds is threatened. Beneficial uses of waters in the watershed that are impaired by mercury are water contact recreation (due to human consumption of fish), wildlife habitat, and preservation of rare and endangered species.

Sources

Mercury mining waste is the largest source of mercury to waters of the Guadalupe River watershed and San Francisco Bay. Mercury is a legacy pollutant from the California Gold Rush, when cinnabar mines in the Central Coast Ranges produced the mercury used to extract gold from the Sierra Nevada. The world's fifth-largest mercury mine was the historic New Almaden Mercury Mining District, located in the headwaters of the Guadalupe River watershed.

Current sources of mercury in the Guadalupe River watershed include 1) mercury mining waste, 2) reservoirs, lakes, and shallow impoundments, where mercury is converted to methylmercury, 3) urban stormwater runoff, 4) nonurban stormwater runoff, and 5) atmospheric deposition.

1) **Mercury mining waste**
   Mercury mining waste is found at historic mine sites and downstream of them, at three categories of locations:
   a) **New Almaden Mining District and Guadalupe Mine**. The New Almaden Mining District includes the following mines and their associated processing areas and mining wastes:
      - New Almaden Mine (Mine Hill, Cora Blanca, Harry, Velasco, Central stope, Victoria, North Randol, South Randol, San Francisco, Santa Mariana, and San Pedro-Almaden mines)
      - America Mine
      - Providencia Mine
      - Enriquita Mine
      - San Antonio Mine
      - San Mateo Mine
      - Senador Mine
      - Deep Gulch placer cinnabar deposit

      Guadalupe mine is located on Los Capitancillos ridge contiguous with the New Almaden Mining District, but because of separate ownership, it has retained a distinct name. Because mining waste was not contained on these mine sites, the wastes continue to erode and discharge large quantities of mercury-laden sediments to streams in the watershed.
   b) **Santa Teresa and Bernal mercury mines**. These much smaller, less productive mercury mines are located within the Guadalupe River watershed outside of the New Almaden Mining District. These mines include the mine sites, their associated processing areas, and mining wastes.
   c) **Depositional areas**. Depositional areas downstream of mercury mines accumulate mercury mining waste and include creek beds, banks, and floodplains, percolation ponds, and shallow impoundments. Impoundments are slow-moving water bodies that form behind engineered structures and anthropogenic alterations to the landscape that pond water. Depositional areas also accumulate mercury from other sources, such as urban stormwater runoff and atmospheric deposition. Depositional areas discharge mercury mining waste (in the form of mercury-laden sediment) to surface waters during periods of erosive flows.
2) **Reservoirs and lakes.** Reservoirs and lakes (deep impoundments) undergo thermal stratification in the dry season. Thermal stratification increases the conversion of inorganic mercury to methylmercury, a bioaccumulative toxin, in the deep, cold waters of a reservoir or lake's hypolimnion. In the dry season, reservoirs and lakes discharge elevated methylmercury concentrations to downstream waters.
3) **Urban stormwater runoff**. Urban stormwater runoff contains mercury from controllable urban sources, such as improperly discarded fluorescent lamps, electrical switches, thermostats, thermometers, and other mercury-containing devices; historical and ongoing industrial activities; and naturally occurring mercury in soil. Mercury in urban stormwater runoff also results in part from atmospheric deposition to the land surface.
4) **Nonurban stormwater runoff.** Nonurban stormwater runoff contains mercury from atmospheric deposition to the land surface, and from naturally occurring mercury in soil.
5) **Atmospheric deposition.** Mercury emissions from many industrial processes are widely dispersed in the atmosphere and deposit directly on the land and water surface. Mercury deposition from the atmosphere is minimal relative to other loads in the watershed.

Targets

The numeric TMDL targets are the fish-tissue water quality objectives from Table 3-4A designed to protect aquatic organisms and wildlife. They are also protective of human health. The targets are:

- 0.05 mg methylmercury per kg fish, average wet weight concentration measured in whole trophic level 3 fish 5–15 cm in length, and
- 0.1 mg methylmercury per kg fish, average wet weight concentration measured in whole trophic level 3 fish >15–35 cm in length.

Total Maximum Daily Loads

The TMDLs, shown in Table 7-A, are expressed as methylmercury and mercury concentrations in water and sediment.

Table 7-A: Total Maximum Daily Loads

Waters	TMDLs
Creeks and river: • Guadalupe Creek • Alamitos Creek • Guadalupe River •	0.2 mg mercury per kg suspended sediment (dry wt., annual median)
Reservoirs and lakes: • Guadalupe Reservoir • Almaden Reservoir • Calero Reservoir • Lake Almaden	1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)

Load and Wasteload Allocations

Concentration-based pollutant allocations by source category, equal to the TMDLs in Table 7-A, are shown in Table 7-B.

Table 7-B: Load and Wasteload Allocations

Source	Load Allocation	Wasteload Allocation
Total Mercury Sources:		
Mercury mining waste discharged from the New Almaden Mining District, and Guadalupe, Santa Teresa, and Bernal mercury mines	0.2 mg mercury per kg erodible mercury mining waste (dry wt., median)[a, b, c]	
Mercury-laden sediment discharged from depositional areas in Alamitos Creek, Guadalupe Creek, Los Gatos Creek downstream of Vasona Dam[d], Canoas Creek, Ross Creek, Guadalupe River, tributaries to these creeks that drain mercury mines, and percolation ponds along these creeks	0.2 mg mercury per kg erodible sediment (dry wt., median)[a, b]	
Urban stormwater runoff discharges[e]: Santa Clara Valley Water District, County of Santa Clara, Town of Los Gatos, cities of Campbell, Monte Sereno, San José, Santa Clara, and Saratoga		0.2 mg mercury per kg suspended sediment (dry wt., annual median)[f]
Nonurban stormwater runoff discharges[g]	0.1 mg mercury per kg suspended sediment (dry wt., annual median)[h]	
Atmospheric deposition	0.02 mg mercury per square meter of water surface (per year)[i]	
Methylmercury production in reservoirs and lakes:		
Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden	1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)[b]	

Notes continued on next page

Notes:

[a] Allocations to mercury mining waste and mercury-laden sediment are not cleanup standards. These allocations are equal to the mercury suspended sediment TMDLs in Table 7-A.

[b] “Erodible” means material readily available for transport by stormwater runoff to surface waters.

[c] The mercury mining waste allocation shall be measured in fines less than 63 microns in diameter.

[d] This allocation applies to the Los Gatos Creek watershed between Vasona Dam and Lenihan Dam.

[e] Urban stormwater runoff is subject to an NPDES permit. At the time of adoption, the permit no. was CAS029718

[f] The urban stormwater runoff allocation is proportionally equivalent to the mass allocation (7.2 kg mercury per year) in the San Francisco Bay mercury TMDL. The urban stormwater runoff allocation is the fraction of the Santa Clara Valley Urban Runoff Pollution Prevention Program allocation attributed to the Guadalupe River watershed. The urban stormwater runoff allocation implicitly includes all current and future permitted discharges within the geographic boundaries of municipalities and unincorporated areas including, but not limited to, California Department of Transportation (Caltrans) roadways and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

[g] This allocation applies to waters that do not drain areas mined for mercury upstream of Lenihan Dam, Guadalupe Reservoir, Almaden Reservoir, and Calero Reservoir.

[h] The nonurban stormwater runoff allocation is proportionally equivalent to the mass allocation (0.5 kg mercury per year) in the San Francisco Bay mercury TMDL. The nonurban stormwater runoff allocation is the fraction of the regionwide allocation attributed to the Guadalupe River watershed. The background mercury concentration in non-urban and non-mined areas is equal to the nonurban stormwater runoff allocation (0.1 mg mercury per kg suspended sediment), and includes mercury from both naturally occurring mercury in soil and atmospheric deposition.

[i] The atmospheric deposition allocation to water surfaces in the Guadalupe River watershed is equal to the rate in the San Francisco Bay mercury TMDL.

[j] The methylmercury allocation to reservoirs and lakes is equal to the methylmercury TMDL in Table 7-A.

Implementation Plan

This implementation plan:

- Implements these TMDLs, allocations, and the water quality objectives in Table 3-4A
- Builds upon past and ongoing successful efforts to reduce mercury loads both in the Guadalupe River watershed and to San Francisco Bay, and anticipates the development of new and innovative methylmercury control methods
- Encourages a coordinated watershed approach
- Reduces mercury loads in the watershed and simultaneously to the South Bay Salt Pond Restoration Project adjacent to Alviso Slough and to San Francisco Bay
- Reduces methylmercury production in the watershed, and reduces the risks from methylmercury exposure to both humans and wildlife.

The Guadalupe River watershed mercury TMDLs implementation plan will proceed in two phases, beginning January 1, 2009, with targets to be attained before 2029. The goals for the first phase include implementing effective source control measures for mining waste at mine sites; completing studies to reduce discharge of mining waste accumulated in Alamitos Creek; and completing studies of methylmercury and bioaccumulation controls in reservoirs and lakes, by December 31, 2018. The goal for the second 10-year phase of implementation is the attainment of the watershed fish tissue targets and the San Francisco Bay mercury TMDL allocations to urban stormwater runoff and legacy mercury sources in the Guadalupe River watershed, by December 31, 2028.

This plan establishes requirements for responsible parties to reduce or control mercury loads using available technology (see Mercury Source Control Actions). If methods under development to reduce methylmercury production and bioaccumulation prove feasible and effective, this plan also requires responsible parties to implement proven methods in Phase I (see Methylmercury Production Control Actions). Monitoring of mercury loads, mercury and methylmercury concentrations in water and suspended sediments, and bioaccumulation will occur throughout both phases to ensure that mercury and methylmercury levels have declined and fish targets are attained (see Coordinated Watershed Monitoring Program). The adaptive implementation section describes the approach and schedule for evaluating and adapting the TMDLs and implementation plan as needed to assure water quality standards are attained.

Mercury Source Control Actions

Actions are required to control mercury mining waste and urban runoff sources. This section specifies actions required to control discharges from sources to surface waters.

Mercury mining waste control actions are phased so that mercury discharges from upstream will be eliminated or significantly reduced before downstream projects are undertaken. Erosion control actions at mercury mines shall be completed within the first 10 years (Phase 1). Water Code Chapter 5.7 contains a program for public agencies and cooperating private parties, who are not otherwise legally responsible for abandoned mine lands, to reduce the threat to water quality caused by these lands without becoming responsible for completely remediating mining waste from abandoned mines. The Water Board encourages these parties to participate in the program.

Downstream erosion control actions shall be completed within the second 10 years (Phase 2). Implementation actions that reduce loads of mercury mining waste and/or mercury-laden sediment to the waters of the Guadalupe River watershed downstream of dams will also count towards achieving the San Francisco Bay mercury TMDL allocation to legacy mercury sources in the Guadalupe River watershed.

The implementation plan for urban stormwater runoff, nonurban stormwater runoff, and atmospheric deposition source categories is contained in the San Francisco Bay mercury TMDL. Monitoring required in the Bay mercury TMDL for urban stormwater runoff is similar to the monitoring requirements herein. Consequently, the urban stormwater runoff permittees may find it is advantageous to participate in coordinated watershed monitoring. Urban stormwater runoff implementation actions in the Guadalupe River watershed that reduce loads of mercury to San Francisco Bay will also count towards achieving the Guadalupe TMDL allocation to the urban stormwater runoff source.

Implementation Actions for Mercury Mines

The Water Board will implement load allocations for mercury mining waste discharged from the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines through Water Code §§ 13267 and 13304 orders to compel investigation, clean up and monitoring, as well as through Basin Plan Section 4.21.4 (*Mining Program Description*) to the extent applicable. Parties responsible for investigation, cleanup, and monitoring include, but are not limited to, current mine site property owners and prior mine owners and/or operators that have caused or permitted, or threaten to cause or permit, mercury to be discharged or deposited where it will probably be discharged into waters of the State and create a condition of pollution or nuisance. Except for the cleanup and restoration projects at Hacienda Furnace Yard (including immediately adjacent reaches in Alamitos Creek); Mine Hill; San Francisco Open Cut; Senador, Enriquita and San Mateo mines; Jacques Gulch; and Deep Gulch; the Water Board will issue the § 13267 orders by June 30, 2009, and the § 13304 orders by June 30, 2011.

These orders will collectively require the responsible parties to:

1. Conduct a site investigation evaluating the erosion potential of mercury mining waste and the potential for seeps to discharge mercury from mining waste to surface waters. Submit the site investigation report for review and approval by the Executive Officer within the first two years of Phase 1, but no later than December 31, 2010.

2. Develop plans and schedules to control mercury mining waste discharges to surface waters. Submit plans and schedules for review and approval by the Executive Officer within 6 months of approval of the investigation report. Implement the approved plans in accordance with the approved schedule.

3. Cleanup and abate discharges of mercury mining waste within the 10-year duration of Phase 1. Submit a cleanup report for review and approval by the Executive Officer no later than December 31, 2018.

4. Monitor to evaluate the following:

    a) effectiveness of erosion control measures
    b) mercury loads discharged annually to waters of the State at the points of discharge
    c) fish bioaccumulation of mercury in waters downstream of the discharge
    d) mercury loads discharged annually to San Francisco Bay, and
    e) answer the questions posed by special study 3b

    Alternatively, the responsible parties may participate in a coordinated watershed monitoring program to address above monitoring requirements c) to e); see Coordinated Watershed Monitoring Program. The Water Board may consider waiving or reducing monitoring requirement b), on an individual basis, based on progress on abating discharges of mining waste and participation in an approved coordinated watershed monitoring program.

Implementation Actions for Depositional Areas
The Water Board will implement load allocations to depositional areas, as defined above, in creeks and the Guadalupe River downstream of mercury mines through Clean Water Act § 401 certifications and/or waste discharge requirements to minimize discharge of mercury-laden sediment. Specifically, when projects are proposed in depositional areas that may result in sediment discharges and/or require § 401 certifications, the Water Board will require projects designed for channel stability and implementation of measures to minimize erosion. Additionally, it will impose monitoring and reporting requirements to demonstrate the effectiveness of erosion control measures in floodplains, creek banks, creek beds, and shallow impoundments.

Examples of projects subject to these requirements include riparian habitat restoration and creek bank stability projects by the District and creekside property owners. The District may also propose projects in shallow impoundments, which will be regulated through the existing § 401 certifications and waste discharge requirements for the District’s Stream Maintenance Program. The Water Board will issue § 401 certifications and/or waste discharge requirements to the District for percolation pond operations and maintenance activities unless actions are satisfactorily undertaken on a voluntary basis.

The Water Board’s strategy for Alamitos Creek, which is highly polluted with mercury mining waste, is to encourage a cooperative effort among the District, local agencies, and creekside property owners to undertake a comprehensive creek bank stability and habitat restoration project. The Water Board encourages the District to be the technical lead for this project, and to seek funding for it. The Water Board will identify mercury cleanup as a grant funding priority for the San Francisco Bay region. Where necessary, the Water Board will invoke its cleanup authority to compel upstream dischargers who initially discharged mercury mining waste into depositional areas, to cleanup and abate mercury mining waste. Creekside property owners are responsible to provide reasonable access to the creek for project studies, construction, and monitoring, and to not take actions on their property that worsen the discharge of mercury mining waste into the creek. The Water Board urges the District and its partners to complete studies by December 31, 2016; submit plans and schedules for review and approval by the Executive Officer by December 31, 2018; and complete and report on the project within the 10-year duration of Phase 2, by December 31, 2028.

Implementation Actions for Urban Stormwater Runoff

The San Francisco Bay mercury TMDL and urban stormwater NPDES permit require control programs for mercury and monitoring (mercury is a pollutant of concern). The stormwater permit allows for a coordinated and collaborative watershed monitoring program. Urban runoff permittees may participate in a coordinated watershed monitoring program to a) determine fish bioaccumulation of mercury in waters downstream of the discharge ("studies aimed at better understanding the fate, transport, and biological uptake of mercury discharged in urban runoff to San Francisco Bay and tidal areas"), and b) determine the loads of mercury discharged annually to San Francisco Bay; see Coordinated Watershed Monitoring Program. Additionally, if the Water Board determines that special study 3b is necessary, urban runoff permittees shall participate in special study 3b during the second 10-year phase of implementation (see "Special Studies" section below), to determine whether urban stormwater runoff contributes to methylmercury production and bioaccumulation. If special study 3b is necessary and it is not undertaken voluntarily, the Water Board will compel permittees and others (see Special Studies) to undertake special study 3b through Water Code § 13267 requirements.

Methylmercury Production Control Actions

The Santa Clara Valley Water District is a leading researcher in methods of controlling methylmercury production and bioaccumulation in reservoirs and lakes. This TMDL project anticipates that before the end of the implementation period (20 years), new methylmercury production controls in reservoirs and lakes will reduce methylmercury bioaccumulation both in the reservoirs and lakes, and downstream. However, if implementation actions in the reservoirs and lakes do not result in attaining targets downstream, the Santa Clara Valley Water District shall evaluate and test additional methods of controlling methylmercury production and bioaccumulation in shallow impoundments.

Implementation Actions for Reservoirs and Lakes

The District shall voluntarily conduct or cause to be conducted technical studies of methylmercury production and control. As necessary, the Water Board will compel the District to undertake technical studies of methylmercury production and control through Water Code § 13267 requirements. The responsible party for these studies and subsequent implementation actions is the owner and operator of the reservoirs and lakes, the District. Without methylmercury controls, construction and operation of reservoirs and lakes create nuisance conditions and discharges of methylmercury, which pollutes downstream waters.

The District shall continue to operate, maintain and improve the performance of, or replace with newer technology, existing methylmercury controls already in place on Lake Almaden, Almaden Reservoir, and Guadalupe Reservoir. The District shall install methylmercury controls in Calero Reservoir, if necessary, by December 31, 2017. The District shall report to the Water Board, by December 31 of odd years beginning in 2009 until directed to stop, on the operation and effectiveness of the methylmercury controls.

Where the Water Board finds it is feasible to reduce methylmercury production and/or bioaccumulation, the Water Board will issue cleanup and abatement orders to the District to undertake actions to reduce fish mercury concentrations to attain the targets.

The Water Code § 13267 requirements and/or cleanup and abatement orders will also require the District to a) determine the loads of mercury discharged annually to waters of the State at the points of discharge, b) monitor mercury in fish tissue, c) determine the loads of mercury discharged annually to San Francisco Bay, and to d) conduct the special studies described in the Monitoring Program below. Alternatively, the District may participate in a coordinated watershed monitoring program to address monitoring requirements b and c, and to address special study 3b); see Coordinated Watershed Monitoring Program. The Water Board may consider waiving or reducing monitoring requirement a), based on participation in an approved coordinated watershed monitoring program.

The Water Board will consider the need to control methylmercury production and bioaccumulation in shallow impoundments in the reviews described below under “Adaptive Implementation.”

Monitoring Program

The monitoring program encompasses:

1. Monitoring to ensure continued effectiveness of erosion control measures to reduce discharges of mercury mining wastes, including mercury-laden sediment (applicable to mercury mines and depositional areas)

2. Monitoring of mercury load at the points of discharge to demonstrate progress in reducing loads (applicable to mercury mines, and reservoirs and lakes)

3. Fish tissue mercury monitoring to assess progress in attaining targets (applicable to mercury mines, and reservoirs and lakes)

4. Monitoring of mercury load to San Francisco Bay to assess progress in attaining the legacy and urban stormwater runoff mass load allocations assigned by the Bay mercury TMDL (applicable to mercury mines, urban stormwater runoff, and reservoirs and lakes)

5. Special studies to inform adaptive implementation of these TMDLs (applicable to mercury mines, urban stormwater runoff, and reservoirs and lakes)

The Water Board will compel the responsible parties to conduct monitoring through NPDES stormwater permits, Water Code § 13267 requirements, and/or cleanup and abatement orders, as described above, which will require the responsible parties to submit a (individual or coordinated watershed) monitoring plan for review and approval by the Executive Officer no later than October 15, 2009. Although the responsible parties are required to satisfy the monitoring requirements individually, the Water Board encourages a coordinated watershed approach particularly for mercury in fish tissue and loads to San Francisco Bay. The Water Board will collaborate with other resource agencies to coordinate fish monitoring, to leverage their expertise and, where possible, to achieve multiple objectives.

Prey fish (i.e., fish that wildlife consume) methylmercury concentrations shall be estimated as a) one hundred percent of the total mercury in eviscerated fish, or b) ninety-five percent of the total mercury in whole fish, or c) a percentage of methylmercury (as total mercury) in fish tissue based on scientific studies and upon approval of the Executive Officer of the Water Board. Large predator fish (i.e., fish that humans consume) methylmercury concentrations shall be estimated as one hundred percent of the total mercury in skinless filet samples. Water quality shall be monitored at the same time and location as fish collection for mercury species, nutrients, and general water quality parameters.

Coordinated Watershed Monitoring Program
The responsible parties may satisfy monitoring requirements 2–5 through a coordinated effort. Fish mercury monitoring is best undertaken in a coordinated effort, because fish integrate methylmercury over time and space. Monitoring of legacy (i.e., mercury mining waste) and urban stormwater runoff mercury discharges to San Francisco Bay is best undertaken in a coordinated effort, because this load to the Bay is from a combination of sources and responsible parties. The Water Board encourages a coordinated watershed approach to monitoring, and will consider reducing or waiving monitoring requirement 2 (mercury load at the points of discharge), based on progress in implementation and participation in coordinated watershed monitoring. To participate in the coordinated watershed monitoring program, participating parties shall submit a coordinated watershed monitoring plan no later than October 15, 2009 for review and approval by the Executive Officer.

Special Studies

Additional studies may be needed to provide information to improve understanding of mercury cycling in the watershed, and to verify assumptions used in developing these TMDLs. Results of the studies will inform adaptive implementation of these TMDLs and the implementation plan. The special studies should address the following questions.

1. How do the reservoirs and lakes in the Guadalupe River watershed differ from one another? Factors to consider include, but are not limited to, area of connected wetlands, food web, water chemistry (phosphorus, pH, acid neutralizing capacity, and dissolved organic carbon), water level fluctuations, and infrastructure (outlet structure). Do outlet samples adequately represent hypolimnetic methylmercury concentrations for each reservoir? How significant are these differences?

2. Is it possible to increase the assimilative capacity for methylmercury in reservoirs and lakes? Is it feasible? If it is feasible, will this help to attain the fish tissue targets? How does increasing the assimilative capacity affect the food web: Is the resulting food chain multiplier from large (>15 cm) trophic level 3 (TL3) to large TL4 fish significantly different from 2? If it is significantly different, where and at what frequency should large predator fish (i.e., fish that humans consume) be monitored?

If the monitoring program has not already provided the information to answer these questions, the Santa Clara Valley Water District shall voluntarily conduct or cause to be conducted studies 1 and 2, or equivalent or alternative studies with prior approval of the Water Board Executive Officer. As necessary, the Water Board will compel the District to undertake these studies in accordance with Water Code § 13267 requirements (see “Implementation Actions for Reservoirs and Lakes”). Completing study 1 within the first five years of Phase 1 (by December 31, 2013), and completing study 2 within the 10-year duration of Phase 1 (by December 31, 2018), would meet the following goal for the first phase of implementation: “completing studies of methylmercury and bioaccumulation controls in reservoirs and lakes”.

3a. What effect do the reservoir and lake control measures have on methylmercury bioaccumulation downstream? Are the fish targets attained downstream?

3b. If not, what factors contribute to methylmercury production and bioaccumulation in creeks and rivers? Factors to consider include, but are not limited to, shallow impoundments, excess nutrients, stagnant pools, shade cover, and aquatic vegetation.

If the monitoring program has not already provided the information to answer these questions, the Santa Clara Valley Water District shall voluntarily conduct or cause to be conducted study 3a, or equivalent or alternative studies with prior approval of the Water Board Executive Officer. As necessary, the Water Board will compel the District to undertake these technical studies in accordance with Water Code § 13267 requirements (see “Implementation Actions for Reservoirs and Lakes”). If the fish targets are not attained downstream by methylmercury controls in the reservoirs and lakes, Santa Clara Valley Water District together with the New Almaden Mining District and the Guadalupe, Santa Teresa and Bernal mercury mines responsible parties, and the urban stormwater runoff permittees shall conduct or cause to be conducted study 3b, or equivalent or alternative studies with prior approval of the Water Board Executive Officer, either voluntarily or in accordance with Water Code § 13267 or NPDES stormwater permit requirements (see above). Completing studies 3a and 3b within the first 5 years of Phase 2 (by December 31, 2023) would support the Water Board’s effort to identify whether methylmercury production and bioaccumulation controls are necessary in shallow impoundments, in accordance with the adaptive implementation program.

4. Where the TL3 50–150 mm target is attained, is methylmercury in fish that Forster’s terns consume (fish less than 50 mm in length), at or below 0.05 mg/kg? Where the TL3 >150–350 mm target is attained, is methylmercury in fish that ospreys consume (TL4 >150–350 mm target), at or below 0.20 mg/kg? If these assumptions pertaining to proportional bioaccumulation are not valid for this watershed, what monitoring should be conducted to support a revised water quality objective and target to protect piscivorous wildlife?

5. Where the larger TL3 target is attained (in fish >150–350 mm), is the smaller TL3 target also attained (fish 50–150 mm)? If so, how should the monitoring frequency for the smaller TL3 target be reduced?

If the monitoring program has not already provided the information to answer these questions, the Water Board will conduct studies 4 and 5. Completing study 4 within the 10-year duration of Phase 1 (by December 31, 2018), would provide timely information to support whether the water quality objectives require revision through the adaptive implementation process. The timing for study 5 is contingent upon the effectiveness of methylmercury controls.

Adaptive Implementation

Adaptive implementation entails taking actions commensurate with the existing, available information, reviewing new information as it becomes available, and modifying actions as necessary based on the new information. Taking action allows progress to occur while more and better information is collected and the effectiveness of current actions is evaluated. Accordingly, these TMDLs will be implemented in phases starting with source controls at mine sites so that upstream mercury discharges will be eliminated or significantly reduced before downstream projects are undertaken.

The Water Board will adapt these TMDLs and the implementation plan to incorporate new and relevant scientific information, so that effective and efficient actions can be taken to attain TMDL allocations and targets. The Water Board recognizes that attaining the methylmercury allocation may be especially difficult because of the need for new and innovative control methods. The Water Board staff will present an annual progress report to the Water Board on implementation of the TMDL that includes evaluation of new and relevant information that becomes available through implementation actions, monitoring, special studies, and current scientific literature. Within ten years of the effective date of this TMDL project (by December 31, 2018), the Water

Board will consider amending this TMDL project and implementation plan as necessary to ensure attainment of fish targets in a timely manner.

Reviews will be coordinated through the Water Board's continuing planning program and will provide opportunities for stakeholder participation. Water Board staff will propose modifications to the targets, allocations, implementation plan actions, or the schedule in this Basin Plan amendment. At a minimum, answers to the following questions will be included in the reviews. Water Board staff will develop additional questions in collaboration with stakeholders during each review.

- Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should this TMDL project be modified?
- Is the watershed progressing toward TMDL targets as expected? If progress is unclear, how should monitoring efforts be modified to detect trends? If there has not been adequate progress, how should the implementation actions or allocations be modified?
- Does additional sediment, water column, or fish tissue mercury or methylmercury data support our understanding of linkages and food webs in the watershed? Does new data suggest an alternative allocation or implementation strategy?
- What are the current pollutant loads from the various sources? Have these loads changed over time? Are they meeting the allocations? How might source control measures be modified to further reduce loads?
- Are Water Board strategies to encourage and compel implementation actions effective? If not, how should the Water Board revise its strategies to reach the goal of attaining fish tissue targets within 20 years?
- Can the assimilative capacity for mercury in reservoirs and lakes be increased? If so, how can reservoirs and lakes be managed to reduce bioaccumulation? Should the implementation actions or allocations be modified? If so, how?
- Are capital projects like the Lower, Downtown, and Upper Guadalupe Flood Control Projects helping to meet TMDL allocations or are these projects causing increasing loads of mercury and methylmercury to the Guadalupe River and San Francisco Bay? If the loads are increased over pre-project conditions, how might the loads be reduced or their effects be mitigated?