# CHAPTER 7: WATER QUALITY ATTAINMENT STRATEGIES INCLUDING TOTAL MAXIMUM DAILY LOADS

Water Quality Attainment Strategies (WQAS) including Total Maximum Daily Loads (TMDLs) deemed necessary and appropriate to ensure attainment and maintenance of water quality standards in the Region are presented in this chapter.

## 7.1 Region-Wide Water Quality Attainment Strategies And TMDLs

### 7.1.1 Water Quality Attainment Strategy and TMDL for Diazinon and Pesticide-related Toxicity in Urban Creeks

The following sections establish a water quality attainment strategy and TMDL for diazinon and pesticide-related toxicity in the Region's urban creeks, including actions and monitoring necessary to implement the strategy. The term "pesticides," as used here, refers to substances (or mixtures of substances) intended for defoliating plants, regulating plant growth, or preventing, destroying, repelling, or mitigating pests that may infest or be detrimental to vegetation, humans, animals, or households, or be present in any agricultural or nonagricultural environment. The term "urban creeks," as used here, refers to freshwater streams that flow through urban areas, including incorporated cities and towns and unincorporated areas with similar land use intensities. This strategy applies to all San Francisco Bay Region urban creeks.

The numeric targets, allocations, and implementation plan described below are intended to ensure that urban creeks meet applicable water quality standards established to protect and support beneficial uses. This strategy will also reduce pesticide concentrations in the Bay resulting from urban creek flows. The effectiveness of the implementation actions, the monitoring undertaken to track progress toward meeting the targets, and the most current scientific understanding pertaining to pesticide-related toxicity will be periodically reviewed, and the strategy will be adapted as necessary to reflect changing conditions and information.

#### 7.1.1.1 Problem Statement

In 1998, a number of the Region's urban creeks were placed on the 303(d) list of impaired waters due to toxicity attributed to diazinon. In the early 1990s, many urban creek water samples collected from selected creeks throughout the Region were toxic to aquatic organisms. Studies found that pesticides, particularly diazinon, caused the toxicity. The 303(d) listings were based on observed toxicity, diazinon detections, and similarities among the Region's urban pesticide use profiles.

When pesticide-related toxicity occurs in urban creek water, creeks do not meet the narrative toxicity objective. When pesticide-related toxicity occurs in sediment, the creeks also do not meet the narrative sediment objective. Likewise, when creek water or sediment is toxic, creeks do not meet the narrative population and community ecology objective. Urban creek waters that fail to meet these objectives are not protective of cold and warm freshwater habitats.

Although U.S. EPA phased out urban diazinon applications at the end of 2004, other pesticides may now pose potential water quality and sediment quality concerns because they are used as diazinon

replacements and because pesticide regulatory programs, as currently implemented, allow pesticides to be used in ways that threaten water quality.

#### 7.1.1.2 Numeric Targets

The numeric targets below interpret the applicable narrative objectives in terms of quantitatively measurable water quality parameters. Meeting these pesticide-related toxicity and diazinon concentration targets will protect cold and warm freshwater habitats. These targets shall be met at all urban creek locations, including those near storm drain outfalls where urban runoff enters receiving waters.

##### *Pesticide-Related Toxicity*

The toxicity targets are expressed in terms of acute toxic units ($TU_a$) and chronic toxic units ($TU_c$). The targets are as follows: pesticide-related acute and chronic toxicity in urban creek water and sediment, as determined through standard toxicity tests, shall not exceed 1.0 $TU_a$ or 1.0 $TU_c$, where $TU_a = 100/NOAEC$ and $TU_c = 100/NOEC$. "NOAEC" refers to the "no observed adverse effect concentration," which is the highest tested concentration of a sample that causes no observable adverse effect (i.e., mortality) to exposed organisms during an acute toxicity test. For purposes of this strategy, "NOEC" refers to the "no observable effect concentration," which is the highest tested concentration of a sample that causes no observable effect to exposed organisms during a chronic toxicity test. NOAEC and NOEC are both expressed as the percentage of a sample in a test container (e.g., an undiluted sample has a concentration of 100%). In both cases, an observable effect must be statistically significant. For purposes of this strategy, an undiluted ambient water or sediment sample that does not exhibit an acute or chronic toxic effect that is significantly different from control samples on a statistical basis shall be assumed to meet the relevant target.

The above definitions of $TU_a$ and $TU_c$ apply only to ambient conditions in the context of this diazinon and pesticide-related toxicity strategy. If toxicity exists in urban creeks but pesticides do not cause or contribute to the toxicity, these targets do not apply. Moreover, the numeric toxicity targets do not limit the Water Board's authority to evaluate attainment of the narrative objectives through other appropriate means.

##### *Diazinon*

The diazinon concentration target is as follows: diazinon concentrations in urban creeks shall not exceed 100 ng/l as a one-hour average. The target addresses both acute and chronic diazinon-related toxicity.

#### 7.1.1.3 Sources

Pesticides, including diazinon, enter urban creeks through urban runoff. Most urban runoff flows through storm drains owned and operated by the Region's municipalities, industrial dischargers, large institutions (e.g., campuses), construction dischargers, and the California Department of Transportation (Caltrans). Urban runoff contains pesticides as a result of pesticides being manufactured, formulated into products, and sold through distributors and retailers to businesses and individuals who apply them for structural pest control, landscape maintenance, agricultural, and other pest management purposes. Factors that affect pesticide concentrations in urban creeks include the amount used, the chemical and physical properties of the pesticide and its product formulation, the sites of use (e.g., landscaping, turf, or paved surfaces), and irrigation practices and precipitation. In the San Francisco Bay Region, ants are the most common pest problem for which pesticides are used. Argentine ants are an introduced species. Pesticide use by structural pest control professionals and use of products sold over-the-counter can be among the greatest contributors of pesticides in urban runoff.

#### 7.1.1.4 Total Maximum Daily Load

The assimilative capacity of the Region's urban creeks for diazinon and pesticide-related toxicity is the amount of diazinon and pesticide-related toxicity they can receive without exceeding water quality standards. For urban creeks to assimilate diazinon and other pesticide discharges and meet water quality standards, the targets must be met. Rather than establishing a mass-based TMDL to attain the targets, this TMDL is expressed in concentration units. The TMDL is equal to the targets.

The targets rely on a conservative approach that provides an implicit margin of safety to account for any lack of knowledge concerning the relationship between the allocations and water quality. Weather and seasons affect creek flows and pesticide loads, concentrations, and toxicity. By expressing the targets in terms of toxicity and diazinon concentrations, the inherent pesticide mass loads automatically reflect seasonal and other critical conditions as creek conditions change.

#### 7.1.1.5 Allocations

The TMDL is allocated to all urban runoff, including urban runoff associated with municipal separate storm sewer systems, Caltrans facilities, and industrial, construction, and institutional sites. The allocations are expressed in terms of toxic units and diazinon concentrations, and are the same as the numeric targets and the TMDL.

#### 7.1.1.6 Implementation

The cornerstone of this strategy is pollution prevention. Pesticide-related toxicity in the Region's urban creeks is to be eliminated and prevented by using pest management alternatives that protect water quality and by not using pesticides that threaten water quality. This can best be accomplished through the rigorous application of integrated pest management techniques and the use of less toxic pest control methods. The term "integrated pest management," as used here, refers to a process that includes setting action thresholds, monitoring and identifying pests, preventing pests, and controlling pests when necessary. Integrated pest management meets the following conditions:

- Pest control practices focus on long-term pest prevention through a combination of techniques, such as biological control, habitat manipulation, and modification of cultural practices;
- Pesticides are used only after monitoring indicates that they are needed;
- Treatments are made with the goal of removing only the target pest; and
- Pesticides are selected to minimize risks to human health, beneficial and non-target organisms, and the environment, including risks to aquatic habitats.

The term "less toxic pest control," as used here, refers to the use of pest control strategies selected to minimize the potential for pesticide-related toxicity in water and sediment.

Strategy implementation will focus on three areas: (1) regulatory programs, (2) education and outreach, and (3) research and monitoring. Regulatory programs will prevent pollution by using existing regulatory tools to ensure that pesticides are not applied in a manner that results in discharges that threaten urban creek uses. Education and outreach programs will focus on decreasing demand for pesticides that threaten water quality, while increasing awareness of alternatives that pose less risk to water quality. Research will fill existing information gaps, and monitoring will be used to measure implementation progress and success. The actions described below are intended to address these strategic goals.

When pesticide-related toxicity occurs in urban creeks, many entities share responsibility for the discharge, and therefore many entities share responsibility for implementing actions to ensure that pesticide-related toxicity does not threaten water quality. Although the allocations apply to all urban runoff, responsibility for attaining the allocations is not the sole responsibility of urban runoff management agencies, whose authority to regulate pesticide use is constrained. Actions to be implemented by regulatory agencies, urban runoff management agencies, and other entities are listed below. The agencies with the broadest authorities to oversee pesticide use and pesticide discharges include U.S. EPA, the California Department of Pesticide Regulation, and the Water Board. Regulatory and non-regulatory actions are needed to ensure that pesticide use does not result in discharges that cause or contribute to toxicity in urban creeks. Implementing these actions is expected to ensure attainment of the allocations. Many entities are already implementing these actions. Actions that can be required through NPDES permits are already in some permits and shall be incorporated into all applicable NPDES permits when the permits are reissued or by other regulatory actions if appropriate. Voluntary actions should commence immediately, and inter-agency coordination is already underway.

### *Water Board Actions*

The role of the Water Board is to encourage, monitor, and enforce implementation actions, and to lead by example. The Water Board will implement the following actions related to regulatory programs:

- Track U.S. EPA pesticide evaluation and registration activities as they relate to surface water quality and share monitoring and research data with U.S. EPA;
- When necessary, request that U.S. EPA coordinate implementation of the Federal Insecticide, Fungicide, and Rodenticide Act and the Clean Water Act;
- Encourage U.S. EPA to fully address urban water quality concerns within its pesticide registration process;
- Work with the California Department of Pesticide Regulation, County Agricultural Commissioners, and the Structural Pest Control Board to ensure that pesticide applications result in discharges that comply with water quality standards;
- Interpret water quality standards for the California Department of Pesticide Regulation and County Agricultural Commissioners, and assemble available information (such as monitoring data) to assist the California Department of Pesticide Regulation and County Agricultural Commissioners in taking actions necessary to protect water quality; and
- Use authorities (e.g., through permits or waste discharge requirements) to require implementation of best management practices and control measures to minimize pesticide discharges to urban creeks.

The Water Board will implement the following actions related to outreach and education:

- Encourage integrated pest management and less toxic pest management practices;
- Encourage grant funding for activities likely to reduce pesticide discharges, promote less toxic pest management practices, or otherwise further the goals of this implementation plan; and
- Encourage pilot demonstration projects that show promise for reducing pesticide discharges throughout the Region.

The Water Board will implement the following actions related to research, monitoring, and overall program coordination:

- Promote and support studies to address critical data needs (see Adaptive Implementation, below); and
- Assist municipalities and others implementing this strategy by convening stakeholder forums to coordinate implementation.

### *U.S. Environmental Protection Agency Actions*

U.S. EPA is responsible for implementing the Federal Insecticide, Fungicide, and Rodenticide Act and the Clean Water Act. U.S. EPA is therefore responsible for ensuring that both federal pesticide laws and water quality laws are implemented. U.S. EPA should exercise its authorities to ensure that foreseeable pesticide applications do not cause or contribute to water column or sediment toxicity in the Region's waters. Because some pesticides pose water quality risks, U.S. EPA should implement the following actions:

- Continue internal coordination efforts to ensure that pesticide applications and resulting discharges comply with water quality standards and avoid water quality impairment (i.e., restrict uses or application practices to manage risks);
- Continue and enhance education and outreach programs to encourage integrated pest management and less toxic pest control; and
- Complete studies to address critical data needs (see Adaptive Implementation, below).

### *California Department of Pesticide Regulation Actions*

Like the Water Board, the California Department of Pesticide Regulation is part of the California Environmental Protection Agency. It regulates pesticide product sales and use within California pursuant to the California Food and Agricultural Code. When the California Department of Pesticide Regulation evaluates whether to register a pesticide product, it must give special attention to the potential for environmental damage, including interference with attainment of water quality standards. The California Department of Pesticide Regulation is mandated to protect water quality from environmentally harmful pesticide materials, which should include pesticides used such that their runoff violates water quality standards. The California Department of Pesticide Regulation should also recognize pesticides used such that their runoff poses a reasonable potential to violate water quality standards to be potentially harmful and take preventive action to address foreseeable risks. The Water Board will assist the California Department of Pesticide Regulation in identifying pesticides that could harm water quality.

The California Department of Pesticide Regulation must endeavor to mitigate adverse effects of pesticides that endanger the environment, such as existing or reasonably foreseeable pesticiderelated violations of water quality standards. If a pesticide product has a demonstrated serious uncontrollable adverse effect, mitigation may include canceling its registration. Mitigation is also warranted to avoid existing and reasonably foreseeable serious uncontrolled adverse effects. The Water Board will notify the California Department of Pesticide Regulation whenever it obtains information concerning actual or potential water quality standard violations so the California Department of Pesticide Regulation can implement appropriate protective actions.

To be effective, this strategy relies on the California Department of Pesticide Regulation to use its authorities in concert with the Water Board. Consistent with its authorities, the California Department of Pesticide Regulation should implement the following actions:

- Work with the Water Board to identify pesticides applied in urban areas in such a manner that runoff does or could cause or contribute to water quality standard violations;

- Condition registrations, as appropriate, to require registrants to provide information necessary to determine the potential for their products to cause or contribute to water quality standard violations and to implement actions necessary to prevent violations;
- Continue and enhance efforts to evaluate the potential for registered pesticide products to cause or contribute to water quality standard violations (the California Department of Pesticide Regulation need not wait for the Water Board to evaluate potential water quality effects);
- Implement actions to eliminate pesticide-related water quality standard violations caused by registered pesticides;
- Implement actions to prevent potential pesticide-related water quality standard violations before they occur;
- Notify U.S. EPA of potential deficiencies in product labels for products that threaten water quality;
- Continue and enhance education and outreach programs to encourage integrated pest management and less toxic pest control (work with County Agricultural Commissioners, urban runoff management agencies, and the University of California Statewide Integrated Pest Management Program to coordinate activities);
- Continue and enhance efforts to prevent the introduction of new exotic pests to the Region; and
- Complete studies to address critical data needs (see Adaptive Implementation, below).

### *Collaboration within the California Environmental Protection Agency*

As sister agencies within the California Environmental Protection Agency, the Water Board and the California Department of Pesticide Regulation should coordinate pesticide and water quality regulation in the Region. In 1997, the California Department of Pesticide Regulation and the State Water Resources Control Board entered into a management agency agreement. The California Department of Pesticide Regulation agreed to ensure that compliance with numeric and narrative water quality objectives is achieved. The State and Regional Water Boards retained responsibility for interpreting compliance with narrative water quality objectives. In light of the agreement, the Water Board and the California Department of Pesticide Regulation should work together to eliminate recurrences of water quality standard violations and prevent potential future violations. In consultation with the California Department of Pesticide Regulation, the Water Board will implement the following actions:

- Gather and review available information to identify pesticides most likely to run off into urban creeks and cause or contribute to water quality standard violations;
- Identify evaluation criteria that can be used to discern whether water quality standards are met (e.g., water quality objectives, targets, monitoring benchmarks, or other criteria);
- Evaluate available information to determine whether water quality standards are met and, if so, whether circumstances suggest that future violations are likely; and
- Notify the California Department of Pesticide Regulation and County Agricultural Commissioners if water quality standard violations exist or are likely to exist in the future due to pesticide discharges, thereby enabling these agencies to implement appropriate actions and assisting them in ensuring that their regulatory programs adequately protect water quality.

In consultation with the Water Board, the California Department of Pesticide Regulation should implement the following actions:

- When available information is insufficient to conclude whether water quality standards are met, work with the Water Board to identify information needed to evaluate the potential for pesticide discharges to cause or contribute to water quality standard violations;
- Obtain information necessary to determine whether water quality standards are or are likely to be met from pesticide product registrants, U.S. EPA, and other sources (conservative [i.e., protective] assumptions may be used to fill information gaps);
- Evaluate whether water quality standards are likely to be met (e.g., consider pesticide use, toxicity, application sites and techniques, runoff potential, and environmental persistence; estimate foreseeable water and sediment pesticide concentrations; and consider Water Board evaluation criteria);
- When pesticide discharges are or are likely to cause or contribute to water quality standard violations, identify and evaluate possible corrective actions (using the Water Board's evaluation criteria) and implement those needed to ensure that water quality standards will be met; and
- When available information suggests that pesticide discharges appear likely to cause or contribute to water quality standard violations in the future (assuming standards are currently met), identify and evaluate possible preventive actions and, commensurate with the weight of the evidence, implement those actions needed to ensure that water quality standards will be met.

Sometimes, a pesticide-by-pesticide approach may be counterproductive, particularly if existing pesticide problems are likely to be replaced by new pesticide problems. As appropriate, the California Department of Pesticide Regulation may evaluate several pesticides at once if related to a specific application method, application site of concern, or other shared factor.

During adaptive implementation reviews (see "Adaptive Implementation," below), the Water Board will consider the extent to which inter-agency collaboration is sufficient to address water quality concerns. If necessary, the Water Board will notify the California Department of Pesticide Regulation of deficiencies and could consider the need to use its own regulatory authorities to control pesticide discharges.

### *County Agricultural Commissioners' Actions*

County Agricultural Commissioners are the local enforcement agents for the California Department of Pesticide Regulation. They provide local enforcement of applicable pesticide laws and, when necessary to address local circumstances (e.g., localized toxicity in an urban creek), can adopt local regulations (subject to California Department of Pesticide Regulation approval) that govern the conduct of pest control operations and the records and reports of those operations. County Agricultural Commissioners should implement the following actions:

- Continue and enhance enforcement related to illegal sale or use of pesticides, including pesticides sold over-the-counter;
- Continue to enforce the phase out of diazinon products and any new regulations affecting pesticide applications and their water quality risks;
- Continue and enhance efforts to prevent the introduction of new exotic pests to the Region;
- Provide outreach and training to pest control licensees regarding water quality issues as part of pest control business license registration and inspection programs; and
- Work with the California Department of Pesticide Regulation, urban runoff management agencies, and the University of California Statewide Integrated Pest Management Program to coordinate education and outreach programs to minimize pesticide discharges.

### *Structural Pest Control Board Actions*

The Structural Pest Control Board is responsible for licensing structural pest control professionals. The Structural Pest Control Board requires training and examinations to maintain a license to practice structural pest control, and regulates the advertising practices of structural pest control businesses. The Structural Pest Control Board should implement the following actions:

- Through licensing and other authorities, work to ensure that structural pest control practices result in discharges that comply with water quality standards;
- Work to develop a mechanism through which consumers can determine which structural pest control providers offer services most likely to protect water quality; and
- Work to enhance initial and continuing integrated pest management training for structural pest control licensees.

### *University of California Actions*

The University of California Statewide Integrated Pest Management Program promotes pest management education and outreach throughout California. The University of California should implement the following actions:

- Continue and enhance educational efforts targeting urban pesticide users to promote integrated pest management and less toxic pest management practices;
- Continue to encourage and support efforts to identify and improve new less toxic pest management strategies for the urban environment;
- Continue to serve as a resource for information on alternative pest management practices that protect water quality and develop publications others can use to support outreach activities;
- Continue to train University of California Master Gardeners to help disseminate information about integrated pest management and pest management alternatives that protect water quality; and
- Work with the California Department of Pesticide Regulation, County Agricultural Commissioners, and urban runoff management agencies to coordinate education and outreach programs to minimize pesticide discharges.

### *Urban Runoff Management Agencies and Similar Entities Actions*

NPDES permits for urban runoff management agencies and similar entities responsible for controlling urban runoff (e.g., industrial facilities, construction sites, California Department of Transportation facilities, universities, and military installations) shall require implementation of best management practices and control measures. Urban runoff management agencies' and similar entities' respective responsibilities for addressing these allocations and targets will be satisfied by complying with the requirements set forth below and permit-related requirements based on them.

Requirements in each NPDES permit issued or reissued and applicable for the term of the permit shall be based on an updated assessment of control measures intended to reduce pesticides in urban runoff. Control measures implemented by urban runoff management agencies and other entities (except construction and industrial sites) shall reduce pesticides in urban runoff to the maximum extent practicable. Control measures for construction and industrial sites shall reduce discharges based on Best Available Technology Economically Achievable. All permits shall remain consistent with the section of this chapter titled "Surface Water Protection and Management—Point Source Control - Stormwater

Discharges." These requirements shall be included in permits no later than five years after the effective date of this strategy. If these requirements prove inadequate to meet the targets and allocations, the Water Board will require additional control measures or call for additional actions by others until the targets and allocations are attained.

The following general requirements shall be implemented through NPDES permits issued or reissued for urban runoff discharges:

- Reduce reliance on pesticides that threaten water quality by adopting and implementing policies, procedures, or ordinances that minimize the use of pesticides that threaten water quality in the discharger's operations and on the discharger's property;
- Track progress by periodically reviewing the discharger's pesticide use and pesticide use by its hired contractors;
- Train the discharger's employees to use integrated pest management techniques and require that they rigorously adhere to integrated pest management practices;
- Require the discharger's contractors to practice integrated pest management; and
- Study the effectiveness of the control measures implemented, evaluate attainment of the targets, identify effective actions to be taken in the future, and report conclusions to the Water Board.

The following education and outreach requirements shall also be implemented through NPDES permits issued or reissued for urban runoff discharges:

- Undertake targeted outreach programs to encourage communities within a discharger's jurisdiction to reduce their reliance on pesticides that threaten water quality, focusing efforts on those most likely to use pesticides that threaten water quality;
- Work with the California Department of Pesticide Regulation, County Agricultural Commissioners, and the University of California Statewide Integrated Pest Management Program to coordinate education and outreach programs to minimize pesticide discharges.
- Encourage public and private landscape irrigation management that minimizes pesticide runoff; and
- Facilitate appropriate pesticide waste disposal, and conduct education and outreach to promote appropriate disposal.

The following monitoring and reporting requirements shall also be implemented through NPDES permits issued or reissued for urban runoff discharges:

- Monitor diazinon and other pesticides discharged in urban runoff that pose potential water quality threats to urban creeks; monitor toxicity in both water and sediment; and implement alternative monitoring mechanisms, if appropriate, to indirectly evaluate water quality as described below (see Monitoring, below);
- Disseminate monitoring data to appropriate regulatory agencies; and
- Contribute to studies to address critical data needs (see Adaptive Implementation, below).

The following requirements related to regulatory programs shall also be implemented through NPDES permits issued or reissued for urban runoff discharges:

- Track U.S. EPA pesticide evaluation and registration activities as they relate to surface water quality and, when necessary, encourage U.S. EPA to coordinate implementation of the Federal

Insecticide, Fungicide, and Rodenticide Act and the Federal Clean Water Act and to accommodate water quality concerns within its pesticide registration process;

- Assemble and submit information (such as monitoring data) as needed to assist the California Department of Pesticide Regulation and County Agricultural Commissioners in ensuring that pesticide applications within the Region comply with water quality standards; and
- Report violations of pesticide regulations (e.g., illegal handing) to County Agricultural Commissioners.

The actions above may be implemented by individual urban runoff management entities, jointly by two or more entities acting in concert, or cooperatively through a regional approach, as appropriate.

NPDES permits issued or reissued for industrial, construction, and California Department of Transportation facilities shall implement the general requirements and education and outreach requirements listed above and monitoring requirements as appropriate.

#### *Private Entities Actions*

Most pesticides do not occur naturally in the environment; they are manufactured. Pesticide manufacturers and formulators sell products to distributors and retailers, who sell them to the pesticide users who apply them. These private entities should implement the following actions to prevent pesticide-related toxicity in urban creeks:

- Pesticide manufacturers and formulators should minimize potential pesticide discharges by developing and marketing products designed to avoid discharges that exceed water quality standards. (Many manufacturers successfully market such products.) They should also undertake studies to address critical data needs (see Adaptive Implementation, below);
- Distributors and retailers should offer point-of-sale information on less toxic alternatives. They should also offer and promote less toxic alternatives to customers;
- Pest control advisors should recommend integrated pest management strategies so pesticides that could threaten water quality are used only as a last resort; and
- Pesticide users (e.g., private citizens, professional pesticide applicators, school districts, transit districts, and mosquito abatement and vector control districts) should adopt integrated pest management and less toxic pest control techniques so pesticide applications do not contribute to pesticide runoff and toxicity in urban creeks.

### 7.1.1.7 Monitoring

Monitoring is needed to demonstrate target attainment and to track and evaluate the effectiveness of strategy implementation. Diazinon monitoring needs to demonstrate that diazinon concentrations meet the target. When the concentrations consistently drop below the target, such monitoring may no longer be needed. However, because other pesticides will continue to be applied in urban areas, the need to monitor for water and sediment toxicity—and sometimes specific pesticides—will likely remain well after achieving the diazinon concentration target.

A number of programs monitor pesticide concentrations and toxicity in the Region's waters, including the Water Board's Surface Water Ambient Monitoring Program, the California Department of Pesticide Regulation's Surface Water Protection Program, and the Regional Monitoring Program for Trace Substances. Municipal storm water NPDES permits may also require dischargers to characterize their

discharges and receiving waters. This can involve monitoring toxicity and specific pollutants, like diazinon, in storm drain systems and urban creeks.

### *Monitoring Requirements*

Monitoring requirements shall be implemented through NPDES permits issued or reissued for urban runoff discharges. Urban runoff management agencies shall undertake monitoring efforts related to pesticides and toxicity. They shall design and implement a monitoring program to answer the following questions:

- Is the diazinon concentration target being met?
- Are the toxicity targets being met?
- Is toxicity observed in urban creeks caused by a pesticide?
- Is urban runoff the source of any observed toxicity in urban creeks?
- How does observed pesticide-related toxicity in urban creeks (or pesticide concentrations contributing to such toxicity) vary in time and magnitude across urban creek watersheds, and what types of pest control practices contribute to such toxicity?
- Are actions already being taken to reduce pesticide discharges sufficient to meet the targets, and if not, what should be done differently?

The monitoring program may be developed by individual urban runoff management agencies, jointly by two or more agencies acting in concert, or cooperatively through a regional approach. Designing the program shall involve characterizing watersheds, selecting representative creeks, identifying sample locations, developing sampling plans, and selecting appropriate analytical tests of water and sediment. Chemical and toxicity tests shall be conducted on urban creek water and sediment. At a minimum, tests shall be used to measure the following:

- Water column toxicity;
- Sediment toxicity;
- Diazinon concentrations in water (until the diazinon concentration target is met consistently); and
- Concentrations of other pesticides that pose potential water quality and sediment quality threats, as feasible.

Sampling frequency, timing, and number of samples shall be adequate to answer the monitoring questions above and any others set forth for the monitoring program.

Additional types of monitoring tools may be used to support and optimize conventional water and sediment monitoring. For example, monitoring in storm drain systems or near application sites may be useful in selecting creek sampling strategies because pesticide concentrations are easier to detect nearer to the pesticide application site. Efforts to monitor parameters that can serve as surrogates or indicators of pesticide-related water quality conditions may moderate the need for more comprehensive water quality monitoring. While some toxicity and pollutant monitoring will always be necessary, extensive monitoring will be less important if other information is collected that can be used to evaluate the potential for toxicity or specific pollutants to occur in water. Alternative monitoring information can also help focus water quality monitoring efforts and mitigation actions. Such monitoring could include reviewing pesticide sales and use data for the Region, pesticide fate and transport data, and public attitudes

regarding pesticides and water quality. If undertaken, such monitoring may seek to answer the following questions:

- What pesticides pose the greatest water quality risks?
- How is the use of such pesticides changing?
- Are existing actions effective in reducing pesticide discharges that threaten water quality?
- What approach is best for monitoring toxicity and pesticides in urban creek water and sediment?

### *Monitoring Benchmarks*

To determine whether measured or predicted pesticide concentrations in water are cause for concern, monitoring benchmarks are needed. Ideally, water quality criteria would be used; however, water quality criteria do not exist for most pesticides. In the absence of water quality criteria, a monitoring benchmark may be calculated as follows. Such a monitoring benchmark is not a water quality objective unless adopted as such by the Water Board. Where valid tests have determined four-day $LC_{50}$ values for aquatic organisms (the concentration that kills one half of the test organisms), a monitoring benchmark may be calculated by dividing the lowest $LC_{50}$ value measured by the appropriate benchmark factor from Table 7.1.1-1 (typically 14 or less for a registered pesticide).

$$\text{Monitoring Benchmark} = \text{Lowest } LC_{50} \div \text{Benchmark Factor}$$

Where multiple $LC_{50}$ measurements are available, the lowest "genus mean acute value" may be used in place of the lowest $LC_{50}$. The term "genus mean acute value," as used here, refers to the geometric mean of the available "species mean acute values" within a genus. The term "species mean acute value," as used here, refers to the geometric mean of available four-day $LC_{50}$ values for each species. Other available information regarding the pesticide (such as its potential for sub-lethal effects) may also be considered to determine if lower monitoring benchmarks are appropriate to reflect attainment of the narrative objectives. Table 7.1.1-1 is not intended for deriving monitoring benchmarks for sediment tests.

**Table 7.1.1-1 Benchmark Factors**

| Number of Data Requirements Satisfied [a] | Benchmark Factor [b] |
|---|---|
| 2 | 16 |
| 3 | 14 |
| 4 | 14 |
| 5 | 12 |
| 6 | 10 |
| 7 | 8 |

Notes:
[a] U.S. EPA water quality criteria guidelines require data for at least eight taxonomic families to derive water quality criteria.
[b] These values apply only when both daphnid and salmonid toxicity data are available. U.S. EPA typically requires such data to register a pesticide.

When monitoring data demonstrate that pesticide concentrations exceed monitoring benchmarks, the information will be considered during periodic reviews undertaken as part of adaptive implementation (see below). When pesticide concentrations exceed monitoring benchmarks, the Water Board may consider such information in determining compliance with the narrative toxicity, sediment, and population and community ecology objectives. The Water Board may also seek additional toxicity data to derive water quality criteria. The Water Board may inform other regulatory agencies (e.g., the California Department of Pesticide Regulation) about the potential threat to water quality and seek action to prevent water quality impairment.

### 7.1.1.8 Adaptive Implementation

Adaptive implementation entails taking immediate actions commensurate with available information, reviewing new information as it becomes available, and modifying actions as necessary based on the new information. Taking immediate action allows progress to occur while more and better information is collected and the effectiveness of current actions is evaluated. Table 7.1.1-2 lists specific actions the Water Board will use to track its progress and an implementation timeframe.

**Table 7.1.1-2: Water Board Implementation Measure Tracking**

| Action | Schedule |
|---|---|
| Summarize pesticide regulatory activities as they relate to water quality, and identify opportunities to advise pesticide regulatory oversight agencies regarding future actions | Annually |
| Summarize research and monitoring data for pesticide regulatory oversight agencies and others, and determine where to focus future monitoring efforts based on critical data needs | Annually |
| Describe urban pesticide use trends and identify pesticides likely to affect water quality | Annually |
| Notify pesticide regulatory oversight agencies if water quality standard violations exist or are likely to exist in the future due to pesticide discharges | At least annually |
| Identify waters impaired by pesticide-related toxicity and waters where there is a potential for impairment | Biennially |
| Meet or correspond with pesticide regulatory oversight agencies regarding their | At least annually |

| Action | Schedule |
|---|---|
| roles in protecting water quality | |
| Place required actions in NPDES stormwater permits | No later than five years from effective date of strategy |
| Report implementation status to Water Board | Annually |

### *Periodic Review*

The Water Board will review this strategy approximately every five years. The reviews will be coordinated through the Water Board's continuing planning program and will provide opportunities for stakeholder participation. If any modifications are needed, they will be incorporated into the Basin Plan. At a minimum, the following focusing questions will be used to conduct the reviews. Additional focusing questions will be developed in collaboration with stakeholders during each review.

- Are changes in urban creek conditions moving toward improvements in water quality (e.g., toward target attainment)?
- If it is unclear whether there is progress, how should monitoring efforts be modified to measure trends?
- If there has not been adequate progress, how might the implementation actions or allocations be modified to improve progress?
- Is there new information that suggests the need to modify the targets, allocations, or implementation actions?
- If so, how should the strategy be modified?

During the periodic reviews, the Water Board will consider newly available information regarding such topics as market trends, monitoring results, tools for risk evaluation, outreach effectiveness, and regulatory actions.

### *Additional Sources*

As the strategy is implemented, additional sources of pesticide-related toxicity may emerge, either as the result of a new discharge or a new pesticide being applied. In such situations, the allocations for additional sources shall be the same as those for the existing sources unless the Water Board finds these allocations to be inappropriate or chooses to refine the strategy in some other manner.

### *Critical Data Needs*

Various types of information and tools are needed to adequately evaluate the risks associated with pesticide runoff. To the extent possible, the pesticide industry should shoulder the burden of collecting this information and developing appropriate tools. At times, however, the citizens of the Region (as represented by the Water Boards, the urban runoff management agencies, and others) should lead by example. Therefore, the pesticide industry should undertake and others should support and promote the following actions:

- Conduct surveillance monitoring of surface waters and sediment and publicly report the results;
- Develop publicly available and commercially viable analytical methods to detect ecologically relevant concentrations of pesticides that pose water quality risks;

- Develop procedures that can be used to identify potential causes of toxicity in water and sediment (e.g., Toxicity Identification Evaluation procedures);
- Complete publicly available studies that characterize the fate and transport of pesticides applied in urban areas;
- Develop and adopt evaluation methods (e.g., quantitative fate and transport models) for urban pesticide applications, including applications to impervious surfaces; and
- Complete publicly available studies to support the development of water quality criteria for pesticides in water and sediment.

## 7.2 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR SAN FRANCISCO BAY AND BAY SEGMENTS

### 7.2.1 Water Quality Attainment Strategy to Support Copper Site-specific Objectives for San Francisco Bay, and Nickel Site-specific Objectives for South San Francisco Bay

The Water Quality Attainment Strategy (WQAS) for copper in all San Francisco Bay segments (see Figure 7.2.1-1) and nickel in South San Francisco Bay is designed to prevent water quality degradation and ensure attainment of the copper and nickel site-specific objectives (SSOs). This section describes the details of the WQAS and how the Water Board will use its regulatory authority to implement this strategy.

The four elements of the WQAS are:

- Control measures/actions to minimize the discharge of copper (from wastewater treatment plants, urban runoff, anti-fouling boat paints, and lagoons to ensure that significant copper sources are properly managed)
- Statistically-based water quality "triggers" and a receiving water monitoring program that would initiate additional control measures/actions if the "triggers" are exceeded
- Metal translators that will be used to compute copper and nickel effluent limits for the municipal wastewater treatment plants discharging to South San Francisco Bay
- Metal translators that will be used to compute copper effluent limits for municipal and industrial wastewater treatment plants that discharge to deep water (see Section 4.6.1 for definition) north of the Dumbarton Bridge

#### 7.2.1.1 Background

All San Francisco Bay segments (see Figure 7.2.1-01) meet water quality objectives for copper and nickel. Since the mid-1980s, because of effective treatment and successful pollution prevention and source control efforts, substantial reductions in metal loading to San Francisco Bay segments have been achieved. Other sources that are difficult to manage such as urban runoff (which includes copper from automobile brake pads), historical deposits of copper in the Bay sediments, and natural sources of copper are among the dominant contributions to current ambient water concentrations. SSOs (see Chapter 3) for dissolved copper in all Bay segments (and nickel in South San Francisco Bay) have been derived using toxicity data representing site-specific conditions in all San Francisco Bay segments, and these SSOs fully protect San Francisco Bay beneficial uses.


**Figure 7.2.1-1 Segments of San Francisco Bay showing location of Hayward Shoals as a line connecting Little Coyote Point and the Oakland Airport.**

#### 7.2.1.2 Implementation Plan and Monitoring Program

This section discusses the actions and ambient monitoring program needed to ensure continued attainment of the copper site-specific objectives throughout San Francisco Bay and ensure that copper sources are properly managed so ambient copper levels do not increase due to potential increases in loading of copper to San Francisco Bay. The implementation plan also calls for requirements in NPDES permits to support investigations to resolve three key areas of remaining technical uncertainty regarding copper: urban tributary loads and trends; toxicity to benthic organisms; and possible effects on the olfactory system of salmonids.

##### *Control Measures for Urban Runoff Management Agencies*

The NPDES permits for urban runoff management agencies shall require the implementation of best management practices and copper control measures designed to prevent urban runoff discharges from causing or contributing to exceedances of copper water quality objectives. Requirements in each permit issued or reissued and applicable for the term of the permit shall be based on an updated assessment of control measures intended to reduce copper in stormwater runoff to the maximum extent practicable. Urban runoff management agencies must implement control measures targeting: vehicle brake pads, architectural copper, copper pesticides, and industrial copper use. Additionally, these permits shall contain requirements to conduct or cause to be conducted: monitoring of copper loading to the Bay at locations and frequency sufficient to track loading trends; and technical studies to investigate possible copper sediment toxicity and sublethal effects on salmonids.

If an ambient trigger concentration in any San Francisco Bay segment (see Ambient Monitoring Program, below) is exceeded, all urban runoff management agencies discharging to that segment shall submit a report to the Water Board that describes best management practices that are currently being implemented and additional measures, with a schedule, that will be implemented to prevent their copper discharges from causing or contributing to the exceedance.

##### *Control Measures for Wastewater Treatment Facilities*

The management measures for municipal and industrial wastewater treatment facilities will be implemented through their individual NPDES permits, which shall include the following elements:

- Water quality-based effluent limits (WQBELs) computed from the SSOs.
- Baseline Program of pollution prevention measures.
- Requirement to conduct or cause to be conducted technical studies to investigate possible copper sediment toxicity and sublethal effects on salmonids.
- Effluent Monitoring and Reporting.

The baseline pollution prevention measures for wastewater facilities include:

- Evaluate copper sources (all municipal and industrial facilities)
- Confirm industrial facility compliance with local pre-treatment copper limits (municipal facilities only)
- Control municipal water supply pipeline corrosion from commercial and residential sources (municipal facilities only)

More advanced, facility-specific pollution prevention measures shall be implemented by facilities that exceed a copper effluent limit due to increased copper influent loading compared to the previous year's performance. Additionally, if an ambient trigger concentration (see Ambient Monitoring Program, below)

is exceeded, each municipal and industrial wastewater facility discharging to that segment of the Bay shall evaluate the history of its facility's effluent copper concentrations. Those facilities with increasing copper effluent trends shall develop and implement plans to control these increasing levels.

### Metal Translators

An important regulatory element of the WQAS is the specification of metal translators. Water quality objectives for copper and nickel are expressed as dissolved metal concentrations. Effluent limits for the wastewater dischargers' treatment facilities are expressed as total metal concentrations and must be calculated according to the procedure outlined in the "Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California." Therefore, for metals like copper and nickel, the calculation of an effluent limit requires the use of a ratio of total to dissolved metals called the metal translator.

South San Francisco Bay copper and nickel translators were developed using a regression relationship between the translators and total suspended solids (TSS). The translators were computed by evaluating the upper 95 percent confidence interval regression relationship at the median TSS value for South San Francisco Bay. For this reason, there is a single translator value for each metal (Table 7.2.1-1). The higher translators that result from using the upper confidence level regression result in lower numeric effluent limits and provide an additional measure of protection of beneficial uses.

There is not a strong relationship between TSS and translators for the segments of the Bay north of the Dumbarton Bridge. There are geographic differences in computed translators between the northernmost segments and those in the southern segments the Bay. In such cases, median and 90th percentile translators can be computed from available data for use in computing average monthly and maximum daily effluent limits, respectively. The translators in Table 7.2.1-2 apply only to deepwater wastewater discharges to San Francisco Bay because the available translator data are not representative of shallow water discharge (defined as those wastewater discharges that have been granted an exception to the prohibition against wastewater discharges into non-tidal water, dead-end sloughs or at any point that wastewater does not receive dilution of at least 10:1) locations. Shallow water wastewater dischargers must develop translators applicable to the discharge location at the time of permit reissuance.

**Table 7.2.1-1 Translators Applicable to South San Francisco Bay Municipal Wastewater Discharges for Copper and Nickel**

| Bay Segments | Copper Translator For Effluent Limit Calculation | Nickel Translator For Effluent Limit Calculation |
|---|---|---|
| South San Francisco Bay | 0.53 | 0.44 |

**Table 7.2.1-2 Translators Applicable to Other San Francisco Bay Municipal and Industrial Wastewater Deep Water Discharges for Copper**

| Bay Segments | Copper Translator For Average Monthly Effluent Limit Calculation | Copper Translator For Maximum Daily Effluent Limit Calculation |
|---|---|---|
| Suisun Bay<br>San Pablo Bay | 0.38 | 0.66 |
| Central San Francisco Bay<br>Lower San Francisco Bay | 0.73 | 0.87 |

### *Copper From Anti-Fouling Boat Paint*

Paints applied to boats and ships to control unwanted "fouling" growth on their hulls often contain copper-based biocides. In San Francisco Bay, there are major ports, industrial piers, and dozens of marinas. Boats and ships coated with copper-containing biocides may release copper directly into the Bay during storage, operation, and in-water maintenance.

The Water Board is relying on the authority of the California Department of Pesticide Regulation (DPR) to regulate the pesticidal use of copper in antifouling paints such that water quality objectives will be attained. The Water Board will work with DPR as it executes its regulatory strategy for biocides in marine antifouling coatings, which includes monitoring to evaluate water quality impacts and review of registration status.

### *Control Measures for Lagoons*

There are many managed lagoons that are hydraulically connected to the Bay. Because of nutrient loading and stagnant conditions, excessive growth of aquatic plants and algae can cause nuisance conditions. In addition to mechanical harvesting, copper-based algaecides are used to control nuisance plant and algae growth. The application of these algaecides is permitted under the State Water Board's Statewide General NPDES Permit (Order No. 2004-0009-DWQ) for discharges of aquatic pesticides to surface waters. The Water Board recognizes coverage under the general permit as being sufficient to ensure that application of copper pesticides to lagoons shall not cause or contribute to violations of the water quality objectives.

### *Ambient Monitoring Program*

The implementation plan establishes copper control measures in order to prevent increases in ambient dissolved copper concentrations. Ambient concentrations of copper in the Bay have remained essentially unchanged from 1993 through 2006 and are not expected to increase in the future. In order to determine systematically if ambient concentrations have increased, specific copper concentration triggers are compared to data collected through the Regional Monitoring Program for Trace Substances (RMP). This is accomplished by calculating every year the three-year rolling mean of RMP copper concentrations in segments of the Bay. These rolling mean concentrations will be compared to trigger concentration values for each segment. The trigger concentrations (shown in Table 7.2.1-3) were calculated in order to detect a change (from 2003 concentrations) in dissolved copper concentration of about 1 μg/L with a statistical power of 99%. If the trigger concentration is exceeded in any Bay segment, the Water Board will investigate causes of the exceedance and potential control options and require wastewater and urban runoff dischargers to that segment to investigate whether they have caused or contributed to the

exceedance and, if so, to identify and submit a plan and schedule to implement controls to resolve their contribution to the exceedance.

The Water Board will assess the continued appropriateness of the SSOs for San Francisco Bay should conditions change in Bay water quality. Dissolved organic carbon (DOC) will be used as a surrogate measure of the protective effect of Bay water against copper water column toxicity. An analysis and evaluation of trends in DOC data collected through the RMP will determine whether or not additional water column toxicity tests are needed to confirm that the SSOs are protective. In addition, the Water Board will evaluate sediment copper concentration and sediment toxicity data collected through the RMP to assess possible effects related to copper accumulation in Bay sediments. The need for a reevaluation of the SSOs or other regulatory actions will be established through the triennial review of the Basin Plan.

**Table 7.2.1-3 Dissolved Copper (µg/L) Trigger Concentrations at 99% Statistical Power**

| Bay Segment (or portion thereof) | Trigger Level ( µg/ L) |
|---|---|
| Suisun Bay | 2.8 |
| San Pablo Bay | 3.0 |
| Central San Francisco Bay<br>Lower San Francisco Bay (north Hayward Shoals) | 2.2 |
| Lower San Francisco Bay (south of Hayward Shoals) | 3.6 |
| South San Francisco Bay | 4.2 |

## 7.2.2 San Francisco Bay Mercury TMDL

The following sections establish the allowable annual mercury load (Total Maximum Daily Load [TMDL]) to San Francisco Bay, and actions and monitoring necessary to implement the TMDL. The numeric targets, allocations, and associated implementation plan will ensure that all San Francisco Bay segments attain applicable water quality standards, including the mercury water quality objectives set forth in Table 3-3B, established to protect and support beneficial uses.

The TMDL allocations and implementation plan focus on controlling the amount of mercury that reaches the Bay and identifying and implementing actions to minimize mercury bioavailability. The organic form of mercury (methylmercury) is toxic and bioavailable, but information on ways of controlling methylmercury production is limited. However, this is an area of active research and strategies for controlling this process are forthcoming. The effectiveness of implementation actions, monitoring to track progress toward targets, and the scientific understanding pertaining to mercury will be periodically reviewed and the TMDL may be adapted as warranted.

### 7.2.2.1 Problem Statement

San Francisco Bay is impaired because mercury contamination is adversely affecting existing beneficial uses, including sport fishing, preservation of rare and endangered species, and wildlife habitat. Mercury concentrations in San Francisco Bay fish are high enough to threaten the health of humans who consume them. In addition, mercury concentrations in some bird eggs harvested from the shores of San Francisco Bay are high enough to account for abnormally high rates of eggs failing to hatch.

In the context of this TMDL, "San Francisco Bay" refers to the following water bodies:

- Sacramento/San Joaquin River Delta (within San Francisco Bay region)
- Suisun Bay
- Carquinez Strait
- San Pablo Bay
- Richardson Bay
- Central San Francisco Bay
- Lower San Francisco Bay
- South San Francisco Bay (including the Lower South Bay)

This TMDL also addresses the following mercury-impaired water bodies that exist within the water bodies listed above:

- Castro Cove (part of San Pablo Bay)
- Oakland Inner Harbor (part of Central San Francisco Bay)
- San Leandro Bay (part of Central San Francisco Bay)

#### 7.2.2.2 Numeric Targets

TMDL numeric targets interpret narrative and/or numeric water quality standards, including beneficial uses and water quality objectives. To protect humans who consume Bay fish, the average fish tissue mercury concentration for a commonly consumed fish species is specified below as a human health target. To protect wildlife and rare and endangered species, the average fish tissue mercury concentration in fish consumed by piscivorous birds is specified below as a wildlife target. The goal of this target is that controllable water quality factors not cause detrimental mercury concentrations in San Francisco Bay wildlife, which is consistent with the bioaccumulation objective in Chapter 3. To achieve the human health and wildlife targets and to attain water quality standards, the Baywide suspended sediment mercury concentration target is 0.2 mg mercury per kg dry sediment.

The Regional Monitoring Program (RMP) conducts monitoring relevant to evaluating progress toward meeting the sediment and human health and wildlife targets. The following passages describe acceptable approaches to evaluate progress toward meeting the targets. Other approaches can be considered during adaptive implementation reviews.

##### *Suspended Sediment Target*

The suspended sediment target (0.2 mg mercury per kg dry sediment) shall be compared to the annual median Bay suspended sediment mercury concentration found through RMP monitoring. The suspended sediment mercury concentration shall be computed as the difference between total and dissolved mercury concentration in a water sample (at each location) divided by the suspended sediment concentration for that same sample.

### *Human Health Target*

The human health target is a fish tissue mercury concentration (0.2 mg mercury per kg fish tissue). This target applies to average wet weight fish tissue muscle concentrations in 60 cm long striped bass. The RMP conducts fish tissue sampling and analysis in San Francisco Bay every three years. Progress toward attainment of the human health target shall be evaluated by tracking mercury concentrations in striped bass, a commonly consumed sport fish with relatively high mercury concentrations. Striped bass are routinely caught in three size ranges: 45-59 cm (small), 60-82 cm (medium), and larger than 82 cm (large). To provide sufficient data to evaluate the target, striped bass in the small and medium size ranges should be caught and analyzed. The best functional relationship between mercury concentration and length shall be established for the fish caught, and the resulting equation of fit shall be evaluated at 60 cm to compute the mercury concentration to compare to the human health target. The RMP tracks mercury concentrations in other San Francisco Bay sportfish, such as halibut and jack-smelt. This information will be used to assess overall trends and human health risks.

### *Wildlife Target*

The wildlife target is a fish tissue mercury concentration (0.03 mg mercury per kg fish). This target applies to average wet weight whole fish concentrations in 3–5 cm length fish.

The RMP is developing a long term monitoring program to evaluate mercury concentrations in small fish typically consumed by birds, including by the California least tern. Progress toward attainment of the wildlife target will be evaluated by tracking mercury concentrations in 3–5 cm long Bay fish. The RMP is also collaborating with the U.S. Fish and Wildlife Service on long-term monitoring and analysis of bird egg mercury concentrations.

## 7.2.2.3 Sources and Losses

During the California Gold Rush, cinnabar mines in the Central Coast Ranges produced the mercury used to extract gold from the Sierra Nevada foothills. Mercury was later mined and used to produce munitions, electronics, and health care and commercial products.

The year 2003 estimate of total mercury inputs to the San Francisco Bay is about 1220 kg/yr. The sources of mercury in San Francisco Bay include bed erosion (about 460 kg/yr), the Central Valley watershed (about 440 kg/yr), urban stormwater runoff (about 160 kg/yr), the Guadalupe River watershed (about 92 kg/yr), direct atmospheric deposition (about 27 kg/yr), non-urban stormwater runoff (about 25 kg/yr), and wastewater discharges (about 18 kg/yr). There is a potential that mercury may enter the Bay from Bay margin contaminated sites and abandoned mercury mines outside the Guadalupe watershed. An evaluation of these potential sources is addressed below under Mercury TMDL Implementation.

Using box models for sediment and mercury inputs and outputs to and from San Francisco Bay, the 2003 estimate for San Francisco Bay mercury losses is approximately 1700 kg/yr. Mercury leaves the Bay by transport to the Pacific Ocean via the Golden Gate, the net result of dredging and disposal (in-Bay and upland), and other losses.

## 7.2.2.4 Allocations

Tables 7.2.2-1 through 7.2.2-5 present load and wasteload allocations for San Francisco Bay mercury sources. Table 7.2.2-1 presents load and wasteload allocations by source category and the 2003 estimated annual loads. Tables 7.2.2-2 through 7.2.2-5 contain wasteload allocations for individual wastewater and

urban stormwater discharges to San Francisco Bay. When summed, the individual allocations equal the category totals for urban stormwater and wastewater shown in Table 7.2.2-1.

**Table 7.2.2-1 Mercury Load and Wasteload Allocations By Source Category**

| Source | 2003 Mercury Load (kg/yr) | Allocation (kg/yr) |
|---|---|---|
| Bed erosion[a] | 460 | 220 |
| Central Valley Watershed | 440 | 330 |
| Urban Stormwater Runoff | 160 | 82 |
| Guadalupe River Watershed (mining legacy) | 92[b] | 2 |
| Atmospheric deposition | 27 | 27 |
| Non-urban stormwater runoff | 25 | 25 |
| Wastewater (municipal and industrial) | 18 | 12 |
| Sediment dredging and disposal[c] | net loss | 0 |
| | | ≤ ambient concentration |

Notes:

[a] Bed erosion occurs as mercury buried in Bay sediment becomes available for biological uptake when overlying sediment erodes.

[b] This load does not account for mercury captured in ongoing sediment removal programs conducted in the watershed.

[c] Sediment dredging and disposal often moves mercury-containing sediment from one part of the Bay to another. The dredged sediment mercury concentration generally reflects ambient conditions in San Francisco Bay sediment. This allocation is both mass-based and concentration-based. The allocation will be implemented by confirming both that the combined effect of dredging and disposal continues to be a net loss and that the mercury concentration of dredged material disposed in the Bay must be at or below the Baywide ambient mercury concentration. This allocation ensures that this source category continues to represent a net loss of mercury.

## Table 7.2.2-2 Individual Wasteload Allocations for Mercury in Urban Stormwater Discharges

| Entity | NPDES Permit | Allocation (kg/yr)[a] | Load Reduction (kg/yr)[b] |
|---|---|---|---|
| Santa Clara Valley Urban Runoff Pollution Prevention Program | CAS029718 | 23 | 21 |
| Alameda Countywide Clean Water Program | CAS029831 | 20 | 19 |
| Contra Costa Clean Water Program | CAS029912 | 11 | 11 |
| San Mateo County Stormwater Pollution Prevention Program | CAS029921 | 8.4 | 8.0 |
| Vallejo Sanitation and Flood Control District | CAS612006 | 1.6 | 1.6 |
| Fairfield-Suisun Urban Runoff Management Program | CAS612005 | 1.6 | 1.5 |
| American Canyon | CAS612007 | 0.14 | 0.13 |
| Sonoma County area [c] | CAS000004 | 1.6 | 1.5 |
| Napa County area [c] | CAS000004 | 1.6 | 1.5 |
| Marin County area [c] | CAS000004 | 3.3 | 3.2 |
| Solano County area [c] | CAS000004 | 0.81 | 0.77 |
| San Francisco County area [c,d] | CAS000004 | 8.8 | 8.4 |
| | | | |
| **Total** | | **82[e]** | **78[e]** |

Notes:

[a] Allocations implicitly include 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.

[b] This column contains calculated load reductions relative to the estimated 2003 urban stormwater runoff annual load that are consistent with attaining the wasteload allocation. Demonstration of such load reductions is an alternative manner of showing compliance with the allocations.

[c] Includes unincorporated areas and all municipalities in the county that are in the Region and drain to the Bay. The statewide municipal stormwater general permit issued by the State Water Resources Control Board covers these municipalities.

[d] This urban stormwater runoff load estimate does not account for treatment provided by San Francisco's combined sewer system. The treatment provided by the Bayside facilities (NPDES permit CA0037664) will be credited toward meeting the allocation and load reduction.

[e] These totals differ slightly from the column sum due to rounding.

**Table 7.2.2-3 Individual Wasteload Allocations for Mercury in Municipal Wastewater Discharges**

| Permitted Entity (Bold type indicates advanced treatment) | NPDES Permit | 2000–2003 Load (kg/yr) | Interim Allocation (kg/yr) | Final Allocation (kg/yr) |
|---|---|---|---|---|
| **American Canyon, City of** | **CA0038768** | **0.12** | **0.095** | **0.095** |
| California Department of Parks and Recreation, Angel Island State Park | CA0037401 | 0.013 | 0.013 | 0.013 |
| Benicia, City of | CA0038091 | 0.088 | 0.088 | 0.088 |
| Burlingame, City of | CA0037788 | 0.089 | 0.089 | 0.089 |
| Calistoga, City of | CA0037966 | 0.016 | 0.016 | 0.016 |
| Central Contra Costa Sanitary District | CA0037648 | 2.23 | 1.8 | 1.3 |
| Central Marin Sanitation Agency | CA0038628 | 0.18 | 0.15 | 0.11 |
| Delta Diablo Sanitation District | CA0038547 | 0.31 | 0.25 | 0.19 |
| East Bay Dischargers Authority | CA0037869 | 3.6 | 2.9 | 2.2 |
| Dublin-San Ramon Services District (CA0037613)<br>Hayward Shoreline Marsh (CA0038636)<br>Livermore, City of (CA0038008)<br>Union Sanitary District, wet weather (CA0038733) | | | | |
| East Bay Municipal Utilities District | CA0037702 | 2.6[a] | 2.1 | 1.5 |
| East Brother Light Station | CA0038806 | 0.00001 | 0.000012 | 0.000012 |
| **Fairfield-Suisun Sewer District** | **CA0038024** | **0.22** | **0.17** | **0.17** |
| Las Gallinas Valley Sanitary District | CA0037851 | 0.17 | 0.13 | 0.10 |
| Marin County Sanitary District, Paradise Cove | CA0037427 | 0.00055 | 0.00055 | 0.00055 |
| Marin County Sanitary District, Tiburon | CA0037753 | 0.0099 | 0.0099 | 0.0099 |
| Millbrae, City of | CA0037532 | 0.052 | 0.052 | 0.052 |
| **Mountain View Sanitary District** | **CA0037770** | **0.034** | **0.034** | **0.034** |
| Napa Sanitation District | CA0037575 | 0.28 | 0.23 | 0.17 |
| Novato Sanitary District | CA0037958 | 0.079 | 0.079 | 0.079 |
| **Palo Alto, City of** | **CA0037834** | **0.38** | **0.31** | **0.31** |
| Petaluma, City of | CA0037810 | 0.063 | 0.063 | 0.063 |
| Pinole, City of | CA0037796 | 0.055 | 0.055 | 0.055 |

| Permitted Entity (Bold type indicates advanced treatment | NPDES Permit | 2000–2003 Load (kg/yr) | Interim Allocation (kg/yr) | Final Allocation (kg/yr) |
|---|---|---|---|---|
| Contra Costa County, Port Costa Wastewater Treatment Plant | CA0037885 | 0.00072 | 0.00072 | 0.00072 |
| Rodeo Sanitary District | CA0037826 | 0.060 | 0.060 | 0.060 |
| Saint Helena, City of | CA0038016 | 0.047 | 0.047 | 0.047 |
| San Francisco, City and County of, San Francisco International Airport WQCP | CA0038318 | 0.032 | 0.032 | 0.032 |
| San Francisco, City and County of, Southeast Plant | CA0037664 | 2.7 | 2.1 | 1.6 |
| **San Jose/Santa Clara WPCP** | **CA0037842** | **1.0** | **0.80** | **0.80** |
| San Mateo, City of | CA0037541 | 0.32 | 0.26 | 0.19 |
| Sausalito-Marin City Sanitary District | CA0038067 | 0.078 | 0.078 | 0.078 |
| Seafirth Estates | CA0038893 | 0.00036 | 0.00036 | 0.00036 |
| Sewerage Agency of Southern Marin | CA0037711 | 0.13 | 0.10 | 0.076 |
| Sonoma Valley County Sanitary District | CA0037800 | 0.041 | 0.041 | 0.041 |
| South Bayside System Authority | CA0038369 | 0.53 | 0.42 | 0.32 |
| South San Francisco/San Bruno WQCP | CA0038130 | 0.29 | 0.24 | 0.18 |
| **Sunnyvale, City of** | **CA0037621** | **0.15** | **0.12** | **0.12** |
| US Naval Support Activity, Treasure Island WWTP | CA0110116 | 0.026 | 0.026 | 0.026 |
| Vallejo Sanitation & Flood Control District | CA0037699 | 0.57 | 0.46 | 0.34 |
| West County Agency, Combined Outfall | CA0038539 | 0.38[c] | 0.30 | 0.23 |
| Yountville, Town of | CA0038121 | 0.040 | 0.040 | 0.04 |
| **Total** | | **17**[b] | **14**[b] | **11**[b] |

Notes:
[a] This allocation includes wastewater treatment and all wet weather facilities.
[b] Total differs slightly from the column sum due to rounding.
[c] Mercury monitoring data quality concerns pertaining to this discharger will need to be addressed during the next review.

### Table 7.2.2-4 Individual Wasteload Allocations for Mercury in Petroleum Refinery Wastewater Discharges

| Permitted Entity | NPDES Permit | Allocation (kg/yr) |
|---|---|---|
| Chevron Products Company | CA0005134 | 0.34 |
| ConocoPhillips | CA0005053 | 0.13 |
| Martinez Refining Co. (formerly Shell) | CA0005789 | 0.22 |
| Ultramar, Golden Eagle | CA0004961 | 0.11 |
| Valero Refining Company | CA0005550 | 0.08 |
| **Total** | | **0.9** |

### Table 7.2.2-5 Individual Wasteload Allocations for Mercury in Industrial (Non-Petroleum Refinery) Wastewater Discharges[c]

| Permitted Entity | NPDES Permit | Allocation (kg/yr) |
|---|---|---|
| C&H Sugar Co. | CA0005240 | 0.0013 |
| Crockett Cogeneration | CA0029904 | 0.0047 |
| The Dow Chemical Company | CA0004910 | 0.041 |
| General Chemical[a] | CA0004979 | 0.21 |
| GWF Power Systems, Site I | CA0029106 | 0.0016 |
| GWF Power Systems, Site V | CA0029122 | 0.0025 |
| Hanson Aggregates, Amador Street | CA0030139 | 0.000005 |
| Hanson Aggregates, Olin Jones Dredge Spoils Disposal | CA0028321 | 0.000005 |
| Hanson Aggregates, Tidewater Ave. Oakland | CAA030147 | 0.000005 |
| Pacific Gas and Electric, East Shell Pond | CA0030082 | 0.00063 |
| Pacific Gas and Electric, Hunters Point Power Plant | CA0005649 | 0.020 |
| Rhodia, Inc. | CA0006165 | 0.011 |
| San Francisco, City and Co., SF International Airport Industrial WTP | CA0028070 | 0.051 |
| Southern Energy California, Pittsburg Power Plant | CA0004880 | 0.0078 |
| Southern Energy Delta LLC, Potrero Power Plant | CA0005657 | 0.0031 |
| United States Navy, Point Molate | CA0030074 | 0.013 |
| USS-Posco | CA0005002 | 0.045 |
| **Total** | | **0.4**[b] |

Notes:
[a] Data quality concerns pertaining to this discharger will need to be addressed during the next review.
[b] Total differs slightly from the column sum due to rounding.

[c] Wasteload allocations for industrial wastewater discharges do not include mass from once-through cooling water. The Water Board will apply intake credits to once-through cooling water as allowed by law.

#### 7.2.2.5 Total Maximum Daily Load

The mercury TMDL for San Francisco Bay is the sum of the load and wasteload allocations, 700 kg/yr. The Bay will attain applicable water quality standards for mercury when the overall mercury load is reduced to the TMDL and mercury methylation control measures are implemented.

A TMDL must include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. This TMDL's targets and allocations rely on conservative assumptions, which thereby provide an implicit margin of safety. The adaptive approach to implementation provides an additional margin of safety.

There is no evidence that mercury contamination in San Francisco Bay is worse at any particular time of year. Therefore, the TMDL and allocation scheme do not have a seasonal component.

#### 7.2.2.6 Mercury TMDL Implementation

The San Francisco Bay mercury TMDL implementation plan has four objectives: (1) reduce mercury loads to achieve load and wasteload allocations, (2) reduce methylmercury production and consequent risk to humans and wildlife exposed to methylmercury, (3) conduct monitoring and focused studies to track progress and improve the scientific understanding of the system, and (4) encourage actions that address multiple pollutants. The plan establishes requirements for dischargers to reduce or control mercury loads and identifies actions necessary to better understand and control methylmercury production. In addition, it addresses potential mercury sources and describes actions necessary to manage risks to Bay fish consumers. The adaptive implementation section describes the method and schedule for evaluating and adapting the TMDL and implementation plan as needed to assure water quality standards are attained.

##### *Mercury Source Control Actions*

This section, organized by mercury source categories, specifies actions required to achieve allocations and implement the TMDL.

##### Central Valley Watershed

The Central Valley Regional Water Quality Control Board (Central Valley Water Board) is developing mercury TMDLs for several mercury-impaired water bodies in its region that drain to San Francisco Bay. The Central Valley Water Board staff is currently developing a mercury TMDL for portions of the Delta within the Central Valley region designed to meet the Central Valley watershed's load allocation. This Delta mercury TMDL is scheduled for consideration as a Basin Plan Amendment by the Central Valley Water Board by December 2006.

Attainment of the load allocation shall be assessed as a five-year average annual mercury load by one of two methods. First, attainment may be demonstrated by documentation provided by the Central Valley Water Board that shows a net 110 kg/yr decrease in total mercury entering the Delta from within the Central Valley region. Alternatively, attainment of the load allocation may be demonstrated by multiplying the flow-weighted suspended sediment mercury concentration by the sediment load measured at the RMP Mallard Island monitoring station. If sediment load estimates are unavailable, the load shall be assumed to be 1,600 million kg of sediment per year. The mercury load fluxing past Mallard Island will be less than or equal to 330 kg/yr after attainment of the allocation.

The allocation for the Central Valley watershed should be achieved within 20 years after the Central Valley Water Board begins implementing its TMDL load reduction program. Studies need to be conducted to evaluate the time lag between the remediation of mercury sources and resulting load reductions from the Delta. An interim loading milestone of 385 kg/yr of mercury, halfway between the current load and the allocation, should be attained ten years after implementation of the Central Valley Delta TMDL begins. This schedule will be reevaluated as the load reduction plans are implemented.

### Urban Stormwater Runoff

The wasteload allocations shown in Table 7.2.2-2 shall be implemented through the NPDES stormwater permits issued to urban runoff management agencies and the California Department of Transportation (Caltrans). The urban stormwater runoff allocations implicitly include all current and future permitted discharges, not otherwise addressed by another allocation, and unpermitted discharges within the geographic boundaries of urban runoff management agencies (collectively, "source category") including, but not limited to, Caltrans roadway and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

The allocations for this source category should be achieved within 20 years, and, as a way to measure progress, an interim loading milestone of 120 kg/yr, halfway between the current load and the allocation, should be achieved within ten years. If the interim loading milestone is not achieved, NPDES-permitted entities shall demonstrate reasonable and measurable progress toward achieving the 10-year loading milestone.

The NPDES permits for urban runoff management agencies shall require the implementation of best management practices and control measures designed to achieve the allocations or accomplish the load reductions derived from the allocations. In addition to controlling mercury loads, best management practices or control measures shall include actions to reduce mercury-related risks to humans and wildlife. Requirements in each permit issued or reissued and applicable for the term of the permit shall be based on an updated assessment of control measures intended to reduce pollutants in stormwater runoff to the maximum extent practicable and remain consistent with the section of this chapter titled "Surface Water Protection and Management—Point Source Control—Stormwater Discharges." The following additional requirements are or shall be incorporated into NPDES permits issued or reissued by the Water Board for urban runoff management agencies.

1. Evaluate and report on the spatial extent, magnitude, and cause of contamination for locations where elevated mercury concentrations exist;
2. Develop and implement a mercury source control program;
3. Develop and implement a monitoring system to quantify either mercury loads or loads reduced through treatment, source control, and other management efforts;
4. Monitor levels of methylmercury in discharges;
5. Conduct or cause to be conducted studies aimed at better understanding mercury fate, transport, and biological uptake in San Francisco Bay and tidal areas;
6. Develop an equitable allocation-sharing scheme in consultation with Caltrans (see below) to address Caltrans roadway and non-roadway facilities in the program area, and report the details to the Water Board;

7. Prepare an annual report that documents compliance with the above requirements and documents either mercury loads discharged, or loads reduced through ongoing pollution prevention and control activities; and
8. Demonstrate progress toward (a) the interim loading milestone, or (b) attainment of the allocations shown in Table 7.2.2-2, by using one of the following methods:
    - Quantify the annual average mercury load reduced by implementing (a) pollution prevention activities, and (b) source and treatment controls. The benefit of efforts to reduce mercury-related risk to wildlife and humans should also be quantified. The Water Board will recognize such efforts as progress toward achieving the interim milestone and the mercury-related water quality standards upon which the allocations and corresponding load reductions are based. Loads reduced as a result of actions implemented after 2001 (or earlier if actions taken are not reflected in the 2001 load estimate) may be used to estimate load reductions.
    - Quantify the mercury load as a rolling five-year annual average using data on flow and water column mercury concentrations.
    - Quantitatively demonstrate that the mercury concentration of suspended sediment that best represents sediment discharged with urban runoff is below the suspended sediment target.

Once the Water Board accepts that a requirement has been completed by an urban runoff management agency, it need not be included in subsequent permits for that agency. These requirements apply to municipalities covered by the statewide municipal stormwater general permit (issued by the State Water Resources Control Board) five years after the effective date of the San Francisco Bay mercury TMDL.

Urban runoff management agencies have a responsibility to oversee various discharges within the agencies' geographic boundaries. However, if it is determined that a source is substantially contributing to mercury loads to the Bay or is outside the jurisdiction or authority of an agency the Water Board will consider a request from an urban runoff management agency which may include an allocation, load reduction, and/or other regulatory requirements for the source in question.

Within the jurisdiction of each urban runoff management agency, Caltrans is responsible for discharges associated with roadways and non-roadway facilities. Consequently, Caltrans shall be required to implement the following actions:

1. Develop and implement a system to quantify mercury loads or loads reduced through control actions;
2. Prepare an annual report that documents mercury loads or loads reduced through control actions; and
3. Develop an equitable allocation-sharing scheme that reflects Caltrans load reduction responsibility in consultation with the urban runoff management agencies, and report the details to the Water Board. Alternatively, Caltrans may choose to implement load reduction actions on a watershed or regionwide basis in lieu of sharing a portion of an urban runoff management agency's allocation. In such a case, the Water Board will consider a separate allocation for Caltrans for which they may demonstrate progress toward attaining an allocation or load reduction in the same manner mentioned previously for municipal programs.

### Guadalupe River Watershed (Mining Legacy)

In the near term, the effort underway to develop the Guadalupe River Watershed Mercury TMDL will be the mechanism used to implement and track progress toward achieving the load allocation. Ultimately, the Water Board expects the implementation plan for the Guadalupe River Watershed Mercury TMDL to integrate implementation efforts relative to that TMDL with those implementation efforts for the San Francisco Bay mercury TMDL.

The Guadalupe River Watershed Mercury TMDL will provide a watershed-wide mercury management strategy. Efforts are already underway in the watershed to take early actions to reduce mercury loads, and more are planned. A high priority for the watershed-based strategy is to control upper watershed sources associated with the mining legacy to avoid compromising actions taken in the lower watershed. The strategy will include measures that prevent mercury-laden sediment from reaching the Bay, either by removal or by preventing their transport to the Bay. The strategy will also feature measures intended to reduce methylmercury production and risks to human health and wildlife. An essential component of the strategy will also involve testing and evaluation of new techniques and control measures, the benefits of that may apply throughout the Bay. As the mercury load, methylation, and reductions resulting from these efforts are quantified by the dischargers identified through the Guadalupe River Watershed Mercury TMDL process, the Water Board will consider how the reductions achieved will be counted toward fulfillment of the load reductions required to meet the Guadalupe River watershed load allocation.

The Guadalupe River watershed mining legacy mercury load allocation is expected to be attained within 20 years after the Water Board begins implementing the Guadalupe River Watershed Mercury TMDL. As a way to measure progress, an interim-loading milestone of 47 kg/yr of mercury, halfway between the current load and the allocation, should be achieved within ten years. If the interim loading milestone is not achieved, dischargers shall make reasonable and measurable progress toward achieving the ten-year load reduction through implementation of the watershed-wide strategy.

Progress toward (a) the interim loading milestone, or (b) attainment of the allocation, shall be demonstrated by the dischargers identified through the Guadalupe River Watershed TMDL using one of the methods listed below:

- Quantify the annual average mercury load reduced by implementing (a) pollution prevention activities, (b) source and treatment controls, and (c) if applicable, other efforts to reduce methylation or mercury-related risks to humans and wildlife consistent with the watershed-based strategy. The Water Board will recognize loads reduced resulting from activities implemented after 1996 (or earlier if actions taken are not reflected in the 2001 load estimate) to estimate load reductions.
- Quantify the mercury load as a rolling five-year annual average using data on flow and water column mercury concentrations.
- Quantitatively demonstrate that the mercury concentration of suspended sediment that best represents sediment discharged from the watershed to San Francisco Bay is below the suspended sediment target.

### Municipal Wastewater

The individual municipal wastewater wasteload allocations shown in Table 7.2.2-3 shall be implemented via individual mass limits and an aggregate mass limit that is the sum of the individual allocations, 11 kg/yr. The Water Board will issue a San Francisco Bay watershed mercury NPDES permit to all dischargers listed in Table 7.2.2-3 to implement the individual and aggregate mass limits.

The wasteload allocations for this source category shall be achieved within 20 years, and, as a way to measure progress, interim individual allocations equal to a 20 percent reduction from 2000-2003 annual mass discharge levels shall be achieved within 10 years. These interim allocations, shown in Table 7.2.2-3, shall be implemented via individual mass limits and an aggregate mass limit that is the sum of the individual interim allocations, 14 kg/yr. During the initial ten years, individual mass limits shall be the 2000-2003 annual mass discharge levels shown in Table 7.2.2-3, and the aggregate mass limit is the sum of these individual mass discharge levels.

If any aggregate mass limit is exceeded, the Water Board will pursue enforcement actions against those individual dischargers whose mass discharges exceed their individual mass limits.

The mass limits and the following requirements shall be incorporated into the watershed NPDES permit for municipal wastewater dischargers:

- Develop and implement effective programs that include but are not limited to pollution prevention to control mercury sources and loading, a plan and schedule of actions and effectiveness measures applicable for the term of the permit, based on identification of the largest and most controllable sources and an updated assessment of source control measures and wastewater treatment technologies (the level of effort shall be commensurate with the mercury load and performance of the facility) and quantify the mercury load avoided or reduced;
- Develop and implement effective programs to reduce mercury-related risks to humans and wildlife and quantify risk reductions resulting from these activities;
- Comply with water quality-based effluent limitations, to be elaborated through the permit, that are consistent with the assumptions and requirements of the mercury wasteload allocation;
- Track individual facility and aggregate wastewater loads and the status of source control and pollution prevention activities;
- Monitor levels of methylmercury in discharges;
- Conduct or cause to be conducted studies aimed at better understanding mercury fate, transport, the conditions under which mercury methylation occurs, and biological uptake in San Francisco Bay and tidal areas;
- Conduct or cause to be conducted studies to evaluate the presence or potential for local effects on fish, wildlife, and rare and endangered species in the vicinity of wastewater discharges; and
- Prepare an annual report that documents mercury loads from each facility, mercury and methylmercury effluent concentrations, and ongoing source control activities, including mercury loads avoided through control actions.

The watershed NPDES permit shall also specify conditions that apply to each individual facility. These conditions are intended to minimize the potential for adverse effects in the immediate vicinity of discharges and to ensure that municipal wastewater facilities maintain proper operation, maintenance, and performance. If a facility exceeds its individual mercury load allocation as a 12-month rolling average

or an effluent mercury trigger concentration, it shall be required to report the exceedance in its individual Self-Monitoring Report, implement a corrective action plan, and to submit a report within 60 days that:

- Evaluates the cause of the trigger or mass exceedances;
- Evaluates the effectiveness of existing pollution prevention or pretreatment programs and methods for preventing future exceedances;
- Evaluates the feasibility and effectiveness of technology enhancements to improve plant performance;
- Evaluates other measures for preventing future exceedances, depending on the cause of an exceedance; and
- Includes an action plan and time schedule to correct and prevent trigger exceedances.

Effluent mercury trigger concentrations for secondary treatment facilities are a daily maximum of 0.065 µg/l total mercury and monthly average of 0.041 µg/l total mercury. For advanced treatment facilities, effluent mercury trigger concentrations are a daily maximum of 0.021 µg/l total mercury and a monthly average of 0.011 µg/l total mercury.

The Water Board will pursue enforcement action against dischargers that do not respond to exceedances of triggers or do not implement reasonable actions to correct and prevent trigger exceedances. Determination of reasonable actions will be based on an updated assessment of source control measures and wastewater treatment technologies applicable for the term of each issued or reissued permit.

### Industrial Wastewater

The individual wasteload allocations for the industrial wastewater discharges from the five Bay Area petroleum refineries (Chevron, ConocoPhillips, Martinez Refining Co., Ultramar Golden Eagle, and Valero) listed in Table 7.2.2-4, and the individual wasteload allocations for all other industrial wastewater facilities listed in Table 7.2.2-5 shall be implemented via individual mass limits and an aggregate mass limit that is the sum of the individual allocations, 1.3 kg/yr. If the aggregate mass limit is exceeded, the Water Board will pursue enforcement actions against those individual dischargers whose mass discharges exceed their individual mass limits.

The mass limits and the following requirements shall be incorporated into NPDES permits for all industrial wastewater dischargers:

- Develop and implement effective programs to control mercury sources and loading including demonstration that discharge levels represent good performance based on an updated assessment of source control measures and wastewater treatment technologies (the level of effort will be commensurate with the mercury load and performance of the facility) and quantify the mercury load avoided or reduced;
- Develop and implement effective programs to reduce mercury-related risks to humans and wildlife and quantify the risk reductions resulting from these activities;
- Comply with water quality-based effluent limitations, to be elaborated through the permit, that are consistent with the assumptions and requirements of the mercury wasteload allocation;
- Monitor levels of methylmercury in discharges;
- Conduct or cause to be conducted studies aimed at better understanding mercury fate, transport, the conditions under which mercury methylation occurs, and biological uptake in San Francisco Bay and tidal areas;

- Conduct or cause to be conducted studies to evaluate the presence or potential for local effects on fish, wildlife, and rare and endangered species in the vicinity of wastewater discharges; and
- Prepare an annual report that documents mercury loads from each facility, mercury and methylmercury effluent concentrations, and ongoing source control activities, including mercury loads avoided through control actions.

The NPDES permits for industrial facilities shall also specify conditions that apply to each individual facility. These conditions are intended to minimize the potential for adverse effects in the immediate vicinity of discharges and to ensure that industrial wastewater facilities maintain proper operation, maintenance, and performance. If a facility exceeds its individual mercury load allocation as a 12-month rolling average or an effluent mercury trigger concentration, it shall be required to report the exceedance in its individual Self-Monitoring Report, implement a corrective action plan, and submit a report within 60 days that:

- Evaluates the cause of the trigger or mass exceedances;
- Evaluates the effectiveness of existing pollution prevention or pretreatment programs and methods for preventing future exceedances;
- Evaluates the feasibility and effectiveness of technology enhancements to improve plant performance;
- Evaluates other measures for preventing future exceedances, depending on the cause of an exceedance; and
- Includes an action plan and time schedule to correct and prevent trigger exceedances.

Effluent mercury trigger concentrations are a daily maximum of 0.062 μg/l total mercury and monthly average of 0.037 μg/l total mercury.

The Water Board will pursue enforcement action against dischargers that do not respond to exceedances of triggers or do not implement reasonable actions to correct and prevent trigger exceedances. Determination of reasonable actions will be based on an updated assessment of source control measures and wastewater treatment technologies applicable for the term of each issued or reissued permit.

Bay Area petroleum refineries shall be required to work collaboratively with the Water Board to investigate the environmental fate of mercury in crude oil and report findings to the Water Board within five years of the effective date of the San Francisco Bay mercury TMDL implementation plan. These requirements may be implemented via the Water Board's authority under Section 13267 of the California Water Code or petroleum refinery wastewater NPDES permits. The report shall address two key questions:

1. What are the potential pathways by which crude oil mercury could be discharged to the Bay from Bay Area petroleum refining facilities?
2. What are the annual mercury loads associated with these discharge pathways?

## Sediment Dredging and Disposal

The allocation for sediment dredging and disposal is both mass-based and concentration-based. The mercury concentration in dredged material disposed of in the Bay shall not exceed the 99th percentile mercury concentration of the previous 10 years of Bay sediment samples collected through the Regional Monitoring Program (excluding stations outside the Bay like the Sacramento River, San Joaquin River, Guadalupe River and Standish Dam stations). Prior to disposal, the material shall be sampled and analyzed according to the procedures outlined in the 2001 U.S. Army Corps of Engineers document

"Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region." All in-Bay disposal of dredged material shall comply with the Dredging and Disposal of Dredged Sediment program described in Chapter 4 and the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region.

The process of dredging and disposing of dredged material in the Bay may enhance biological uptake and methylmercury exposure. To address this concern, permitted dredging and disposal operations shall demonstrate that their activities are accomplished in a manner that does not increase bioavailability of mercury. As part of this demonstration, the Waste Discharge Requirements for such operations shall include requirements to conduct or cause to be conducted studies to better understand how their operations affect mercury fate, transport, and biological uptake.

### Atmospheric Deposition

Mercury that deposits directly on the Bay surface and the surrounding watershed is attributed to both remote and local sources. The extent to which these sources can be controlled is unknown and the Water Board's authority to control such sources is limited. The load allocation does not allow an increase of current loads, and does not require a reduction from this source category at this time. Recent scientific studies suggest that mercury newly deposited from the atmosphere may be more available for biological uptake than mercury already present in an aquatic system. As such, the following implementation efforts need to be undertaken to evaluate the significance of atmospheric deposition and the feasibility of load reductions:

- The U.S. Environmental Protection Agency should investigate the significance of atmospheric deposition and actively pursue national and international efforts to reduce the amount of mercury released through combustion of fossil fuels; and
- The Bay Area Air Quality Management District should conduct a local mercury emissions inventory, investigate the significance of local mercury air emissions, evaluate the effectiveness of existing control measures and the feasibility of additional controls.

If local air sources are found to contribute substantially to atmospheric deposition loading to the Bay and its surrounding watershed, the Water Board will consider assigning allocations and load reductions to individual air sources and work with the Bay Area Air Quality Management District to ensure allocations are achieved.

#### *New Mercury Sources*

As the TMDL is implemented, new sources of mercury may emerge either as the result of a new facility applying for a discharge permit or as a result of a new source being discovered. The Water Board will consider establishing a load or wasteload allocation for a new mercury source under any of the following circumstances:

- The allocation from one or more existing sources of the same category (e.g., municipal wastewater) will be reduced by an amount equal to the new allocation; or
- The Water Board finds that the magnitude of the new allocation is negligible compared to load reductions from all sources that will have been realized prior to establishing the new allocation; or
- The allocation is for a previously unquantified discharge of mercury from a source category that does not already have an allocation.

This section specifies actions required for sources that are potentially either discharging mercury or enhancing methylmercury production in the Bay.

### Mercury Mines

Local inactive mercury mines shall be addressed through continued implementation of the Mines and Mineral Producers Discharge Control Program (Mines Program) described in Chapter 4. The key regulatory component of this established program is that property owners of inactive and active mine sites that discharge stormwater contaminated by contact with any overburden, raw material, intermediate products, finished products, byproducts, or waste products are required to comply with NPDES industrial stormwater regulations. Under the Mines Program, the Water Board has the authority to issue individual industrial permits or allow the discharger to obtain coverage under the industrial stormwater general permit issued by the State Water Resources Control Board. For those mines that are not currently meeting the conditions set forth in the Mines Program, responsible parties shall attain compliance within five years of the effective date of the San Francisco Bay mercury TMDL implementation plan.

### Bay Margin Contaminated Sites

A number of former industrial and military sites that contain mercury-enriched sediment surround the Bay. Available data are insufficient at this time to determine whether these sites may be discharging to the Bay. While the load these sites contribute to the Bay may be small relative to known sources, these sites may pose local threats. As such, cleanup of these sites is a Water Board priority and many cleanups are underway. The Water Board will require parties responsible for Bay margin contaminated sites to:

1. Quantify mercury mass on site such that the upper 95% confidence limit of the mean value is no more than 20% higher than the estimated mean;
2. Determine seasonal and spatial patterns of total mercury and methylmercury in sediments on site;
3. Estimate future mercury mass on site and patterns of contamination after planned remediation efforts are complete;
4. Determine seasonal patterns of total mercury and methylmercury in the water column at the site;
5. Collect prey items for local fish and birds and assess mercury concentrations; and
6. Quantify rate of sediment accretion or erosion at the site.

These requirements shall be incorporated into relevant site cleanup plans within five years of the effective date of the San Francisco Bay mercury TMDL, and the actions shall be fully implemented within ten years of the effective date of this TMDL.

### Wetlands

Wetlands may contribute substantially to methylmercury production and biological exposure to mercury within the Bay. Plans for extensive wetland restoration in the San Francisco Bay region raise the concern that mercury methylation may increase, thereby increasing the amount of mercury entering the food web. Implementation tasks related to wetlands focus on managing existing wetlands and ensuring that new constructed wetlands are designed to minimize methylmercury production and subsequent transfer to the food web.

The Water Board issues Waste Discharge Requirements and Clean Water Act Section 401 certifications that set forth conditions related to Bay filling and the construction and management of wetlands. To

implement the San Francisco Bay mercury TMDL, the Waste Discharge Requirements and Section 401 certifications for wetland projects shall include provisions that the restored wetland region be designed and operated to minimize methylmercury production and biological uptake, and result in no net increase in mercury or methylmercury loads to the Bay. Additionally, projects must include pre- and post-restoration monitoring to demonstrate compliance. There is much active research on mercury cycling in wetlands. Information about how to manage wetlands to suppress or minimize mercury methylation will be adaptively incorporated into this implementation plan as it becomes available.

### *Risk Management*

The mercury problem in San Francisco Bay may take decades to solve. However, there are activities that should be undertaken immediately to help manage the risk to consumers of mercury-contaminated fish. In this effort, the Water Board will work with the California Office of Environmental Health Hazard Assessment, the California Department of Health Services, and dischargers that pursue risk management as part of their mercury-related programs. The risk management activities will include the following:

- Providing multilingual fish-consumption advice to the public to help reduce methylmercury exposure through community outreach, broadcast and print media, and signs posted at popular fishing locations;
- Regularly informing the public about monitoring data and findings regarding hazards of eating mercury-contaminated fish; and
- Performing special studies needed to support health risk assessment and risk communication.
- Investigate ways 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 caught fish, such as subsistence fishers and their families.

### *Adaptive Implementation*

The Water Board will adapt the TMDL to incorporate new and relevant scientific information such that effective and efficient actions can be taken to achieve TMDL goals. Approximately every five years, the Water Board will review the San Francisco Bay mercury TMDL and evaluate new and relevant information from monitoring, special studies, and scientific literature. The reviews will be coordinated through the Water Board's continuing planning program and will provide opportunities for stakeholder participation. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan. At a minimum, the following focusing questions will be used to conduct the reviews. Additional focusing questions will be developed in collaboration with stakeholders during each review.

1. Is the Bay progressing toward TMDL targets 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?
2. What are the 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?
3. Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? In particular, is there new evidence regarding methylmercury that might justify a methylmercury TMDL or allocation, either in addition to or instead of the total mercury TMDL and allocations? If so, how should the TMDL be modified?

4. 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?
5. Do prey fish monitoring data confirm that TMDL load allocations are adequate to attain the wildlife target?
6. Are mercury mine and Bay margin contaminated site cleanups proceeding as expected? Are any additional actions needed to protect water quality?

Using available data, the load and wasteload allocations were determined on the basis of their sufficiency to achieve water quality standards. As part of the adaptive implementation process, the Water Board will review the TMDL as a whole and determine whether new evidence suggests revisions of specific load and wasteload allocations that will result in more strategic, efficient, and cost effective achievement of water quality standards.For example, as reliable information becomes available regarding methylation control or the relative bioavailability of sources, the Water Board will consider adjusting allocations to implement the TMDL more effectively. The Water Board may also consider revising implementation requirements and/or resulting permit requirements if such changes are consistent with the assumptions and requirements of the allocations and the cumulative effect of such changes will ensure attainment of water quality standards.

Achievement of the allocations for three of the largest source categories (Central Valley Watershed, Urban Stormwater Runoff, Guadalupe River Watershed) is projected to take 20 years, with an interim 10-year milestone of fifty percent achievement. Approximately 10 years after the effective date of the TMDL or any time thereafter, the Water Board will consider modifying the schedule for achievement of the load allocations for a source category or individual discharger provided that they have complied with all applicable permit requirements and all of the following have been accomplished relative to that source category or discharger:

- A diligent effort has been made to quantify mercury loads and the sources of mercury and potential bioavailability of mercury in the discharge;
- Documentation has been prepared that demonstrates that all technically and economically feasible and cost effective control measures recognized by the Water Board as applicable for that source category or discharger have been fully implemented, and evaluates and quantifies the comprehensive water quality benefit of such measures;
- A demonstration has been made that achievement of the allocation will require more than the remaining 10 years originally envisioned; and
- A plan has been prepared that includes a schedule for evaluating the effectiveness and feasibility of additional control measures and implementing additional controls as appropriate.

Achievement of the wasteload allocations for municipal wastewater dischargers is required within 20 years, and interim allocations within 10 years. The interim allocations are expected to be attained though aggressive pollution prevention and other cost-effective mercury reduction methods. The final wasteload allocations are expected to be attained through wastewater treatment system improvements and/or implementation of a pollutant offset program. Approximately 10 years after the effective date of the TMDL or any time thereafter, the Water Board will consider modifying the schedule for achievement of the wasteload allocations or revisions to wasteload allocations if:

- The State Board has not established a pollutant offset program that can be implemented within the 20 years required to achieve final wasteload allocations;.

- It can be demonstrated that all reasonable and feasible efforts have been taken to reduce mercury loads; and
- It can be demonstrated that no adverse local effects will result.

At approximately 20 years after the start of implementation and after taking the steps regarding schedule modification listed above, 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 Water Board as applicable for that source category or discharger, the Water Board will consider revising the allocation scheme provided that any resulting revisions ensure water quality standards are attained.

Load and wasteload allocations have been assigned to individual entities. However, assigning loads by watersheds could be a useful approach for managing pollutant loads, particularly if net environmental benefits can be realized. A watershed-based allocation program would only involve watersheds in the San Francisco Bay region that drain to the Bay. Such an approach could involve urban runoff management programs, wastewater facilities, and other dischargers in a watershed accepting joint responsibility for load reductions. An acceptable watershed allocation program may include incentives for agencies to implement load reduction activities and account for avoided mercury loads as well as incentives for strategic removal or sequestration of mercury already in the system. Credits could be used to offset annual loads and attain allocations for multiple sources. In addition, the Water Board will encourage and consider a pilot mercury mass offset program if it is demonstrated that such a program is a more cost effective and efficient means of achieving water quality standards, and the relative potential for mercury from different sources to enter the food web and the potential for adverse local impacts have been evaluated. These programs should recognize and reward ongoing efforts that are above and beyond those required by this TMDL. Until such programs are established, the Water Board will consider mercury source control and risk reduction activities on a case-by-case basis to determine how they contribute toward achievement of TMDL goals. The Water Board will also include in any new or modified NPDES permit a reopener to implement a pollutant offset program when it is established.

### 7.2.3 San Francisco Bay Polychlorinated Biphenyls TMDL

The following sections establish the TMDL for total polychlorinated biphenyls including dioxin-like PCBs congeners (hereinafter referred to as PCBs) for the San Francisco Bay. The associated numeric target, allocations, and implementation plan are designed to ensure attainment of beneficial uses and water quality objectives for the San Francisco Bay.

#### 7.2.3.1 Problem Statement

All segments of the San Francisco Bay have been identified as impaired due to elevated levels of PCBs in sport fish. Neither the narrative water quality objective, which states that controllable water quality factors shall not cause a detrimental increase in toxic substances found in bottom sediments or aquatic life, nor the numeric water quality objective of 0.00017 μg/L total PCBs in water is attained in the San Francisco Bay. The existing beneficial use for commercial and sport fishing is not fully supported.

This TMDL addresses impairment of San Francisco Bay segments by PCBs. In the context of this TMDL, "San Francisco Bay" refers to all of the following water bodies:

- Sacramento/San Joaquin Delta (within Region 2)
- Suisun Bay

- Carquinez Strait
- San Pablo Bay
- Richardson Bay
- San Francisco Bay, Central
- San Francisco Bay, Lower (including)
    - Central Basin, San Francisco
    - Mission Creek
    - Oakland Inner Harbor (Fruitvale site)
    - Oakland Inner Harbor (Pacific Dry-Dock Yard 1 site) San Francisco Bay, South

This TMDL is intended to achieve protection of the commercial and sport fishing beneficial use and to the extent that other beneficial uses are affected by PCBs, the TMDL will also ensure protection of other beneficial uses, specifically, preservation of rare and endangered species, estuarine habitat and wildlife habitat.

#### 7.2.3.2 Numeric Target

The numeric target (also referred to as the TMDL target) to protect both human health and wildlife is an average fish tissue concentration of 10 micrograms total PCBs per kilogram of typically consumed fish, on a wet weight basis (10 μg/kg wet weight). Attainment of the total PCBs fish tissue numeric target will also protect human health and wildlife for dioxin-like PCBs.

Attainment of the fish tissue target for PCBs in San Francisco Bay will be initially evaluated by comparing the average total PCBs concentrations in the edible portion of two fish species, white croaker (size class, 20 to 30 centimeters in length) and shiner surfperch (size class, 10 to 15 centimeters in length) to the target. Comparison of the fish target against these two species of fish is considered to be protective and provides a margin of safety for the TMDL, because PCBs concentrations in these species are the highest of the fish species measured and sport recreational fishers likely consume a variety of fish species, including those species with lower PCBs concentrations. As part of the adaptive implementation of this TMDL, the Water Board will require the collection of additional information regarding recreational and subsistence fishers' patterns of consumption and evaluate if fish species other than white croaker and shiner surfperch should be considered to evaluate attainment of the target.

The number of fish samples collected to determine compliance with the target will be based on guidance described in USEPA's Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories (EPA 823-B-00-007) and on the statistical power needed to demonstrate trends in total PCBs concentration over time.

#### 7.2.3.3 Sources

Sources of PCBs to fish and the water column of San Francisco Bay fall into two categories: (1) external sources including atmospheric deposition, Central Valley inflow, municipal and industrial wastewater discharges, and urban and non-urban stormwater runoff; and (2) internal sources, including movement or release of PCBs already in San Francisco Bay sediments, specifically, dredging and in-Bay disposal of dredged sediment, erosion of bay bottom sediment containing PCBs (bed erosion), and in-Bay contaminated sediment sites. These sources and estimates of associated loads are shown in Table 7.2.3-1.

Decreases of PCBs in San Francisco Bay occur via out-of-Bay dredge material disposal, natural attenuation, and outflow through the Golden Gate.

**Table 7.2.3-1 PCBs Sources and Current Loads to San Francisco Bay**

| Source Category | PCBs Loads |
|---|---|
| | Kilograms per year |
| **External** | |
| Direct Atmospheric Deposition | Net Loss |
| Central Valley Watershed | 11 |
| Municipal Wastewater Dischargers | 2.3 |
| Industrial Wastewater Dischargers | 0.035 |
| Urban and Non Urban Stormwater Runoff | 20 |
| **Total** | **33**[a] |
| **Internal** | |
| Sediment Dredging and Disposal | Net Loss |
| Bed Erosion | Not Quantified |
| In-Bay Contaminated Sediment | Not Quantified |

a. Total differs from column sum due to rounding

### 7.2.3.4 Total Maximum Daily Load

The TMDL for PCBs in San Francisco Bay is 10 kg/year. Calculation of the TMDL is based on two models: a food-web PCBs bioaccumulation model and a long-term fate mass balance model. The model results predict that attainment of the numeric target will occur when the total PCBs concentration in surface sediments in the Bay declines to one μg/kg, which will be achieved when loads from external sources are reduced to 10 kg/year.

### 7.2.3.5 Load and Wasteload Allocations

Load allocations are presented in Table 7.2.3-2 for source categories. Individual wasteload allocations for municipal wastewater dischargers and industrial wastewater dischargers are presented in Table 7.2.3-3 and Table 7.2.3-4. Individual wasteload allocations for stormwater runoff to county-based watersheds are presented in Table 7.2.3-5.

**Table 7.2.3-2 Load and Wasteload Allocations**

| Source Category | Allocations |
|---|---|
| | **Kilograms per year** |
| **External** | |
| Direct Atmospheric Deposition | 0 [a] |
| Central Valley Watershed | 5 |
| Municipal Wastewater Dischargers | 2 |
| Industrial Wastewater Dischargers | 0.035 |
| Stormwater Runoff | 2 |
| Stormwater Runoff Treatment by Municipal Wastewater Dischargers | 1 |
| *Total* | ***10*** [b] |

a. Zero allocation reflects overall net loss to the atmosphere
b. Total differs from column sum due to rounding

**Table 7.2.3-3 Individual Wasteload Allocations For Municipal Wastewater Dischargers**

| Permitted Entity | NPDES Permit | Allocations |
|---|---|---|
| | | kilograms per year |
| American Canyon, City of | CA0038768 | 0.002 |
| Benicia, City of | CA0038091 | 0.009 |
| Burlingame, City of | CA0037788 | 0.01 |
| Calistoga, City of | CA0037966 | 0.002 |
| Central Contra Costa Sanitary District | CA0037648 | 0.1 |
| Central Marin Sanitation Agency | CA0038628 | 0.04 |
| Delta Diablo Sanitation District | CA0038547 | 0.04 |
| East Bay Dischargers Authority<br>Dublin-San Ramon Services District (CA0037613)<br>Hayward Shoreline Marsh (CA0037702)<br>Livermore, City of (CA0038008)<br>Union Sanitary District, Wet Weather (CA0038733) | CA0037869 | 0.3 |
| East Bay Municipal Utilities District | CA0037702 | 0.3 |
| East Brother Light Station | CA0038806 | 0.00030 |
| Fairfield-Suisun Sewer District | CA0038024 | 0.05 |
| Las Gallinas Valley Sanitary District | CA0037851 | 0.01 |
| Marin County Sanitary District, Paradise Cove | CA0037427 | 0.00003 |
| Marin County Sanitary District, Tiburon | CA0037753 | 0.002 |
| Millbrae, City of | CA0037532 | 0.007 |
| Mt. View Sanitary District | CA0037770 | 0.007 |
| Napa Sanitation District | CA0037575 | 0.04 |
| Novato Sanitary District | CA0037958 | 0.02 |
| Palo Alto, City of | CA0037834 | 0.09 |
| Petaluma, City of | CA0037810 | 0.02 |
| Pinole, City of | CA0037796 | 0.009 |
| Contra Costa County, Port Costa Wastewater Treatment Plant | CA0037885 | 0.0001 |
| Rodeo Sanitary District | CA0037826 | 0.002 |
| Saint Helena, City of | CA0038016 | 0.001 |
| San Francisco, City and County of,<br>San Francisco International Airport WQCP | CA0038318 | 0.002 |
| San Francisco, City and County of, Southeast Plant | CA0037664 | 0.3 |
| San Jose/Santa Clara WPCP | CA0037842 | 0.4 |

| Permitted Entity | NPDES Permit | Allocations |
|---|---|---|
| | | kilograms per year |
| San Mateo, City of | CA0037541 | 0.04 |
| Sausalito-Marin City Sanitary District | CA0038067 | 0.005 |
| Seafirth Estates | CA0038893 | 0.00001 |
| Sewerage Agency of Southern Marin | CA0037711 | 0.01 |
| Sonoma Valley County Sanitary District | CA0037800 | 0.01 |
| South Bayside System Authority | CA0038369 | 0.06 |
| South San Francisco/San Bruno WQCP | CA0038130 | 0.03 |
| Sunnyvale, City of | CA0037621 | 0.05 |
| US Naval Support Activity, Treasure Island WWTP | CA0110116 | 0.002 |
| Vallejo Sanitation & Flood Control District | CA0037699 | 0.05 |
| West County Agency, Combined Outfall | CA0038539 | 0.05 |
| Yountville, Town of | CA0038121 | 0.001 |
| ***Total*** | | ***2[a]*** |

a) Total differs from column sum due to rounding

## Table 7.2.3-4 Individual Wasteload Allocations for Industrial Wastewater Dischargers

| Permitted Entity | NPDES Permit | Allocations[a] |
|---|---|---|
| | | kilograms per year |
| C&H Sugar and Crockett Community Services District. | CA0005240 | 0.00006 |
| Chevron Products Company | CA0005134 | 0.003 |
| ConocoPhillips | CA0005053 | 0.0006 |
| Crockett Cogeneration LP, and Pacific Crockett Energy, Inc. | CA0029904 | 0.0006 |
| General Chemical | CA0004979 | 0.0009 |
| GWF Power Systems, Site I | CA0029106 | 0.0001 |
| GWF Power Systems, Site V | CA0029122 | 0.0001 |
| Hanson Aggregates, Amador Street | CA0030139 | 0.00003 |
| Hanson Aggregates, Olin Jones Dredge Spoils Disposal | CA0028321 | 0.00003 |
| Hanson Aggregates, Tidewater Ave., Oakland | CA0030147 | 0.00003 |
| Morton Salt | CA0005185 | 0.00008 |
| Pacific Gas and Electric, East Shell Pond | CA0030082 | 0.00003 |
| Rhodia, Inc. | CA0006165 | 0.0003 |
| San Francisco, City and Co., SF International Airport Industrial WTP | CA0028070 | 0.002 |
| Shell Oil Products US and Equilon Enterprises LLC | CA0005789 | 0.002 |
| Mirant Delta LLC, Pittsburg Power Plant | CA0004880 | 0.0008 |
| Mirant Potrero LLC, Potrero Power Plant | CA0005657 | 0.0003 |
| Tesoro Refining and Marketing Company | CA0004961 | 0.002 |
| The Dow Chemical Company | CA0004910 | 0.0006 |
| USS-Posco | CA0005002 | 0.02 |
| Valero Refining Company | CA0005550 | 0.0007 |
| ***Total*** | | ***0.035[b]*** |

a. Wasteload allocations for industrial wastewater dischargers do not include mass from once-through cooling water. The Water Board will apply intake credits to once-through cooling water as allowed by law.
b. Total differs from column sum due to rounding

**Table 7.2.3-5 County-Based Watershed Wasteload Allocations for Stormwater Runoff**

| County[b] | Allocations[a] kilograms per year |
|---|---|
| Alameda | 0.5 |
| Contra Costa | 0.3 |
| Marin | 0.1 |
| Napa | 0.05 |
| San Francisco[c] | 0.2 |
| San Mateo | 0.2 |
| Santa Clara | 0.5 |
| Solano | 0.1 |
| Sonoma | 0.05 |
| ***Total*** | ***2*** |

a. Allocations implicitly include all current and future permitted discharges within the geographic boundaries of municipalities and unincorporated areas within the County. Examples of discharges include but are 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.

b. Includes unincorporated areas and all municipalities in the county that drain to the Bay and are part of the San Francisco Bay Region.

c. Does not account for treatment provided by San Francisco's combined sewer system. The treatment provided by the City and County of San Francisco's Southeast Plant and Northpoint Wet Weather Facility (NPDES permit CA0037664) will be credited toward meeting the allocation and load reduction.

### 7.2.3.6 Implementation Plan

The implementation plan includes three general implementation categories: control of external loadings of PCBs to the Bay, control of internal sources of PCBs within the Bay, and actions to manage risks to Bay fish consumers. In addition, the plan includes monitoring to measure attainment of the numeric target and load allocations, and measuring implementation progress. The plan will be implemented in phases via an adaptive implementation strategy founded on requiring actions in each category based on the current state of knowledge of PCBs sources and control measures, while also conducting studies to improve our understanding of PCBs sources, control options, and fate in the environment.

#### ***External Sources***

This section, organized by source categories, specifies actions required to achieve allocations and implement the TMDL.

### *Central Valley Watershed*

Sediments entering the Bay from the Central Valley have lower concentrations of PCBs than in-Bay sediment. Major mass loading events that occur during episodic high flow conditions generally flow directly out of the Bay through the Golden Gate. It is anticipated that the Central Valley allocation will be attained through natural attenuation.

### *Municipal and Industrial Wastewater Dischargers*

Wasteload allocations shall be implemented through NPDES permits that require implementation of best management practices to maintain optimum treatment performance for solids removal and the identification and management of controllable sources. NPDES permits shall include effluent limits based on current performance and a requirement for quantification of PCBs loads to the Bay in order to determine attainment of the wasteload allocations. Compliance with effluent limits shall be determined using a Title 40, Code of Federal Regulations, Part 136 analytical method **(effective as of April 25, 2007)**. In addition, municipal and industrial wastewater dischargers will be required to support actions to reduce the health risks of people who eat PCBs-contaminated, San Francisco Bay fish and to conduct or cause to be conducted monitoring, and studies to fill critical data needs identified in the adaptive implementation section.

It is the Water Board's intent to implement individual wasteload allocations via numeric water quality-based effluent limitations for PCBs in NPDES permits. These limits shall represent individual dischargers' PCBs loads, consistent with the underlying assumptions and requirements of the wasteload allocations. In the absence of actual discharge performance data sufficient to calculate such limits, the Water Board will apply appropriate uncertainty factors to the individual wasteload allocations.

Dischargers shall also be required to conduct sufficient monitoring of their effluent, which accounts for discharge variability and blended effluent, to enable calculation of current PCBs loading. These requirements will be implemented via NPDES permits or the Water Board's authority under Section 13267 of the California Water Code, such that monitoring begins no later than January 2009 and is completed in a timely manner.

### *Stormwater Runoff*

Stormwater runoff wasteload allocations shall be achieved within 20 years and shall be implemented through the NPDES stormwater permits issued to stormwater runoff management agencies and the California Department of Transportation (Caltrans). The urban stormwater runoff wasteload allocations implicitly include all current and future permitted discharges, not otherwise addressed by another allocation, and unpermitted discharges within the geographic boundaries of stormwater runoff management agencies including, but not limited to, Caltrans roadway and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

Requirements in each NPDES permit issued or reissued, shall be based on an updated assessment of best management practices and control measures intended to reduce PCBs in urban stormwater runoff. Control measures implemented by stormwater runoff management agencies and other entities (except construction and industrial sites) shall reduce PCBs in stormwater runoff to the maximum extent practicable. Control measures for construction and industrial sites shall reduce discharges based on best available technology economically achievable. All permits shall remain consistent with Section 4.8 - Stormwater Discharges.

In the first five-year permit term, stormwater permittees will be required to implement control measures on a pilot scale to determine their effectiveness and technical feasibility. In the second permit term, stormwater permittees will be required to implement effective control measures, that will not cause significant adverse environmental impacts, in strategic locations, and to develop a plan to fully implement control measures that will result in attainment of allocations, including an analysis of costs, efficiency of control measures and an identification of any significant environmental impacts. Subsequent permits will include requirements and a schedule to implement technically feasible, effective and cost efficient control measures to attain allocations. If, as a consequence, allocations cannot be attained, the Water Board will take action to review and revise the allocations and these implementation requirements as part of adaptive implementation.

In addition, stormwater permittees will be required to develop and implement a monitoring system to quantify PCBs urban stormwater runoff loads and the load reductions achieved through treatment, source control and other actions; support actions to reduce the health risks of people who consume PCBs-contaminated San Francisco Bay fish; and conduct or cause to be conducted monitoring, and studies to fill critical data needs identified in the adaptive implementation section.

Stormwater runoff management agencies have a responsibility to oversee various discharges within the agencies' geographic boundaries. However, if it is determined that a source is substantially contributing to PCBs loads to the Bay or is outside the jurisdiction or authority of an agency the Water Board will consider a request from an stormwater runoff management agency which may include an allocation, load reduction, and/or other regulatory requirements for the source in question.

### *Urban Stormwater Runoff Treatment by Municipal Wastewater Dischargers*

Routing of urban stormwater runoff through municipal wastewater treatment facilities may be an efficient means of reducing PCBs, and other particle-associated contaminant loads to the Bay. This load allocation shall be implemented through a permit. Within five years of adoption of this TMDL, the Water Board will consider issuance of a permit under which municipal wastewater dischargers can apply for a portion of this reserved allocation.

## ***Internal Sources***

### *In-Bay PCB-Contaminated Sites*

A number of former industrial and military sites adjacent to PCBs-enriched sediment are found throughout the Bay. This TMDL does not require any specific party to implement new actions for in-Bay PCB-contaminated sites. However, cleanup of these sites is a Water Board priority and many cleanups are underway. The Water Board will maintain an inventory of contaminated sites and continue to set priorities for investigating and remediating the sites. The existing list of in-Bay PCB-contaminated sites referred to in this TMDL is based on data collected under the Bay Protection Toxic Cleanup Program, which identified sites with total PCBs in sediment that exceed 180 μg/kg. This TMDL does not set a cleanup level for total PCBs in sediment. The fish tissue target of 10 μg/kg and the sediment goal of one ug/kg are not cleanup standards, nor should they be considered appropriate, or relevant, and applicable requirements (ARARs) or a "to-be-considered" ARAR under the National Contingency Plan, 40 CFR Part 300 et. Seq. or the 1986 Superfund Amendments and Reauthorization Act. An analysis of the feasibility, technical practicability, and potential environmental impacts of individual clean-up actions is currently required prior to conducting cleanup of contaminated in-Bay sediment overseen by the Water Board and the Department of Toxic Substances Control and will continue to be required, not withstanding this TMDL. The Water Board has the authority to approve, disapprove or condition these projects to minimize adverse environmental impacts while achieving the goals of environmental cleanup.

The Water Board will coordinate cleanup actions with the U.S. EPA and the Department of Toxic Substances Control, and advise them that the fish tissue target and sediment goal do not constitute cleanup standards for ARARs. The Water Board will issue cleanup orders as necessary. The Water Board will require responsible parties for each specific Bay margin contaminated site to:

1) Estimate the pre-cleanup and post-cleanup vertical and lateral extent of PCBs in Bay sediments;
2) Estimate the pre-cleanup and post-cleanup mass of PCBs in Bay sediments;
3) Quantify rate(s) of sediment accretion, erosion or natural attenuation;
4) Implement on-land source control measures, if necessary, to ensure that on-land sources of PCBs do not further contaminate in-Bay sediments;
5) Evaluate post-cleanup, the residual risks to humans and wildlife;
6) Support actions to reduce the health risks of people who consume PCBs-contaminated San Francisco Bay fish;
7) Conduct or cause to be conducted studies to fill critical data needs identified in the Adaptive Implementation section.

These requirements shall be incorporated into relevant site investigation plans within five years of the effective date of this TMDL, and the actions shall be fully implemented within ten years of the effective date of this TMDL or as agreed to in the individual site investigation plan.

### *Navigational Dredging*

The PCBs concentration in dredged material disposed of in the Bay shall not exceed the 99$^{th}$ percentile PCBs concentration of the previous 10 years of Bay sediment samples collected through the RMP (excluding stations outside the Bay like the Sacramento River, San Joaquin River, Guadalupe River and Standish Dam stations). Prior to disposal, the material shall be sampled and analyzed according to the procedures outlined in the 2001 U.S. Army Corps of Engineers document "Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region." All in-Bay disposal of dredged material shall comply with Section 4.20, entitled Dredging and Disposal of Dredged Sediment, including the Long Term Management Strategy. Additionally, dredged material dischargers will be required to conduct or cause to be conducted studies to fill critical data needs identified in the Adaptive Implementation section.

### *Risk Management*

Load reductions and attainment of the numeric target to support fishing in the Bay as a beneficial use will take time to achieve. However, there are actions that should be undertaken prior to achievement of the numeric fish tissue target to help manage the risk to consumers of PCBs-contaminated fish. The Water Board will work with the California Office of Environmental Health Hazard Assessment, the California Department of Toxic Substances Control, the California Department of Public Health, dischargers, and interested parties to pursue risk management strategies. The risk management activities will include the following:

- Investigating and implementing actions to address the public health impacts of PCBs in San Francisco Bay/Delta fish, including activities that reduce the actual and potential exposure of, and mitigate health impacts to, people and communities most likely to be consuming PCB-contaminated fish from San Francisco Bay, such as recreational and subsistence fishers and their families;

- Providing multilingual fish-consumption advice to the public to help reduce PCBs exposure through community outreach, broadcast and print media, and signs posted at popular fishing locations;
- Regularly informing the public about monitoring data and findings regarding hazards of eating PCB-contaminated fish; and
- Conducting special studies needed to support health risk assessment and risk communication, including the collection of additional information regarding recreational and subsistence fishers' patterns of consumption.

#### 7.2.3.7 Critical Data Needs

Additional data and other information will be needed to assess both the progress toward attainment of the fish tissue target and to evaluate the need for modifications to the implementation plan, TMDL, and/or allocations. Dischargers will be required to conduct or cause to be conducted the following studies to fill critical data needs.

- PCBs mass budget modeling and food web model improvements – Model refinements to improve our ability to predict recovery rates of the Bay from impairment by PCBs, to help strategically focus implementation actions on those actions with the most potential for success, and to help better our understanding of the role in-Bay PCBs-contaminated sites play in the Bay's recovery.
- Rate of natural attenuation of PCBs in the Bay environments –A better understanding of local rates of natural attenuation in order to predict with more certainty the recovery time of the Bay.

##### *Monitoring*

Monitoring to demonstrate progress toward attainment of the TMDL target shall be conducted by maintaining discharger-funded RMP monitoring of PCBs in San Francisco Bay fish, sediments, and water at a spatial scale and frequency to track trends in the decline of PCBs in the Bay. Monitoring of load allocations to demonstrate progress towards attainment shall be conducted by municipal and industrial wastewater dischargers and stormwater permittees as discussed in external sources above.

Continued regular monitoring of PCB loads from the Central Valley and other tributaries to the Bay shall be conducted by maintaining discharger-funded RMP monitoring in order to provide information on the long term decline of PCBs to the Bay and to confirm the assumption that Central Valley loads are being reduced due to natural attenuation. Monitoring of loads allocated to other sources will be considered as part of the RMP special studies.

##### *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, this TMDL will be implemented in phases starting with actions described in each source category, risk management, monitoring, and critical data needs section above with subsequent modifications and phases based on improved knowledge of PCBs sources, control measures, and fate in the environment.

The Water Board will adapt the TMDL and implementation plan to incorporate new and relevant scientific information such that effective and efficient measures can be taken to achieve the allocations

and numeric fish tissue target. 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 the scientific literature. Within ten years of the effective date of the TMDL, Water Board will consider a Basin Plan amendment that will reflect and incorporate the data and information that is generated in the intervening years. The Water Board will consider amending the PCBs TMDL and implementation plan as necessary to ensure attainment of water quality standards in a timely manner while considering the financial and environmental consequences of new control measures.

In particular, achievement of the allocations for stormwater runoff, which is projected to take 20 years, will be challenging. Consequently, the Water Board will consider modifying the schedule for achievement of the load allocations for stormwater runoff provided that dischargers have complied with all applicable permit requirements and accomplished all of the following:

- A diligent effort has been made to quantify PCBs loads and the sources of PCBs in the discharge;
- Documentation has been prepared that demonstrates that all technically and economically feasible and cost-effective control measures recognized by the Water Board have been fully implemented, and evaluates and quantifies the PCBs load reduction of such measures;
- A demonstration has been made that achievement of the allocation will require more than the remaining 10 years originally envisioned; and
- A plan has been prepared that includes a schedule for evaluating the effectiveness and feasibility of additional control measures and implementing additional controls as appropriate.

## 7.3 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE MARIN COASTAL BASIN (SEE FIGURE 2-3)

### 7.3.1 Tomales Bay Watershed Pathogens TMDL

The overall goal of the Tomales Bay Watershed Pathogens Total Maximum Daily Load (TMDL) is to ensure protection of water contact recreational uses and Bay shellfish harvesting, thereby minimizing human exposure to disease-causing pathogens. The following sections establish a density-based pathogens TMDL for Tomales Bay and its tributaries, and actions and monitoring necessary to implement theTMDL. The TMDL defines allowable density-based water quality bacteria concentrations and prohibits the discharge of human waste. The associated implementation plan specifies the actions necessary to protect and restore beneficial uses. This TMDL strives to achieve a balance that allows human activities including agriculture, recreation, commercial fishing and aquaculture, and residential use to coexist and also restores and protects water quality. As outlined in the adaptive implementation section, the effectiveness of implementation actions, monitoring to track progress toward targets, and the scientific understanding pertaining to pathogens will be periodically reviewed and the TMDL may be adapted as warranted.

In addition to pathogens, animal and human waste contain nutrients that pose a threat to aquatic ecosystem beneficial uses. Tomales Bay, Walker Creek, and Lagunitas Creek are listed as impaired by excess nutrients. Human and animal wastes may also contain other harmful constituents such as steroids and pharmaceuticals. In addition to protecting pathogen-impaired beneficial uses such as shellfish harvesting, water contact recreation, and non-contact water recreation, by eliminating the discharge of human waste and controlling the discharge of animal waste, this TMDL will also protect aquatic

ecosystem beneficial uses such as marine habitat, estuarine habitat, cold and warm freshwater habitat, and wildlife habitat from other harmful constituents found in human and animal waste.

#### 7.3.1.1 Problem Statement

Monitoring results for Tomales Bay and its main tributaries (Lagunitas, Walker, and Olema creeks) indicate that these waters exceed bacteria water quality objectives for shellfish harvesting and recreational waters (Table 3-1) and, as such, are impaired by pathogens. The presence of pathogens is inferred from high concentrations of fecal coliform bacteria (a commonly used indicator of human pathogenic organisms). Pathogen pollution is adversely affecting existing beneficial uses, which include shellfish harvesting (i.e., sport and commercial oyster, clam, and mussel harvesting), water contact recreation (i.e., swimming, fishing) and non-contact water recreation (i.e., boating, kayaking).

This TMDL addresses the following pathogen-impaired water bodies in the Tomales Bay Watershed:

- Tomales Bay
- Lagunitas Creek
- Walker Creek
- Olema Creek

#### 7.3.1.2 Sources

If not properly managed, the following Tomales Bay Watershed sources have the potential to discharge pathogens to surface waters: on-site sewage disposal systems (OSDSs), small wastewater treatment facilities and sewage holding ponds, boat discharges, grazing lands, dairies, equestrian facilities, and municipal runoff. Pathogens sources are identified based on elevated coliform bacteria levels downstream of identified land uses or facilities and from documentation of inadequately treated human waste discharges.

- The Walker Creek watershed is dominated by grazing lands. Coliform bacteria levels and coliform loads from the Walker Creek watershed are extremely high during storm periods and a significant coliform source to Tomales Bay.
- High coliform levels detected in storm drains indicate that municipal runoff is a pathogens source.
- High coliform levels and loads downstream of residential homes and equestrian facilities suggest that failing septic systems, municipal runoff, and equestrian facilities are coliform sources.
- The Water Board regulates ten small wastewater treatment facilities and sewage holding ponds and prohibits direct discharges from these facilities into Tomales Bay or its tributaries. Four facilities have holding ponds and are permitted to discharge treated effluent to irrigation fields in the dry season. The other six wastewater treatment facilities utilize leach fields for dispersing treated effluent. Accidental malfunctions, including the breaching of ponds, a break in a sewage line, or land application when soil is saturated or it is raining, could result in discharge of untreated or partially treated effluent. Therefore, these facilities are considered potential sources.

In addition to the above sources, warm-blooded mammals and birds that reside in the watershed and Bay produce coliform bacteria. During non-storm periods Tomales Bay coliform levels are typically below the water quality objectives for shellfish harvesting waters, indicating that in-Bay wildlife such as seals and birds are not significant sources. Approximately 30% of the lands draining to Tomales Bay are open space

forested lands. Water quality monitoring of a watershed on the western shoreline of Tomales Bay with minimal human influences suggests that waters draining open space areas are below tributary bacteria water quality objectives and therefore terrestrial wildlife are nota significant source.

#### 7.3.1.3 Numeric Targets

Table 7.3.1-1 contains the numeric water quality targets for the Tomales Bay Watershed Pathogens TMDL. The coliform bacteria targets are based on fecal coliform bacteria concentrations aimed at protecting shellfish harvesting and contact and non-contact water recreation beneficial uses. These density-based numeric targets define bacterial densities associated with minimal risk to humans and are the same as the water quality objectives contained in Table 3-1. The Tomales Bay targets are intended to protect the most sensitive beneficial use, shellfish harvesting. The tributary targets are intended to protect recreational uses. An additional numeric target for Tomales Bay is expressed as the number of days commercial shellfish growing areas are subjected to harvest closures due to elevated water column bacteria densities. Consistent with the definition of "threatened conditions" in the California Shellfish Protection Act, Tomales Bay shellfish growing areas shall not be closed for harvest for more than 30 days per calendar year. The California Department of Health Services requires shellfish growing areas to close for harvesting when 24-hour and 10-day rainfall totals exceed established thresholds. Rainfall thresholds are established based on the relationship between rainfall and observed fecal coliformlevels in Bay waters and shellfish.

In addition, no human waste (raw sewage or inadequately treated waste) shall be discharged to Tomales Bay or its tributaries. The no human waste discharge target is consistent with Discharge Prohibitions 5 and 15, contained in Table 4-1. This target is necessary because human waste is a significant source of pathogenic organisms, including viruses; and attainment of fecal coliform targets alone may not sufficiently protect human health. The coliform bacteria targets, in combination with the human waste discharge prohibitions and the shellfish harvesting closure targets, are the basis for the TMDL and load allocations, and fully protect beneficial uses.

**Table 7.3.1-1 Water Quality Targets[a] for Tomales Bay and Its Tributaries**

| |
|---|
| Zero discharge of human waste |
| Shellfish harvest closures < 30 days/year |
| Coliform Bacteria Levels<br>(Expressed as Most Probable Number [MPN] of fecal coliforms per 100 mL of water)<br>Tomales Bay<br>Median < 14 [b] and 90$^{th}$ percentile < 43 [c]<br>Tomales Bay Tributaries<br>Log mean <200 [b] and 90$^{th}$ percentile < 400 [c] |

a. These targets are applicable year-round
b. Based on a minimum of five consecutive samples equally spaced over a 30-day period
c. No more than 10% of total samples during any 30-day period may exceed this number.

#### 7.3.1.4 Total Maximum Daily Load

Table 7.3.1-2 lists the Tomales Bay Watershed Pathogens TMDL. The TMDL consists of the density-based coliform bacteria TMDL targets. The TMDL ensures protection of water contact recreational uses and Bay shellfish harvesting, thereby minimizing human exposure to disease causing pathogens.

**Table 7.3.1-2 Total Maximum Daily Load of Pathogens Indicators for Tomales Bay and its Tributaries**

| Waterbody | Indicator Parameter | TMDL (Most Probable Number (MPN) of fecal coliforms per 100 mL of water) |
|---|---|---|
| Tomales Bay | Fecal coliform | Median < 14 [a]<br>90th Percentile < 43 [b] |
| Major Tributaries:<br>Walker Creek<br>Lagunitas Creek<br>Olema Creek | Fecal coliform | Log mean <200 [a]<br>90th percentile < 400 [b] |

[a.] Based on a minimum of five consecutive samples equally spaced over a 30-day period.
[b.] No more than 10% of total samples during any 30-day period may exceed this number.

### 7.3.1.5 Load Allocations

TMDL targets are an interpretation of water quality standards, whereas TMDL allocations specify the amount (or concentration) of a pollutant that can be discharged to a waterbody such that standards are attained in both the receiving waterbody and all downstream waters. Table 7.3.1-3 presents density-based load allocations for Tomales Bay watersheds pathogens source categories that implement tributary targets, and Table 7.3.1-4 presents allocations to major tributaries, where they discharge to Tomales Bay, and implement the Bay targets. Load allocations to the tributaries reflect the highest fecal coliform concentrations that can be discharged while still attaining and maintaining the Bay shellfish harvesting water quality objectives. All entities in a watershed are responsible for meeting their source category allocation (Table 7.3.1-3) and the applicable geographic-based allocations (Table 7.3.1-4).

Discharging entities will not be held responsible for uncontrollable coliform discharges originating from wildlife. If wildlife contributions are determined to be the cause of exceedances, the TMDL targets and allocation scheme will be revisited as part of the adaptive implementation program. The discharge of human waste is prohibited. All sources of human waste have an allocation of zero. Nonpoint source runoff containing coliform bacteria of animal and wildlife origin, at levels that do not result in exceedances of water objectives, does not constitute wastewater with particular characteristics of concern to beneficial uses. Therefore, animal- and wildlife-associated discharges, in compliance with the conditions of this TMDL, do not constitute a violation of applicable discharge prohibitions.

### 7.3.1.6 Implementation Plan

The Tomales Bay Watershed Pathogens TMDL Implementation Plan builds upon previous and ongoing successful efforts to reduce pathogen loads in Tomales Bay and its tributaries. The plan requires actions consistent with the California Water Code (CWC 13000 et seq.), the state's Nonpoint Source Pollution Control Program Plan (CWC Section 13369), the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (State Water Resources Control Board. 2004. Policy for

Implementation and Enforcement of the Nonpoint Source Pollution Prevention Control Program), and human waste discharge prohibitions (Prohibitions 5 and 15, Table 4-1).

This plan specifies required implementation measures (Table 7.3.1-5) for each of the source categories (Table 7.3.1-3). These implementation measures include evaluation of operating practices, development of comprehensive site-specific pathogens control measures and an implementation schedule for such management measures, and submittal of progress reports documenting actions undertaken. Progress reports may be submitted directly to the Water Board or, if designated, through third parties. These progress reports will serve as documentation that source reduction measures are being implemented. While third parties may provide valuable assistance to TMDL implementation, the discharger is the entity responsible for complying with the specified regulations and regulatory controls. Responsible parties within each source category are required to implement the measures as specified in Table 7.3.1-5. The numeric targets and load allocations are not directly enforceable. For purpose of demonstrating attainment of applicable allocations, responsible parties will only be responsible for compliance with specified implementation measures and applicable waste discharge requirements or waiver conditions.

**Table 7.3.1-3 Density-Based Pollutant Wasteload and Load Allocations[a] for Dischargers of Pathogens in Tomales Bay Watershed**

| Categorical Pollutant Source | Wasteload and Load Allocations Fecal Coliform (MPN/100 mL) | | |
|---|---|---|---|
| | For Direct Discharges to the Bay | | For Discharges to Major Tomales Bay Tributaries |
| | Median[b] | 90th Percentile[c] | Log Mean[b] |
| Onsite Sewage Disposal Systems | 0 | 0 | 0 |
| Small Wastewater Treatment Facilities | 0 | 0 | 0 |
| Boat Discharges | 0 | 0 | N/A |
| Grazing Lands | <14 | <43 | < 200 |
| Dairies | <14 | <43 | < 200 |
| Equestrian Facilities | <14 | <43 | < 200 |
| Municipal Runoff | <14 | <43 | < 200 |
| Open space lands (terrestrial wildlife) [d] | <14 | <43 | < 200 |
| In-Bay Background (marine wildlife) [d] | <14 | <43 | N/A |

a. These allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a NPDES permit.
b. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
c. No more than 10% of total samples during any 30-day period may exceed this number.
d. Open space lands and the Bay contain wildlife and are therefore recognized as potential source areas. These areas are not believed to be a significant source of pathogens and their contribution is considered natural background; therefore, no management measures are required.

**Table 7.3.1-4 Density-Based Pollutant Load Allocations for Tomales Bay Tributaries**

| Tributary | Allocation Fecal Coliform (MPN/100 mL) Log Mean |
|---|---|
| Walker Creek at Highway 1 Bridge | 95[a] |
| Lagunitas Creek at Green Bridge | 95[a] |

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires that current and proposed nonpoint source discharges are regulated under waste discharge requirements (WDRs), waiver of waste discharge requirements, Basin Plan prohibitions, or some combination of these tools. Table 7.3.1-5 describes the method that will be used to regulate dischargers in each source category. The Water Board has established conditions for waiving WDRs for dairies. The Water Board intends to work with stakeholders to develop similar waiver conditions for grazing lands and equestrian facilities by 2009.

**Table 7.3.1-5 Trackable Implementation Measures for the Tomales Bay Watershed Pathogens Total Maximum Daily Load**

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| On-Site Sewage Disposal Systems (OSDS) | Submit to the Executive Officer for approval a plan and implementation schedule to evaluate OSDS performance for the Tomales Bay watershed and to bring identified OSDS up to County's repair standards. | Marin County, Community Development Agency | January 2007 |
| | Report progress on implementation of OSDS evaluation and repair program. | Marin County, Community Development Agency | Starting January 2011 and biennially thereafter |
| Small Wastewater Treatment Facilities | Comply with applicable Waste Discharge Requirements (WDRs). | Small wastewater treatment facilities | As specified in the applicable WDRs |
| | Inspect and evaluate all permitted WDR facilities and update WDRs as warranted. | Water Board staff | January 2009 |
| | Report progress on inspection and evaluation of WDR facilities. | Water Board staff | No less than once every five years starting in January 2009 |
| Boat Discharges | In coordination with interested stakeholders in Tomales Bay, determine the adequacy of on-shore restroom facilities and boater disposal/pump out facilities, and prepare a schedule for a determination of Pumpout Facility Need and Public Hearing Notification, as appropriate. | Regional Water Board | January 2009 |

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| Boat Discharges (continued) | Water Board will coordinate with participating agencies and rely on their interests and authorities to develop and implement a Tomales Bay boating management plan that includes: evaluation of existing moorings and water quality impacts; permitting and enforcement procedures to ensure compliance with applicable mooring requirements and to ensure no sewage discharge from boats. | Point Reyes National Seashore, California Coastal Commission, California State Lands Commission, California State Parks, County of Marin, Regional Water Board, Gulf of the Farallones National Marine Sanctuary. | January 2009 |
| | Report progress on implementation of boating management plan. | As specified in the Boating Management Plan: Point Reyes National Seashore, California Coastal Commission, California State Lands Commission, California State Parks, County of Marin, Regional Water Board, Gulf of the Farallones National Marine Sanctuary | As specified in the Boating Management Plan |
| | Comply with boating management plan for Tomales Bay. | Boaters | As specified in the Boating Management Plan |
| Grazing Lands[2] | Submit a Report of Waste Discharge[1] to the Water Board that provides the following: a description of the facility; identification of necessary site-specific grazing management measures to reduce animal waste runoff; and a schedule to implement identified management measures. | Dairies and ranchers (landowners and leasees). These Reports may be submitted individually or jointly or through a third party. | January 2009 |

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| | Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. | Dairies and ranchers (landowners and leasees) | As specified in applicable WDRs or waiver of WDRs |
| | Report progress on implementation of grazing management measures that reduce animal waste runoff. | Dairies and ranchers (landowners and leasees). These reports may be submitted individually or jointly or through a third party. | As specified in applicable WDRs or waiver of WDRs |
| Dairies[3] | Comply with applicable Waiver of Waste Discharge Requirements (WDRs) for confined animal facilities or requirements specified in applicable individual WDRs. | Dairies (landowners and leasees) | As specified in applicable WDRs or waiver of WDRs |
| Equestrian Facilities | Submit a Report of Waste Discharge1 to the Water Board that provides the following: a description of the facility; identification of necessary site-specific management measures to reduce animal waste runoff; and a schedule for implementation of identified management measures. | Equestrian facilities. These Reports may be submitted individually or jointly or through a third party. | January 2009 |

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| | Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. | Equestrian facilities | As specified in applicable WDRs or waiver of WDRs. |
| | Report progress on implementation of management measures that reduce animal waste runoff. | Equestrian facilities. These reports may be submitted individually or jointly or through a third party. | As specified in applicable WDRs or waiver of WDRs |
| Municipal Runoff | Submit to Water Board for approval a stormwater management plan (that includes management measures to reduce pathogens runoff and a schedule for implementation of identified management measures. | Marin County, Stormwater Pollution Prevention Program | January 2009 |
| | Report progress on implementation of pathogens reduction measures. | Marin County, Stormwater Pollution Prevention Program | As specified in approved stormwater management plan |

[1] WDRs waiver conditions may allow for other submittals in lieu of a Report of Waste Discharge.

[2] Grazing lands include all land areas grazed by livestock such as ranchlands, riparian areas, and pasturelands. Confined animal facilities which are already regulated under existing WDRs or waiver of WDRs and are excluded from this requirement.

[3] These implementation actions for Dairies are for the confined animal portions of the facilities and do not include the grazing areas. Implementation actions for grazing lands associated with dairies are included under Grazing lands.

| Table 7.3.1-6 Regulatory Framework for Discharges by Source Category | |
|---|---|
| **Source Category** | **Regulatory Tool** |
| On-site Sewage Disposal Systems (OSDS) | Waiver[a] of Waste Discharge Requirements<br>Prohibition of Human Waste Discharge |
| Small Wastewater Treatment Facilities | Individual Waste Discharge Requirements<br>Prohibition of Human Waste Discharge |
| Boat Discharges | Prohibition of Human Waste Discharge |
| Grazing Lands | Waiver[a] of Waste Discharge Requirements |
| Dairies | Waiver[a] of Waste Discharge Requirements or Individual WDRs, as appropriate |
| Equestrian Facilities | Waiver[a] of Waste Discharge Requirements |
| Municipal Runoff | NPDES Permit |

[a] Water Board retains the option of requiring individual waste discharge requirements or compliance with a discharge prohibition, as appropriate.

### *Agricultural Water Quality Control Program Costs*

The implementation measures for grazing lands and dairies constitute an agricultural water quality control program and therefore, consistent with California Water Code requirements (Section 13141), the cost of the program is estimated herein. The total program implementation cost for these agricultural sources is estimated to range between $900,000 – $2 million per year over the next 10 years. The estimated cost will be shared by Tomales Bay watershed grazing lands operators (approximately 150). This estimate includes the cost of implementing animal waste control and grazing management measures and is based on costs associated with technical assistance and evaluation, installation of water troughs, and cattle control fencing along all streams. The program cost estimate may be high as it does not account for implementation actions already underway or areas that may not require fencing. Besides fencing, other acceptable methods of managing livestock access to streams are not included in this cost estimate due to variability in costs and site specific applicability. Potential financing sources include federal and state water quality grants and federal agricultural grants.

### *Evaluation and Monitoring*

Dischargers, stakeholders, and Water Board staff will conduct water quality monitoring to evaluate fecal coliform concentration trends in Tomales Bay and its tributaries. Five years after TMDL adoption, the Water Board will evaluate monitoring results and assess progress made toward attaining TMDL targets (Table 7.3.1-1) and load allocations (Table 7.3.1-3 and Table 7.3.1-4).

In 2009 and approximately every five years after the adoption of the TMDL, the Water Board will evaluate site specific, sub-watershed specific, and watershed-wide compliance with the trackable implementation measures specified in Table 7.3.1-5. In evaluating compliance with the trackable implementation measures, the Water Board will consider the level of participation of each source category as well as individual dischargers (as documented by Water Board staff or third parties).

If a discharger demonstrates that all implementation measures have been undertaken or that it is infeasible to meet their allocation due to wildlife contributions, the Water Board will consider revising allocations as appropriate. If source control actions are fully implemented throughout the Watershed and the TMDL targets are not met, the Water Board may consider re-evaluating or revising the TMDL and

allocations. If, on the other hand, the required actions are not fully implemented, or are partially implemented, the Water Board may consider regulatory or enforcement action against parties or individual dischargers not in compliance.

The California Department of Health Services, working in consultation with the Shellfish Technical Advisory Committee, is encouraged to periodically evaluate, beginning in 2009, shellfish harvest closure guidelines and the relationship between precipitation, runoff, coliform levels, and water quality exceedances.

In order to assess water quality improvements and obtain additional information for further refinement of the TMDL, Water Board staff and stakeholders will collaborate in monitoring efforts. The main objectives of the Monitoring Program are to:

- Assess attainment of TMDL targets;
- Evaluate spatial and temporal water quality trends in the Bay and its tributaries;
- Further identify significant pathogens source areas;
- Evaluate coliform levels and loadings to the Bay at the terminus of major tributaries.
- Collect sufficient data to calibrate and validate the Bay hydrodynamic model to observed coliform levels; and
- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of implementation actions.

Table 7.3.1-7 outlines the locations, constituents, sampling frequency, analytical methods, and the sampling entities for a baseline water quality monitoring program. Additional monitoring will be conducted as needed if funds are available. The Water Board, in coordination with the sampling entities and interested third parties, such as National Park Service, California Department of Health Services, commercial shellfish growers, the Inverness Public Utility District, and the Salmon Protection and Watershed Network will implement this long-term water quality monitoring program. All water quality monitoring (including Quality Assurance and Quality Control procedures) will be performed pursuant to the State Water Board's Quality Assurance Management Plan for the Surface Water Ambient Monitoring Program.

**Table 7.3.1-7 Baseline Water Quality Monitoring Program**

| Constituent | Location | Frequency | Sampling Entities |
|---|---|---|---|
| **Tomales Bay** | | | |
| Fecal Coliform[a] | California Department Health Services designated primary water quality monitoring stations | Weekly for five weeks beginning in January; Monthly March – December<br><br>Weekly for five weeks during summer months | Shellfish Growers |
| **Tributaries** | | | |
| Fecal coliform<br>Stream Flow | Olema Creek (tributary to Lagunitas) | Weekly for five weeks beginning in January; Monthly March - December<br><br>Weekly for five weeks during summer months | National Park Service |
| Fecal coliform | West Shore tributaries | Same as above | Inverness Public Utilities District |
| Fecal coliform | East Shore tributaries | Same as above | Water Board |
| Fecal coliform<br>Stream Flow | Lagunitas Creek | Same as above | Water Board, Salmon Protection and Watershed Network |
| Fecal coliform<br>Stream Flow | Walker Creek | Same as above | Water Board |

[a] *E. coli* monitoring may be used in the future to assess general water quality trends and exceedances. If E. coli is used, a Tomales Bay specific correlation factor linking fecal coliform and E. coli levels will need to be established.

### *Adaptive Implementation*

Approximately every five years, the Water Board will review the Tomales Bay Watershed Pathogens TMDL and evaluate new and relevant information from monitoring, special studies, and scientific literature. The reviews will be coordinated through the Water Board's continuing planning program and will provide opportunities for stakeholder participation. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan. In evaluating necessary modifications, the Water Board will favor actions that reduce sediment and nutrient loads, pollutants for which the Tomales Bay Watershed is also impaired. At a minimum, the following questions will be used

to conduct the reviews. Additional questions will be developed in collaboration with stakeholders during each review.

- Are the Bay and the tributaries 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 might the implementation actions or allocations be modified?
- What are the pollutant loads for the various source categories (including naturally occurring background pathogen contributions and the contribution from open space lands), how have these loads changed over time, how do they vary seasonally, 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?
- The allocations assume a conservative bacterial die-off rate of 0.02 per hour. This value is based on rates reported for San Francisco Bay in 1970. If bacterial die-off is found to be higher, higher allocations may be considered. What are bacterial die-off rates in the water column and stream sediments? Do they vary by season? What are bacteria transport times from sources to the Bay?
- How does estuarine mixing and dilution of tributary waters vary by flow and season?
- What is the relationship between precipitation, runoff, tributary loads, Bay coliform levels, and water quality exceedances and shellfish harvesting closures?
- Are there bacteria in Tomales Bay sediments that enter the water column during storm events? If yes, how should this process be accounted for?

If it is demonstrated that all reasonable and feasible source control measures have been implemented for a sufficient period of time and TMDL targets are still not being met, the Water Board will reevaluate water quality standards, TMDL targets and allocations as appropriate.

### 7.3.2 Total Maximum Daily Load for Mercury in Walker Creek and Soulajule Reservoir

Walker Creek and Soulajule Reservoir, which is located in the Walker Creek watershed, are impaired by mercury. This TMDL applies to Soulajule Reservoir and the freshwater portions of Walker Creek. The goal of the TMDL is to establish and maintain environmental conditions that will support beneficial uses of these waters established in Chapter 2.

The following sections establish a concentration-based TMDL for mercury in the Walker Creek watershed, and prescribe actions and monitoring necessary to implement and maintain the TMDL. The numeric targets, allocations, and associated implementation plan will ensure that Walker Creek and Soulajule Reservoir attain applicable water quality standards and achieve the TMDL.

The TMDL allocations and implementation plan are designed to control the amount of mercury discharged to Walker Creek and from Soulajule Reservoir, and prescribe and promote actions to minimize the potential for mercury to be present in the toxic and bioavailable form, methylmercury. Effectiveness of implementation actions, monitoring to track progress toward targets, and the scientific understanding pertaining to mercury will be periodically reviewed. The TMDL may be adapted as warranted.

#### 7.3.2.1 Problem Statement

Walker Creek and Soulajule Reservoir are impaired because mercury adversely affects beneficial uses, including wildlife habitat and all uses supporting aquatic life.

- Mercury concentrations in Walker Creek exceed the mercury freshwater aquatic life acute toxicity objective established to protect aquatic organisms (Table 3.4).
- Terrestrial species that primarily or exclusively eat fish (such as piscivorous birds, the most sensitive wildlife species in the watershed) are at risk from exposure to mercury due to its tendency to bioaccumulate in the food web. Because mercury concentrations in Walker Creek fish are high enough to threaten the health of piscivorous birds, the narrative bioaccumulation objective (see Chapter 3) and numeric aquatic organism and wildlife mercury water quality objective (Table 3-4a) are not being met.
- Soulajule Reservoir is impaired because some fish in the reservoir exceed mercury levels considered safe for human consumption.
- The beneficial use aimed at protecting the health of people who choose to consume Soulajule Reservoir fish (REC1) is impaired and the narrative bioaccumulation water quality objective is not being met.
- In 2004, the California Office of Environmental Health Hazard Assessment issued an interim advisory recommending that people limit consumption of reservoir fish due to elevated mercury levels.

#### 7.3.2.2 Sources

The following sources have the potential to discharge mercury to surface waters in the Walker Creek watershed:

- **Gambonini Mine site** – An inactive mercury mine and the largest mercury processing facility in the watershed. Mining waste was not properly contained on-site, and consequently the site discharged large quantities of mercury-laden sediments prior to cleanup (initiated in 1998).
- **Soulajule Watershed and Reservoir** – Two abandoned mercury mines are located in this watershed. Soulajule Reservoir discharges into Walker Creek just downstream of the Gambonini Mine drainage.
- **Downstream depositional features** – Mercury-laden sediments in depositional areas (creek beds, banks, and floodplains) downstream of the mercury mines, which discharge mercury to the creek during storms.
- **Background** – Mercury is present at low concentrations throughout the watershed. Background levels account for atmospheric deposition and naturally occurring mercury found in the watershed's soils. The Walker Creek watershed background suspended sediment mercury concentration is 0.2 mg mercury per kg dry sediment.

#### 7.3.2.3 TMDL Targets

- To protect wildlife and rare and endangered species, the mercury concentration in fish consumed by piscivorous birds shall not exceed 0.05 mg mercury per kg fish, measured in whole fish 5–15 cm in length, average wet weight nor shall it exceed 0.1 mg mercury per kg fish, measured in whole fish 15-35 cm in length, average wet weight. The goal of these targets, which are consistent

with the bioaccumulation objective in Chapter 3, is to ensure that controllable water quality factors do not cause detrimental mercury concentrations in Walker Creek and Soulajule Reservoir wildlife.

- To protect aquatic organisms, water column mercury concentrations shall not exceed the water quality objective of 2.4 μg/l (one-hour average).
- To protect humans who consume Soulajule Reservoir and Walker Creek fish (assuming future conditions allow for the consumption of Walker Creek fish), water column mercury concentrations shall not exceed the California Toxics Rule (CTR) criterion of 0.050 μg/l (averaged over a 30-day period).

### 7.3.2.4 Allocations and Total Maximum Daily Load

The TMDL for Walker Creek is 0.5 mg mercury per kg suspended sediment and the TMDL for Soulajule Reservoir is 0.04 ng dissolved methylmercury per liter water. Concentration-based load allocations for Walker Creek and Soulajule Reservoir mercury sources are shown in Table 7.3.2-1.

**Table 7.3.2-1 TMDL Mercury Wasteload and Load Allocations**

| Source | Wasteload Allocation | Load Allocation |
|---|---|---|
| Gambonini Mine site<br>NPDES Permit no. CAS000001 | 5 mg mercury per kg suspended sediment | |
| Soulajule watershed and Reservoir | | 0.04 ng dissolved methylmercury per liter water<br>0.5 mg mercury per kg suspended sediment |
| Downstream depositional features[1] | | 0.5 mg mercury per kg suspended sediment |
| Background[2] | | 0.2 mg mercury per kg suspended sediment |

[1] Applies to sediment released from depositional features (creek beds, banks, and floodplains) downstream of the Gambonini Mine and Soulajule Reservoir.
[2] The background allocation applies to all areas in the Walker Creek watershed outside of the influence of the Gambonini Mine site or Soulajule Reservoir.

### 7.3.2.5 Implementation Plan

The implementation plan builds upon previous and ongoing successful efforts to reduce mercury loads in Walker Creek and its tributaries. Table 7.3.2-2 contains the required implementation measures for each source. It is important to note that the numeric targets and load allocations in the TMDL are not directly enforceable. To demonstrate attainment of applicable allocations, responsible parties must demonstrate compliance with specified implementation measures and any applicable waste discharge requirements (WDRs) or waiver conditions.

**Table 7.3.2-2 Implementation Measures for Walker Creek Mercury TMDL**

| Source | Action | Implementing Parties | Completion Date |
|---|---|---|---|
| Gambonini Mine Site | Apply for coverage under the State of California's Industrial Stormwater General Permit | Gambonini Mine Site owner(s) | 2007 |
| | Submit to the Water Board for approval a Stormwater Pollution Prevention Plan (SWPPP), implementation schedule, and monitoring plan | | |
| Soulajule Reservoir | Submit to the Executive Officer of the Water Board, a monitoring and implementation plan and schedule to 1) characterize fish tissue, water, and suspended sediment mercury concentrations in Soulajule Reservoir and Arroyo Sausal Creek, and 2) develop and implement methylmercury production controls necessary to attain both in-reservoir and downstream TMDL targets | Marin Municipal Water District | 2009 |
| Downstream Depositional Features | Applicants seeking coverage under waste discharge requirements (WDRs) or waivers of WDRs to control pathogens, nutrients, or sediments discharges in the Walker Creek watershed shall incorporate management practices that minimize mercury discharges and methylmercury production | All creekside property owners downstream of Gambonini Mine and Soulajule Reservoir | 2009 |
| | All projects regulated under Clean Water Act Section 401 shall include provisions to minimize mercury discharges and methylmercury production | | |
| | Comply with conditions of Marin County's Creek Permit Program | | |
| | Update Marin County's Creek Permit Guidance for Unincorporated Areas of Marin to include specific guidance for projects in areas that may contain mercury-enriched sediments | County of Marin | 2008 |

### *Cost Estimate: Agricultural Water Quality Control Program*

Because the implementation measures for grazing lands constitute an agricultural water quality control plan, the cost of that program is estimated below, consistent with California Water Code requirements (Section 13141). We estimate that 100 percent of the downstream depositional areas can be considered grazing lands. Costs estimated for reducing mercury discharges and methylmercury production on grazing lands are $1.5 to 2.5 million over a ten-year period. These costs are associated with reducing sediment discharges and enhancing habitat conditions on Walker Creek and its tributaries. Considering potential benefits to the public in terms of habitat restoration and water quality, we expect that a significant portion of the costs will be paid for with public funds.

### *Evaluation and Monitoring*

Water Board staff will conduct water quality monitoring to evaluate mercury concentrations in Walker Creek and its tributaries as part of the Surface Water Ambient Monitoring Program (SWAMP). Marin Municipal Water District will conduct water quality monitoring to evaluate mercury concentrations in

both Soulajule Reservoir and reservoir discharges to Arroyo Sausal Creek. All water quality monitoring (including quality assurance and quality control procedures) will be performed pursuant to the State Water Board's Quality Assurance Management Plan for this program. The main objectives of the monitoring are:

- Assess attainment of TMDL targets and load allocations
- Evaluate spatial and temporal water quality trends
- Refine understanding of mercury loading in downstream depositional areas
- Refine understanding of methylmercury production and bioaccumulation in Soulajule Reservoir
- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of source control actions

Table 7.3.2-3 presents locations in the Walker Creek watershed for baseline water quality monitoring. These sites will be monitored for suspended particulate, methyl- and total mercury concentrations during the wet and dry seasons. Fish tissue mercury concentrations will be monitored to aid in understanding mercury and the food web. Mercury concentrations in fish of the size typically consumed by wildlife and humans will be monitored in Soulajule Reservoir to assess progress towards attaining the wildlife and human health target. Wet season sampling will focus on characterizing conditions during peak flow events. SWAMP monitoring will be conducted based on availability of funds.

Walker Creek Ranch is considered an "integration" site for the watershed. Water quality data collected at Walker Creek Ranch integrates Salmon Creek background concentrations with loads from the Gambonini Mine Site, Soulajule Reservoir, and some downstream depositional features. Mercury levels in 5–15 cm fish in Walker Creek will be monitored every five years at Walker Creek Ranch to assess progress towards attaining the wildlife target. In addition, the Water Board, in cooperation with the United States Geological Survey, maintains a continuous data recorder at Walker Creek Ranch that monitors suspended sediment and particulate mercury concentrations in Walker Creek.

Five years after adoption of this TMDL, the Water Board will evaluate monitoring results and assess progress made toward attaining targets and load allocations. Beginning in 2012 and approximately every five years thereafter, the Water Board will evaluate site specific, sub-watershed-specific, and watershed-wide compliance with the trackable implementation measures specified in Table 7.3.2-2.

**Table 7.3.2-3. Baseline Monitoring Sites**

| |
|---|
| Salmon Creek, upstream of the Gambonini Mercury Mine Site |
| Walker Creek at Walker Creek Ranch |
| Walker Creek at Highway 1 |
| Chileno Creek downstream of the inactive Chileno Mine |
| Soulajule Reservoir |
| Arroyo Sausal Creek downstream of Soulajoule Reservoir |

### *Adaptive Implementation*

Approximately every five years, the Water Board will review the Walker Creek Mercury TMDL and evaluate new and relevant information from monitoring, special studies, and the scientific literature. At a minimum, the following questions will be incorporated into the reviews. Additional questions will be developed in collaboration with stakeholders during each review cycle.

- Are Walker Creek and its tributaries 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?
- What are the pollutant loads for the various sources? Have these loads changed over time? How do they vary seasonally? How might source control measures be modified to improve load reduction?
- What wetland and creek restoration methods should be used to minimize mercury discharges and methylmercury production while enhancing and restoring habitat values?
- Are wildlife feeding in Soulajule Reservoir at risk? If so, how can the Reservoir be managed to reduce this risk?
- Does additional sediment, water column, or fish tissue total or methylmercury data support our understanding of linkages in the watershed or suggest an alternative allocation strategy?
- 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?

Reviews will be coordinated through the Water Board's continuing planning program, with stakeholder participation. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan via an amendment process. In evaluating necessary modifications, the Water Board will favor actions that reduce sediment and nutrient loads, pollutants for which the Walker Creek is also impaired.

### 7.3.3 Lagunitas Creek Fine Sediment Reduction and Habitat Enhancement Plan

The following sections establish:

1. A sediment TMDL defining the allowable amount of sediment that can be discharged into the Lagunitas Creek watershed, expressed as a percentage of the natural background sediment delivery rate to channels; and
2. An implementation plan to achieve the TMDL and substantial habitat enhancement in channel reaches that support coho salmon, steelhead, and/or California freshwater shrimp.

The goals of the Lagunitas Creek Sediment Reduction and Habitat Enhancement Plan (Plan) are as follows:

- To restore an annual spawning run within the Lagunitas Creek watershed of 1300-or-more adult coho salmon, achieved for at least twelve consecutive years.
- For native fish and aquatic wildlife species to be in good condition at the individual, population, and community levels.
- To protect and enhance the aesthetic and recreational values of the creek and its tributaries.

The main focus of this Plan is habitat enhancement, because habitat loss and simplification appears to be a primary cause of the declines of watershed populations of coho salmon, steelhead, and California freshwater shrimp. The Plan also establishes a regulatory program to reduce sediment delivery to channels resulting from road-related erosion, a necessary condition to support recovery of listed species and achieve water quality objectives for sediment and settleable material. Other significant land-use

related sediment sources are already being reduced substantially through existing regulatory programs and/or natural recovery processes.

#### 7.3.3.1 Problem Statement

Due to excess erosion and sedimentation in the Lagunitas Creek watershed, the narrative water quality objectives for sediment and settleable material are not being met, and cold freshwater habitat, wildlife habitat, fish spawning, recreation, and preservation of rare and endangered species beneficial uses are impaired. In addition, the narrative water quality objective for population and community ecology is not being met due to habitat simplification, which is a primary cause for the decline of coho salmon and steelhead trout populations.

Lagunitas Creek provides essential habitat for coho salmon, steelhead trout, and California freshwater shrimp, all of which are listed under the federal Endangered Species Act (coho salmon and California freshwater shrimp also are listed under the California Endangered Species Act). During the historical period - the mid-nineteenth century through present - there has been a precipitous decline in the abundance of coho salmon and steelhead in the Lagunitas Creek watershed. Coho salmon and steelhead runs once numbered in the several thousands. Up until the late 1960s, Lagunitas Creek was a popular destination for sport fisherman hoping to catch steelhead and coho salmon. In 1996, Lagunitas Creek's salmon and steelhead populations had dropped so low that they were listed under the Endangered Species Act.

The most important causes for coho salmon and steelhead population declines in the Lagunitas Creek watershed appear to be: a) the loss of about half of the potential habitat, which has been inundated and/or is no longer accessible as a result of dam construction; and b) in almost all the remaining habitat, the fact that channel incision has greatly simplified habitat and disconnected the channel from its floodplain.

Channel incision causes habitat simplification, which herein is defined as the progressive lowering over time of the streambed elevation as a result of net erosion. San Geronimo and Lagunitas creeks and alluvial reaches of their tributaries have incised substantially during the historical period. Channel incision obliterates the basic physical habitat structure of the channel, expressed by a substantial reduction in the frequency and area of gravel bars, riffles, and side channels. If a channel incises substantially, it will become disconnected from its surrounding floodplain, which further increases the rates of incision, streambed mobility, and scour depth. Another effect of incision has been a significant reduction in large woody debris input to Lagunitas Creek and its tributaries, which also greatly diminishes the capacity for these creeks to store, sort, and meter sediment.

Habitat conditions are degraded by elevated concentrations of fine sediment in the streambed (primarily sand) - caused by pervasive alteration of sediment supply, transport, and storage - which further reduces juvenile salmonid growth and survival in all freshwater life stages. As sediment supply increases or becomes finer, the streambed can respond by becoming finer and more mobile, as has been documented in tributaries to Lagunitas Creek. Streambed scour at spawning redds can be a significant source of mortality during incubation for coho salmon.

#### 7.3.3.2 Numeric Targets

Increased rate and fining of the bed material supply, channel incision, and a reduction in the number and size of large fallen trees in channels, have all contributed to high to very high rates of streambed mobility and scour in tributaries to Lagunitas Creek that provide important spawning habitat for coho salmon and

steelhead, including Arroyo, Cheda, and San Geronimo creeks, and Devils Gulch. To restore properly functioning conditions, we call for actions to substantially reduce sand supply to Lagunitas Creek and its tributaries, to substantially increase the amount of large woody debris in channels, and, where safe and feasible, to reconnect the channel to its floodplain. As such we proposed the following targets for streambed mobility and redd scour.

Meeting the numeric targets listed in Table 7.3.3.1 will allow water quality in Lagunitas Creek and its tributaries to achieve the narrative water quality objectives for sediment, settleable material, and population and community ecology.

**Table 7.3.3.1: Sediment and Habitat Targets for the Lagunitas Creek and its Tributaries**

| |
|---|
| **Sediment Condition Targets** |
| Streambed Mobility ($\tau^*$): $0.03 < \tau^* \leq 0.06$; this target applies to gravel-bedded channel reaches where the adjacent valley flat is a floodplain. |
| Watershed-wide median depth of redd scour ($D_s$) ≤ 12 cm |
| **Habitat Condition Targets** |
| Large Woody Debris (LWD) Loading ≥ 300 $m^3$/ha in Redwood Channels[c] and ≥ 100 $m^3$/ha in Hardwood Channels |
| Explanatory notes:<br>The numeric target for reach-average value of streambed mobility at bankfull stage, or Tau-Star ($\tau^*$), is greater than 0.03 and less than or equal to 0.06, corresponding to a partially-to-fully mobile streambed. This is the natural range of mobility in most gravel-bedded channels. The target applies only to gravel-bedded channel reaches where the adjacent valley flat is a floodplain and where: a) the streambed slope is between 0.001 and 0.03, and b) actual or potential spawning habitat is provided for anadromous salmonid species. As defined by renowned geomorphologists Thomas Dunne and Luna B. Leopold: "The floodplain is the flat area adjoining a river channel constructed by the river in the present climate and overflowed at times of high discharge. It is inundated on the average once every one or two years."<br><br>The watershed-wide median value for depth of scour ($D_s$) at actual or potential spawning sites for coho salmon and/or steelhead shall be ≤ 12 cm below the level of the overlying streambed substrate. This target applies for discharges ≤ the 5-year recurrence interval event (annual maximum series). Channel reaches that provide actual or potential spawning habitat are as defined above. Potential spawning sites within those reaches can be identified based on the following characteristics: 1) median particle size diameter ($D_{50}$) in the surface layer of the streambed is between 16 and 64 mm; 2) surface area of the gravel deposit is ≥ 1.0 square meter; and 3) location at a riffle head, pool tail, pool margin, and/or a gravel deposit associated with a flow obstruction (e.g., woody debris, boulders, banks, etc.).<br><br>Redwood channels are defined as those where the adjacent valley floor and/or hillslopes are vegetated primarily by coast redwood forest. Hardwood channels are defined as those where the adjacent valley flat is vegetated by a hardwood forest (typically some combination of willow species, white alder, California bay laurel, bigleaf maple, tan oak, and/or Oregon ash). The large woody debris loading targets apply to channel reaches that provide actual or potential spawning habitat for anadromous salmonids as defined above. |

### 7.3.3.3 Sediment Sources

Field inventories conducted throughout the Lagunitas Creek watershed provide credible estimates of the rates and sizes of sediment delivered to channels in the watershed during water years 1983 through 2008. Based on this work, the Water Board concludes:

1. Sediment supply to Lagunitas Creek was greater than or equal to two times natural background. Hillslope erosion processes, considered together with road-related erosion, accounted for about 40 percent of sediment delivery to Lagunitas Creek. Human-caused channel incision and associated bank erosion, primarily the result of historical land-use disturbances, accounted for about 60 percent of the supply.

2. Rates of sediment supply to channels in the Lagunitas Creek watershed varied substantially, from less than 100 to about 400 metric tons per $km^2$ per year. Variability is a function primarily of the location of dams, large alluvial valleys (where channels have become deeply incised), road density, and bedrock geology.

3. Channel incision rates were highest in headwater channel reaches, but incision also was active further downstream (at somewhat lower rates) in the reaches that provide habitat for anadromous salmonids and California freshwater shrimp.

4. Considering the significant exposure of hard bedrock in the streambed along San Geronimo Creek, and in the mainstem of Lagunitas Creek in the Shafter and State Park reaches, it is unlikely that streambed elevation will become much lower in these reaches. Absent intervention, complex habitat that now includes riffles and bars will likely decrease, and bedrock exposure will increase, which would further impair habitat condition.

5. While the primary driver for incision is a reduction in large woody debris loading, reduction in coarse sediment supply, following construction of Kent Lake and Nicasio Reservoir, and other historical and ongoing land-use activities also are factors.

In summary, the net result is an elevated amount of fine sediment in the streambed and substantial simplification of channel habitat structure.

The total sediment load in Lagunitas Creek is estimated to have been about 230 percent of natural background upstream of Devils Gulch and about 200 percent of natural background upstream of Olema Creek during the study period. Tables 7.3.3.2 and 7.3.3.3 break down the sediment sources to Lagunitas Creek based on an annual average rate.

**Table 7.3.3.2: Mean Annual Sediment Delivery to Lagunitas Creek upstream of Devils Gulch (drainage area = 89 km$^2$) during water years 1983 through 2008**

| Source | Estimated Mean Annual Delivery Rate (metric tons/yr) |
|---|---|
| Landslides, Gullies, and Soil Creep | 2,600 |
| Roads | 3,600 |
| Tributary Channels: Channel Incision and Bank Erosion | 5,000 |
| San Geronimo Creek and Lagunitas Creek: Channel Incision and Bank Erosion | 2,900 |
| Urban stormwater and wastewater discharges | 100 |
| TOTAL | 14,200 |

**Table 7.3.3.3: Mean Annual Sediment Delivery to Lagunitas Creek upstream of Olema Creek (drainage area = 213 km$^2$) during water years 1983 through 2008**

| Source | Estimated Mean Annual Delivery Rate (metric tons/yr) |
|---|---|
| Landslides, Gullies, and Soil Creep | 5,600 |
| Roads | 4,000 |
| Tributary Channels: Channel Incision and Bank Erosion | 8,500 |
| San Geronimo Creek and Lagunitas Creek: Channel Incision and Bank Erosion | 4,000 |
| Urban stormwater, wastewater, and other point source discharges | 100 |
| TOTAL | 22,200 |

### 7.3.3.4 Total Maximum Daily Load and Allocations

The sediment TMDL for Lagunitas Creek upstream of Devils Gulch is established at 7,500 metric tons per year, which corresponds to about 120 percent of natural background load during the water year 1983 through 2008 period. The sediment TMDL for Lagunitas Creek upstream of Olema Creek is established at 11,900 metric tons per year, which corresponds to about 110 percent of natural background load during the water year 1983 through 2008 period. Natural background load depends upon natural processes and varies significantly. Therefore, these TMDLs and associated allocations are expressed both in terms of sediment mass and percent of natural background. Sediment delivery needs to be reduced overall by about 50 percent from the current proportion of the total load to achieve these TMDLs. Tables 7.3.3.4, 7.3.3.5 and 7.3.3.6 contain the allocations for all sources of sediment in the watershed.

TMDL attainment will be evaluated: a) immediately upstream of the confluence of Lagunitas Creek with Devils Gulch, which approximates the mid-point along the primary spawning reach for coho salmon on Lagunitas Creek; and b) immediately upstream of the confluence of Lagunitas Creek with Olema Creek, which corresponds to the downstream boundary of the TMDL project area. Attainment of the TMDL will be evaluated over a 5-to-10-year averaging period.

**Table 7.3.3.4: Load Allocations for Sediment Discharges for Lagunitas Creek Upstream of Devils Gulch**

| Source category | Load during 1983-2008 | | Estimated reductions needed (percentage) | Load allocations | |
|---|---|---|---|---|---|
| | Metric tons/year | Percentage of Natural Background | | Metric tons/year | Percentage of Natural Background |
| Landslides, Gullies, and Soil Creep | 2,600 | 42 | 50 | 1,300 | 21 |
| Roads | 3,600 | 58 | 50 | 1,800 | 29 |
| Tributary Channels: Channel Incision and Bank Erosion | 5,000 | 80 | 33 | 3,300 | 53 |
| San Geronimo Creek and Lagunitas Creek: Channel Incision and Bank Erosion | 2,900 | 47 | 67 | 1000 | 16 |
| Total | 14,100 | 227 | 48 | 7,400 | 119 |
| Note: Natural background for Lagunitas upstream of Devils Gulch = 6200 metric tons/year | | | | | |

**Table 7.3.3.5: Load Allocations for Sediment Discharges for Lagunitas Creek Upstream of Olema Creek**

| Source Category | Load during 1983-2008 | | Estimated reductions needed (percentage) | Load allocations | |
|---|---|---|---|---|---|
| | Metric tons/year | Percentage of Natural Background | | Metric tons/year | Percent of Natural Background |
| Landslides, Gullies, and Soil Creep | 5,600 | 53 | 50 | 2,800 | 26 |
| Roads | 4,000 | 38 | 50 | 2,000 | 19 |
| Tributary Channels: Channel Incision and Bank Erosion | 8,500 | 80 | 33 | 5,700 | 53 |
| San Geronimo Creek and Lagunitas Creek: Channel Incision and Bank Erosion | 4,000 | 38 | 67 | 1,300 | 12 |
| Total | 22,100 | 209 | 47 | 11,800 | 110 |
| Note: natural background for Lagunitas upstream of Olema Creek = 10700 metric tons/year | | | | | |

**Table 7.3.3.6: Wasteload Allocations for Stormwater for Lagunitas Creek Upstream of Olema Creek**

| Source Category | Current Load | | Reductions needed (percentage) | Wasteload Allocations | |
|---|---|---|---|---|---|
| | Metric tons/year | Percentage of Natural Background | | Metric tons/year | Percent of Natural Background |
| Construction Stormwater NPDES Permit No. CAS000002 | 30 | 0.3 | 0 | 30 | 0.3 |
| Municipal Stormwater NPDES Permit No. CAS000004 | 70 | 0.7 | 0 | 70 | 0.7 |
| **TOTAL** | **100** | **1.0** | **0** | **100** | **1.0** |
| Note: Above estimates for loads, percent reductions, and allocations are rounded to two significant figures. Natural background for Lagunitas upstream of Olema Creek = 10,700 metric tons/year. | | | | | |

### 7.3.3.5 Implementation Plan

The actions described below, including those to control sediment discharges and enhance stream-riparian habitat complexity and connectivity, are to attain allocations and achieve numeric targets for sedimentation and habitat condition.

#### *Regulatory Tools*

The only known point sources of sediment are very small and associated with municipal and construction stormwater runoff, which are regulated under existing NPDES permits that include requirements to control erosion, sedimentation, and hydromodification. Table 7.3.3.7 shows implementation measures required of these sources. The State's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires regulation of nonpoint source discharges using the Water Board's administrative permitting authorities, including waste discharge requirements (WDRs), waiver of WDRs, Basin Plan Discharge Prohibitions, or some combination of these. Consistent with this policy, Tables 7.3.3.8 – 7.3.3.10 specify actions and performance standards by nonpoint source category to achieve TMDL sediment targets and allocations in the Lagunitas Creek watershed.

#### *Control of Nonpoint Sources of Sediment*

The only significant nonpoint source that is not effectively controlled through existing programs and/or natural recovery processes is sediment discharge from roads. This gap applies only to publicly-owned roads, primarily unpaved roads under the jurisdiction of the State Department of Parks and Recreation in S.P. Taylor State Park and/or the U.S. National Park Service within the Golden Gate National Recreation Area. Paved public roads, almost all under the jurisdiction of the County of Marin, also may contribute significant amounts of sediment to channels, although at lower rates.

With regard to the unpaved public roads, reasonable assurances are in place through a memorandum of understanding (MOU) - for the maintenance and management of unpaved roads – that has been agreed to by all of the public agencies within the project area with jurisdiction over roads. Through this MOU, substantial progress has been made to control and reduce sediment delivery to channels. The Marin Open Space District and the Marin Municipal Water District already achieve the performance standard for unpaved roads under their jurisdiction in the Lagunitas Creek watershed.

To ensure that effective sediment source controls are implemented on all public roads –unpaved and paved - consistent with the State Nonpoint Source Program, WDRs, or a conditional waiver of WDRs, are required to meet the road sediment delivery performance standard (Table 7.3.3.9). Whether through adoption of a conditional waiver of WDRs or adoption of WDRs, the required actions are as follows:

1. The County of Marin, Department of Public Works, within five years of TMDL adoption, must conduct an inventory of its paved roads within the project area to identify sediment delivery sites and produce a schedule for treatment, as needed, to achieve road sediment delivery performance standards listed in Table 7.3.3.9.
2. The State Department of Parks and Recreation within S.P. Taylor State Park and the U.S. National Park Service, within that portion of the Golden Gate National Recreation Area that is in the TMDL project area, must control sediment delivery sites on unpaved roads to achieve the performance standard for road-related sediment delivery (Table 7.3.3.9).

3. All public agencies with jurisdiction over roads within the project area must adopt and implement road maintenance guidelines to protect aquatic habitat, water quality, and salmonid fisheries; conduct a biennial training program for road maintenance staff, and biennially submit a report that documents implementation and/or recommends adaptive updates to the maintenance practices.

### *Actions to Enhance Stream-Riparian Habitat Complexity and Connectivity*

Although future sediment delivery from channel incision is predicted to decline substantially as a result of natural process adjustments, absent implementation of a habitat enhancement program, stream-riparian habitat condition will remain substantially degraded. Stream habitat degradation in the channel reaches that remain accessible to populations of coho salmon and steelhead is a key factor in their decline. Floodplains and large woody debris jams provide essential high quality rearing habitats and enhance food production for coho salmon, steelhead, and California freshwater shrimp. These features also reduce streambed scour and sort, meter, and store fine sediment, thereby substantially enhancing the diversity of streambed substrate patches. Therefore, the primary focus of this Plan is a program of channel habitat enhancement, presented in Table 7.3.3.10, focused on actions to substantially increase the amount of large woody debris in channels and to develop focused technical studies to identify priorities and opportunities for floodplain restoration (in channel reaches where it is safe and feasible to do so). Goals for these actions are presented in Table 7.3.3.11. Continued implementation of the *Memorandum of Understanding for Woody Debris Management in Riparian Areas of the Lagunitas Creek Watershed* by the Marin Municipal Water District and other public agencies also will contribute to increased large woody debris loading.

Problems associated with channel incision reflect and integrate multiple historical and ongoing disturbances, some of which are local and direct, and others that are indirect and distal. Effectively addressing these issues will require cooperative and coordinated actions by multiple landowners, working with public agencies, over significant distances along Lagunitas Creek and its tributaries. The Water Board will emphasize cooperative programs to achieve the floodplain restoration and/or large woody debris enhancement goals acting in coordination with the State Water Board Division of Water Rights (Table 7.3.3.11).

The Water Board also encourages stakeholders along San Geronimo Creek and its tributaries to develop reach-based stewardship groups to implement channel habitat enhancement projects in this part of the watershed. Public funding for such efforts should be prioritized for reaches where both potential gains in habitat function are significant and necessary landowner support and participation can be achieved.

**Table 7.3.3.7 TMDL Implementation Measures for Sediment Discharges Associated with Point Sources**

| Source Category | Actions | Implementing Parties |
|---|---|---|
| Municipal stormwater and construction stormwater | Comply with applicable NPDES permit | County of Marin and owners or operators of construction projects > 1 acre |

**Table 7.3.3.8: Required TMDL Implementation Measures for Sediment Discharges Associated with Grazing[1]**

| Land Use Category | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| Grazing | **Surface erosion associated with livestock grazing**: Attain or exceed minimum residual dry matter values consistent with University of California Division of Agriculture and Natural Resources Guidelines; **and**<br><br>**Roads**: Road-related sediment delivery to channels ≤ 350 cubic yards per mile per 20-year period; **and**<br><br>**Minimize delivery of sediment to channels from unstable or potentially unstable areas:** Manage existing grazing operations, stock ponds, and roads to prevent additional erosion of legacy sediment delivery sites, and/or delivery from other potentially unstable areas. | Comply with the existing Water Board regulatory program: conditional waiver of waste discharge requirements for grazing operations in the Tomales Bay watershed (R2-2013-0039),or<br><br>Other applicable WDRs or waiver of WDRs, or<br><br>Submit a Report of Waste Discharge to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures. | Landowner and/or ranch operator | As required by existing regulatory program under R2-2013-0039 or other applicable WDRs or waiver of WDRs. Individual waste discharge requirements also may be issued as needed, with the schedule to be determined. |
| | | Report progress on implementation of site-specific erosion control measures.[2] | Landowner and/or ranch operator | As specified in applicable WDRs or waiver of WDRs |

[1]To achieve TMDL allocations, consistent with the State Nonpoint Source Program.
[2]These reports may be prepared individually or jointly or through a recognized third party.

**Table 7.3.3.9: Required TMDL Implementation Measures for Sediment Discharges associated with Parks and Open Space and/or Municipal Public Works[1]**

| Landowner Type | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| PARKS AND OPEN SPACE AND PUBLIC WORKS | **Roads**: Road-related sediment delivery to channels ≤ 350 cubic yards per mile per 20-year period; **and**<br><br>**Minimize delivery of sediment to channels from unstable or potentially unstable areas:** Manage existing roads and other infrastructure to prevent additional erosion of legacy sediment delivery sites, and/or delivery from other potentially unstable areas. | Submit a Report of Waste Discharge to the Water Board that provides, at a minimum, the following required actions: a) description of the road network and/or segments; b) identification of erosion and sediment control measures to achieve performance standard(s) specified in this table; c) a schedule for implementation of identified control measures; and d) development and implementation of guidelines for road maintenance, as needed to protect water quality, stream-riparian habitat, and salmonid fisheries | County of Marin, Public Works Department<br><br>State of California, Department of Parks and Recreation, S.P. Taylor State Park<br><br>U.S. National Park Service, Golden Gate National Recreation Area | Submit a report of waste discharge within five years of Basin Plan amendment adoption.<br><br>Achieve performance standards within twenty years of Basin Plan amendment adoption. |
| | | Comply with applicable WDRs or waiver of WDRs. | As above | As specified in applicable WDRs or waiver of WDRs |
| | | Report progress on development and implementation of best management practices to control road-related erosion. | As above | As specified in applicable WDRs or waiver of WDRs |

[1]To achieve TMDL allocations, consistent with the State Nonpoint Source Program.

**Table 7.3.3.10: Actions to Enhance Habitat Complexity and Connectivity in Lagunitas Creek and its Tributaries**

| Stressor | Management Objective(s) | Actions | Implementing Parties | Completion Dates and Notes |
|---|---|---|---|---|
| **Habitat degradation** as a result of incision of Lagunitas Creek and its tributaries. | Enhance channel habitat complexity and connectivity as needed to support self-sustaining populations of coho salmon and steelhead and to enhance the overall health of the native fish community.<br><br>Reduce rates of sediment delivery (associated with incision and accelerated bank erosion) to channels by 67 percent in Lagunitas and San Geronimo creeks and by 33 percent in tributaries to both streams. | 1. Develop and implement plans to enhance large woody debris loading and restore natural rates of recruitment to channels, as needed to achieve numeric targets for large woody debris loading (Table 1) and to achieve load allocations for sediment (Tables 3a and 3b). The above plan will include a survey to quantify baseline values for large woody debris loading.<br><br>2. Develop detailed technical studies to characterize reach-specific opportunities and priorities for floodplain restoration. | Along San Geronimo Creek and its tributaries, local government agencies or non-profits in partnership with reach-based landowner stewardships will develop and implement projects to enhance habitat complexity and connectivity.<br><br>Elsewhere in the Lagunitas Creek watershed, the Marin Municipal Water District will pursue partnerships to develop and implement projects to enhance habitat complexity and connectivity. | Targets for large woody debris loading will be achieved within 10 years of Basin Plan amendment adoption.<br><br>Technical studies to characterize reach specific opportunities and priorities for floodplain restoration will be completed within 5 years of Basin Plan amendment adoption.<br><br>Comply with conditions of Clean Water Act section 401 certifications in the implementation of projects to enhance large woody debris loading and recruitment. |

**Table 7.3.3.11: Goals for Floodplain Restoration and/or Large Woody Debris Enhancement in Lagunitas Creek Watershed**

| |
|---|
| 1. To increase side channel plus alcove area, wetted during winter baseflow and higher flows, by 100 percent-or-more. Side channels and alcoves should be accessible, nearby or adjacent to debris jams and/or undercut banks in the main channel and/or tributary junctions. |
| 2. To establish diverse vegetation and substrate patch types that are dynamically established, evolve, and deform through time: a complex and dynamic mosaic of stream-riparian habitats. |
| 3. To store a substantial fraction of the fine sediment supply on the floodplain: 20 percent-or-more of the total sediment supply to a given channel reach. |
| 4. To achieve the streambed mobility and redd scour targets in all reaches where floodplains are reconnected to channels. |
| 5. To increase gravel storage volume and average residence time and to increase the variability in the thalweg profile in S.P. Taylor State Park, Tocaloma, and Lower Lagunitas reaches. |
| 6. To restore natural rates of recruitment of large woody debris from riparian areas of channels located on public lands. |
| 7. To achieve or exceed targets for large woody debris loading as specified in Table 1 within 10 years of Basin Plan amendment adoption. |
| 8. To convert one-third-or-more of the plane bed habitat in channel reaches accessible to anadromous salmonids to forced pool-riffle habitat. |
| 9. To expand the reach length occupied by California freshwater shrimp by two kilometers-or-more. |
| 10. To produce 10,000-or-more coho salmon smolts, and 6,000-or-more steelhead smolts, on average, each year. |

### *Agricultural Water Quality Control Program Costs*

Implementation measures for grazing lands and roads located on those same properties constitute an agricultural water quality control program and, therefore, consistent with California Water Code requirements (Section 13141), the cost of this program is estimated herein. The Tomales Bay watershed pathogens TMDL that was adopted in 2005, which includes all ranches and grazing areas within the Lagunitas Creek watershed, estimates costs to ranch operators to implement best management practices to control pathogen discharges from rangelands including maintaining adequate amounts of residual dry matter in rangelands and the costs of excluding livestock from water courses by construction and maintenance of fences in these sensitive areas. Those actions also are expected to satisfy performance standards for control of surface erosion in rangelands and control of sediment discharge from unstable areas. As such, we do not consider these existing costs, associated with compliance with the previously adopted pathogens TMDL, in calculating the agricultural water quality control program costs associated with achieving compliance with the Lagunitas Creek sediment TMDL. The only new agricultural water quality control program costs are those related to attainment of performance standards and load allocations for sediment discharge from roads to channels. In the Lagunitas Creek watershed, we estimate that there are 20 miles of roads located on privately owned ranchlands. In estimating potential cost of compliance, we reference recently completed road erosion inventories conducted on unpaved roads located on ranches and/or parklands in the Lagunitas Creek watershed that include estimates of the costs for treating all significant sediment delivery sources from those roads. Relying on these data, we estimate that the maximum total cost to ranch operators, assuming no public funding is available to support this work, could cost $420,000 over the 20-year implementation period associated with achievement of the TMDL, or about an average of $21,000 per year. However, the actual cost to agricultural landowners should be lower because it is reasonable to conclude that some projects will qualify for grant funding from public agencies.

#### 7.3.3.6 Evaluation and Monitoring

Three types of monitoring are specified to assess progress toward achievement of numeric targets and load allocations for sediment:

1. Implementation monitoring to document actions to reduce fine sediment discharge and enhance habitat complexity and connectivity;
2. Upslope effectiveness monitoring to evaluate effectiveness of sediment control actions in reducing rates of sediment delivery to channels; and
3. In-channel effectiveness monitoring (e.g., streambed mobility and redd scour) to evaluate channel response to management actions and natural processes.

Implementation monitoring will be conducted by landowners or designated agents. The purpose of this type of monitoring is to document that sediment control and/or habitat enhancement actions specified herein actually occur.

The Water Board, working in partnership with other government agencies, plans to conduct upslope effectiveness monitoring. This will include an update to all or part of the watershed sediment budget, to re-evaluate rates of sediment delivery to channels from land-use activities and natural processes (ten years subsequent to Basin Plan amendment adoption), in the fall of 2024, when sediment delivery associated with land-use activities are projected to be reduced by 25 percent-or-more.

In-channel effectiveness monitoring should be conducted by local government agencies with scientific expertise and demonstrated capability in working effectively with private property owners (to gain permissions for access), as needed to develop a representative sample of stream habitat conditions, in relation to sediment supply and transport within the watershed. In-channel effectiveness monitoring needs to include measurements of redd scour and streambed mobility to evaluate attainment of water quality objectives for settleable material. Water Board staff will work collaboratively with local partners to develop and refine the in-channel effectiveness monitoring program.

Streambed mobility ($\tau^*$) should be measured in gravel-bedded channel reaches along Lagunitas Creek and in its tributaries where the adjacent valley flat is a floodplain.

Redd scour should be measured at 30-or-more potential spawning sites, with 4-or-more scour measurements per spawning site, as needed, to establish a high level of statistical confidence in estimated values. Redd scour sampling sites should be stratified based on estimated average annual sediment supply rate.

Large woody debris loading in channels also needs to be surveyed and assessed to evaluate attainment of the numeric targets for large woody debris loading and to guide development of reach-specific prescriptions for installation of engineered log jams and riparian management actions to maintain or exceed the target values in future years through natural recruitment.

Desired measurement frequency for streambed mobility, redd scour, and large woody debris is once every three years.

#### 7.3.3.7 Adaptive Implementation

In concert with the monitoring programs, described above, the Water Board will adapt the Lagunitas Creek Sediment Reduction and Habitat Enhancement Plan and TMDL. In amending the Basin Plan amendment, the Water Board will consider, at a minimum, the results of validation monitoring conducted to confirm or reject hypotheses regarding effects of actions to enhance large woody debris loading and floodplain area on population dynamics of coho salmon, steelhead, and California freshwater shrimp. The Water Board will also consider the results of salmonid population monitoring programs including juvenile population estimates, adult spawner surveys, and smolt outmigration surveys performed to evaluate the status and trends of these populations and also related analyses of smolt population dynamics in response to changes in the quantity and quality of freshwater habitat. We note that Lagunitas Creek has been identified as a life-cycle monitoring station in the California Department of Fish and Wildlife's Coastal Monitoring Plan (CMP). The Lagunitas Creek Sediment TMDL will seek to dovetail with the CMP's evaluations of salmonid population status and trends in the watershed.

## 7.4 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE SAN MATEO COASTAL BASIN (SEE FIGURE 2-4)

### 7.4.1 San Pedro Creek and Pacifica State Beach Bacteria TMDL

The following sections establish the TMDL for bacteria in San Pedro Creek and at Pacifica State Beach. The numeric targets, load and wasteload allocations, and implementation plan are designed to support

and protect these water bodies' designated beneficial use of water contact recreation (e.g., swimming and fishing).

#### 7.4.1.1 Problem Statement

San Pedro Creek and Pacific Ocean waters adjacent to Pacifica State Beach are impaired by bacteria. Bacteriological water quality objectives are exceeded based on elevated indicator bacteria densities, and thus, there is impairment of the water contact recreation (REC-1) beneficial use in these water bodies. Recreating in waters with elevated indicator bacteria densities has long been associated with adverse health effects. Specifically, national epidemiological studies demonstrate that there is a causal relationship between adverse health effects and recreational water quality, as measured by indicator bacteria densities.

#### 7.4.1.2 Sources

Bacteria sources are identified based on the results of a bacterial source tracking study completed in 2009 and from documentation of inadequately treated human waste discharges from Pacifica's sanitary sewer system. If not properly managed, the following source categories have the potential to discharge bacteria to San Pedro Creek and Pacifica State Beach: sanitary sewer systems, horse facilities, and municipal stormwater runoff and dry weather flows.

#### 7.4.1.3 Numeric Targets

This TMDL establishes a desired, or target, condition for the water contact recreation use in San Pedro Creek and at Pacifica State Beach based on the water quality objectives for indicator bacteria. The numeric targets for San Pedro Creek are based on the Basin Plan water quality objectives for coliform bacteria for water contact recreation use in fresh water (the *E.coli* targets are the U.S. EPA bacteriological criteria for water contact recreation in fresh waters that are also contained in the Basin Plan). The numeric targets for Pacifica State Beach are based on the Ocean Plan water quality objectives for water contact recreation use in marine waters. The water quality objectives for both marine and freshwater that form the basis of the numeric targets for this TMDL are listed in Table 7.4.1-1.

**Table 7.4.1-1 Bacteriological Water Quality Objectives for San Pedro Creek and Pacifica State Beach**

| Indicator Type | Pacifica State Beach (Marine REC-1) MPN/ 100 mL | San Pedro Creek (Freshwater REC-1) MPN/ 100 mL[1] |
|---|---|---|
| | Single Sample Maximum | 90th Percentile/No Sample Greater Than |
| *E. coli* | NA | 235 |
| Fecal Coliform | 400 | 400 |
| Enterococcus | 104 | NA |
| Total Coliform | 10,000[2] | 10,000 |
| | Geometric Mean[3] | Geometric Mean/Log Mean/Median |
| *E. coli* | NA | 126 |
| Fecal Coliform | 200 | 200 |
| Enterococcus | 35 | NA |
| Total Coliform | 1,000 | 240 |

1. Based on a minimum of five consecutive samples equally spaced over a 30-day period.

2. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

3. Calculated based on the five most recent samples from each site during a 30-day period.

NA: not applicable.

It is not the intent of this TMDL to require treatment or diversion of water bodies or to otherwise require treatment of natural sources of indicator bacteria. Therefore, for this TMDL, a reference system and antidegradation approach has been incorporated in the numeric targets as an allowable number of times that the water quality objectives can be exceeded. The purpose of the allowable number of exceedances of the water quality objectives is to account for the natural, and largely uncontrollable sources of bacteria (e.g., birds and wildlife feces), which have been shown can, by themselves, cause exceedances of the REC-1 water quality objectives. Hence, the numeric targets for this TMDL are the allowable number of exceedances of the single-sample water quality objectives as listed in Table 7.4.1-2.

The number of allowable exceedances is based on two criteria: (1) bacteriological water quality at any site must be at least as good as at a designated reference system; and (2) there is no degradation of existing bacteriological water quality if historical water quality at a particular site is better than the designated reference system.

**Table 7.4.1-2 Numeric Targets, TMDLs, and Allocations Based on Allowable Exceedances of Single-Sample Objectives for San Pedro Creek and Pacifica State Beach**

| | San Pedro Creek | | Pacifica State Beach | | |
|---|---|---|---|---|---|
| | Dry Weather | Wet Weather[5] | Summer Dry Weather (Apr. 1 to Oct. 31) | Winter Dry Weather (Nov. 1 to Mar. 31) | Wet Weather[5] |
| Allowable Exceedances of Single-Sample Objectives (assuming daily sampling is conducted) [1,2,3] | 4 | 26 | 0 | 2 | 30 |
| Allowable Exceedances of Single-Sample Objectives (assuming weekly sampling is conducted) [4] | 1 | 4 | 0 | 1 | 5 |

1. Allowable exceedances are calculated by multiplying exceedance rates observed in the reference system(s) by the number of days during each respective period in the reference year (1994).
2. To end up with whole numbers, where the fractional remainder for the calculated allowable exceedance days exceeds 0.1, then the number of days is rounded up.
3. The calculated number of exceedance days assumes that daily sampling is conducted.
4. To determine the allowable number of exceedance events given a weekly sampling regime, as practiced for monitoring San Pedro Creek and Pacifica State Beach, the number of exceedance days was adjusted by solving for "X" in the following equation: X = (exceedance days x 52 weeks) / 365 days.
5. Wet weather is defined as any day with 0.1 inches of rain or more and the following three days.

The numeric targets based on the allowable exceedances of single-sample objectives are also the bacteria TMDLs and load and wasteload allocations.

### 7.4.1.4 Total Maximum Daily Loads

The TMDLs for San Pedro Creek and Pacifica State Beach are the same as the numeric targets listed in Table 7.4.1-2 and are expressed in terms of allowable exceedances of single-sample objectives.

### 7.4.1.5 Load and Wasteload Allocations

Load allocations and wasteload allocations are the same as the numeric targets and TMDLs listed in Table 7.4.1-2 and are expressed in terms of allowable exceedances of single-sample objectives. Table 7.4.1-3 summarizes the allocations for discharges of bacteria in the San Pedro Creek watershed. Dischargers that discharge to San Pedro Creek have allocations based on allowable exceedances for San Pedro Creek. Dischargers that discharge to Pacifica State Beach have allocations based on allowable exceedances for Pacifica State Beach. The TMDLs, load allocations, and wasteload allocations for Pacifica State Beach shall be attained within 8 years of the effective date of the TMDL. The TMDLs, load allocations, and wasteload allocations for San Pedro Creek shall be attained within 15 years of the effective date of the TMDL.

All entities that discharge indicator bacteria or have jurisdiction over such dischargers are collectively responsible for meeting these allocations. Dischargers shall demonstrate achievement of allocations in the

receiving water bodies (i.e., at the mouth of San Pedro Creek and at the existing San Mateo County shoreline water quality monitoring station #5 at the Pacifica State Beach).

| Table 7.4.1-3 Load and Wasteload Allocations for Dischargers of Bacteria in San Pedro Creek Watershed | | | |
|---|---|---|---|
| **Indicator Bacteria Sources** | | | |
| | **Sanitary Sewer Systems** | **Horse Facilities** | **Stormwater Runoff & Dry Weather Flows** |
| **Load Allocation** | Not applicable | As listed in table 7.4.1-2 | Not applicable |
| **Wasteload Allocation** | Zero | Not applicable | As listed in table 7.4.1-2 |
| **Compliance Point** | Existing monitoring stations in receiving water bodies[1] | Existing monitoring stations in receiving water bodies[1] | Existing monitoring stations in receiving water bodies[1] |
| **Responsible Parties** | Pacifica; private home and business owners in the San Pedro Creek watershed[2] | Existing and future horse facility owners/operators | Pacifica; San Mateo County; Caltrans |
| **Applicable Permits** | Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (Order No. 2006-0003-DWQ) | General Waste Discharge Requirements for Confined Animal Facilities (Order No. R2-2003-0093) | Municipal Regional Stormwater NPDES Permit (Order No. R2-2009-0074, NPDES Permit No. CAS612008)<br>Caltrans Stormwater NPDES Permit (No. CAS000003) |

1. Existing monitoring stations are located at the mouth of San Pedro Creek (i.e., "Creek Mouth" station) and at Pacifica State Beach (i.e., Station #5).
2. The private sewer lateral portion of the sanitary sewer system is the responsibility of private property owners.

### 7.4.1.6 Implementation Plan

The San Pedro Creek and Pacifica State Beach Bacteria TMDL implementation plan specifies actions needed to attain the TMDL and allocations. The implementation plan includes actions for which requirements are already in place, and some additional new actions. The new actions include requirements for horse facility owners and operators to obtain coverage under waste discharge requirements to ensure the clean operation of their facilities; and new requirements for stormwater management. Actions for which requirements are already in place, as of the TMDL effective date, include: 1) reduction of sanitary sewer discharges by the measures required under an existing Cease and Desist Order issued to the City of Pacifica and the general waste discharge requirements for sanitary sewer systems; and 2) a Cleanup and Abatement Order issued to one of the horse facilities in the watershed.

The required implementation actions are consistent with the following existing regulations and Orders:

Water Board Orders and Discharge Prohibition

- Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (Order No. 2006-0003-DWQ)
- Statewide Construction Stormwater NPDES General Permit (Order No. 2009-0009-DWQ; NPDES Permit No. CAS000002)
- Municipal Regional Stormwater NPDES Permit (Order No. R2-2009-0074 and amendment Order No. R2-2011-0083; NPDES Permit No. CAS612008)
- General Waste Discharge Requirements for Confined Animal Facilities (Order No. R2-2003-0093)
- Basin Plan Discharge Prohibition No. 15 (Table 4.1), which states: "it shall be prohibited to discharge raw sewage or any waste failing to meet waste discharge requirements to any waters of the Basin."

Water Board Enforcement Orders

- Cease and Desist Order for Pacifica's Wastewater Discharges (Order No. R2-2011-0031)
- Cleanup and Abatement Order for Millwood Ranch (Order No. R2-2009-0045)

Local Regulations

- San Mateo County Confined Animal Ordinance (Section 7700)
- City of Pacifica Administrative Policy on "Standards for Keeping Animals"
- City of Pacifica Municipal Code for Animal Excreta (Section 6-1.301)
- City of Pacifica Municipal Code for Regulation of Sewer Laterals (Section 6-13.601)

Responsible Parties and Jurisdictions

Wasteload allocations for sanitary sewer systems will be implemented through the requirements and provisions of the Statewide General Waste Discharge Requirements Order for sanitary sewer systems as well as Cease and Desist Order No. R2-2011-0031 issued by the Water Board to Pacifica. Pacifica is the responsible party for implementing these requirements and provisions.

Load allocations for existing and any new horse facilities will be implemented through the requirements of the Water Board's General Waste Discharge Requirements for Confined Animal Facilities. The owners of the three horse facilities within the San Pedro Creek watershed (i.e., Millwood Ranch, Park Pacifica Stables, and Shamrock Ranch Stables), as well as any new horse facilities within the watershed, must obtain coverage under and comply with requirements of the updated or existing General Waste Discharge Requirements for Confined Animal Facilities.

Wasteload allocations for municipal stormwater runoff and dry weather flows shall be implemented through the Municipal Regional Stormwater NDPES Permit, or a new stormwater NPDES permit, issued to Pacifica and San Mateo County. No later than six months prior to the expiration date of each NPDES permit, Pacifica and San Mateo County shall submit a plan to the Water Board that describes best management practices (BMPs) that are currently being implemented and the current level of implementation, and additional BMPs that will be implemented, and or an increased level of implementation of existing BMPs, to prevent or reduce discharges of bacteria from their storm drain systems that cause or contribute to exceedance of wasteload allocations. The plan shall include an implementation schedule to account for BMP implementation, and if necessary, trigger implementation of additional BMPs or increased level of implementation, to attain wasteload allocations.

The Water Board may establish permit requirements to implement wasteload allocations based on implementation of BMPs in lieu of numeric limits. The wasteload allocations are not designed to be

implemented directly as numeric effluent limitations applicable to a discharger, Pacifica, or San Mateo County. The Water Board will not include numeric limits, based on the wasteload allocations, in NPDES permits if the discharger demonstrates that it has fully implemented technically feasible, effective, and cost efficient BMPs to control all controllable sources to and discharges from their storm drain systems.

Stormwater discharges from the California Department of Transportation's (Caltrans') stretch of Highway 1 crossing the northwestern edge of the San Pedro Creek watershed are not a significant source of indicator bacteria because that section of the highway does not include any typical bacteria-generating sources such as homeless encampments, restroom facilities, garbage bins, etc. Caltrans' existing BMPs and stormwater NPDES permit requirements, as of the effective date of the TMDL, are sufficient to attain and maintain its portion of the wasteload allocation.

Table 7.4.1-4 lists the implementation actions for each of the source categories and the phased implementation schedule. The implementation schedule allows time for the responsible parties to identify and implement measures that are necessary to control bacteria discharges resulting in exceedances of allocations.

**Table 7.4.1-4 Implementation Plan Requirements and Schedule**

| Source | Implementation Requirements | Responsible Party | Schedule |
|---|---|---|---|
| **Sanitary Sewer Systems** | Comply with Statewide General Waste Discharge Requirements for Sanitary Sewer Systems | Pacifica | Ongoing |
| | Comply with the Cease and Desist Order (CDO) for Pacifica's wastewater discharges. | Pacifica | As required by the CDO |
| | Ensure compliance with private sewer laterals ordinance | Pacifica | Ongoing |
| | Comply with Pacifica's private sewer laterals ordinance | Private home and business owners | Ongoing |
| **Horse Facilities** | Obtain coverage under and comply with Water Board's updated General Waste Discharge Requirements for Confined Animal Facilities, when the order is reissued (or the existing version, if an update to the order is not made within two years of the effective date of the TMDL). | Existing and future horse facility owners or operators | No later than two years after the TMDL effective date |
| | Comply with the Cleanup and Abatement Order (CAO) for | Millwood Ranch owners | As required by the CAO |

| Table 7.4.1-4 Implementation Plan Requirements and Schedule | | | |
|---|---|---|---|
| **Source** | **Implementation Requirements** | **Responsible Party** | **Schedule** |
| | Millwood Ranch | | |
| | Ensure compliance with:<br>Pacifica's administrative policy on "Standards for Keeping Animals"<br>Pacifica's municipal code on "Animal Excreta"<br>San Mateo County's ordinance for confined animals | Pacifica and San Mateo County | Ongoing |
| | Provide a report summarizing current efforts to ensure compliance with local regulations for proper management of horse waste at horse facilities | Pacifica and San Mateo County | Annually |
| **Municipal Stormwater Runoff and Dry-Weather Flows** | Submit a plan to the Water Board, acceptable to the Executive Officer, which describes BMPs being implemented and additional BMPs that will be implemented to prevent or reduce discharges of bacteria to storm drain systems to attain wasteload allocations. The plan shall include implementation methods, an implementation schedule and proposed milestones. | Pacifica and San Mateo County | As soon as possible and no later than June 2014 |
| | Submit a bacteria water quality monitoring plan for the San Pedro Creek watershed to 1) better characterize their bacteria contributions; and 2) assess compliance with the wasteload allocations. The parties may submit plans separately, but are encouraged to collaborate on a single cooperative plan. The Plan(s) shall be acceptable to the Executive Officer. | | As soon as possible and no later than June 2014 |

| Table 7.4.1-4 Implementation Plan Requirements and Schedule | | | |
|---|---|---|---|
| **Source** | **Implementation Requirements** | **Responsible Party** | **Schedule** |
| | If wasteload allocations are not achieved by the end of a permit term, submit a plan acceptable to the executive officer, which describes additional BMPs or increased levels of existing BMPs that will be implemented to prevent or reduce discharges of bacteria to storm drain systems to attain wasteload allocations. The plan shall include implementation methods, an implementation schedule, and proposed milestones. | | Not later than six months prior to permit expiration |
| | Provide a report on the status of the implementation activities | | Annually |

### 7.4.1.7 Water Quality Monitoring in San Pedro Creek and at Pacifica State Beach

Pacifica and San Mateo County shall, jointly or individually, develop and implement a comprehensive monitoring plan to 1) better characterize indicator bacteria contributions from their source; and 2) assess compliance with wasteload allocations. The monitoring plan shall include applicable bacteria water quality objectives and the sampling frequency shall be adequate to assess compliance with the 30-day geometric mean objectives. Responsible parties may build upon existing monitoring program(s) for San Pedro Creek and Pacifica State Beach when developing the bacteria water quality monitoring plan. At a minimum, in addition to the existing San Mateo County sampling stations at the mouth of San Pedro Creek and at Pacifica State Beach, which will be used to evaluate achievement of the designated load and wasteload allocations, at least one sampling station shall be located in each creek reach/subwatershed, such that bacteria contributions from each of the San Pedro Creek's forks/subwatersheds are distinguished. In addition, indicator bacteria concentrations in the stormwater and dry weather discharges from the Linda Mar and Anza pump stations shall be monitored and characterized sufficient to determine their contribution to exceedances and the effects of any corrective actions. Lastly, monitoring of some of the stormwater outfalls within the watershed may be needed to characterize and identify indicator bacteria loadings from different land uses and locations and the effects of any corrective actions. Monitoring data shall be entered into the State Water Board's "Beach Watch" database as appropriate.

### 7.4.1.8 Adaptive Implementation

The Water Board will adapt the TMDL and implementation plan to incorporate new and relevant scientific information such that effective and efficient measures can be taken to achieve the allocations. The Water Board staff will periodically, in coordination with the implementation schedule, at 5, 8 and 15 years, evaluate new and relevant information from implementation actions, water quality monitoring

results and the scientific literature, including any local reference system studies, U.S. EPA's revised recommended bacteria criteria, or new or revised State bacteria water quality objectives, and assess progress toward attaining TMDL targets and load allocations, and present that information to the Water Board. The Water Board will consider a Basin Plan amendment that reflects any necessary modifications to the targets or implementation plan.

## 7.5 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE CENTRAL BASIN (SEE FIGURE 2-5)

### 7.5.1 Richardson Bay Pathogens Total Maximum Daily Load (TMDL)

The following sections establish the TMDL for pathogens in Richardson Bay. The numeric targets, load allocations, and implementation plan are designed to support and protect the Bay's designated beneficial uses, water contact recreation and shellfish harvesting. The TMDL includes actions for adaptive implementation to evaluate the effectiveness of implementation actions, monitor progress toward targets, and review the scientific understanding pertaining to pathogens, which may result in modifying the TMDL in the future.

#### 7.5.1.1 Problem Statement

Richardson Bay is impaired by pathogens. Monitoring results indicate that the Bay exceeds bacteria water quality objectives for shellfish harvesting (e.g., clam, mussel, and oyster harvesting), and water contact recreation (swimming, fishing); Table 3-1). The presence of pathogens is inferred from high concentrations of fecal coliform bacteria, a commonly used indicator of human pathogenic organisms. Therefore, the beneficial uses of shellfish harvesting and recreational water contact are not fully supported.

#### 7.5.1.2 Sources

Pathogen sources are identified based on elevated coliform bacteria (pathogen indicator) levels downstream or in the vicinity of identified land uses or facilities and from documentation of inadequately treated human waste discharges. If not properly managed, the following source categories have the potential to discharge pathogens to Richardson Bay: sanitary sewer systems, stormwater runoff, houseboats, and vessels.

- High coliform levels detected downstream of storm drains, and the increase in the number of wet season exceedances as compared to the number of dry season exceedances, point to stormwater runoff as a potential pathogen source.
- Documentation of sanitary sewer overflows in Richardson Bay area municipalities suggests that sanitary sewer systems are a potential source of pathogens to the Bay.
- Consistently high coliform levels in houseboat and vessel marinas indicate that houseboat and vessel marinas' failing sewage collection systems are potential sources of pathogens.

Bacteria levels are low at monitoring sites that contain wildlife but are minimally impacted by human activities. This suggests that wildlife may not be a significant, widespread potential source of pathogens in Richardson Bay. Wildlife may be a significant source on an intermittent, localized basis.

#### 7.5.1.3 Numeric Targets

The numeric targets (desired future long-term conditions) proposed for pathogen indicators in Richardson Bay are presented in Table 7.5.1-1.

**Table 7.5.1-1. Numeric Targets for Richardson Bay [a]**

| Beneficial Use | Numeric Target |
|---|---|
| Shellfish Harvesting | Median fecal coliform density[b] < 14 (MPN[c]/100 mL)<br>90th percentile fecal coliform density < 43 (MPN/100 mL) |
| Water Contact Recreation | Geometric mean fecal coliform density < 200<br>90th percentile fecal coliform density < 400<br>Geometric mean Enterococci density < 35 CFU[d]/100 mL<br>90th percentile Enterococci density < 104 CFU/100 mL |

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period

b. "Density" refers to the number of bacteria in a given volume of water (U.S. EPA, 1986, 2002, 2003). The term is analogous to "concentration," which refers to the mass of chemical pollutant in a given volume of water. "Bacterial density" and "bacterial concentration" are sometimes used interchangeably.

c. Most Probable Number (MPN) is a statistical representation of the standard coliform test results.

d. CFU stands for colony forming unit (e.g., as in number of bacterial colonies)

The bacterial density targets are based on the Basin Plan's shellfish harvesting and water contact recreation water quality objectives for fecal coliform and on U.S. EPA's recommended Enterococci criteria for water contact recreation in salt water.

### 7.5.1.4 Total Maximum Daily Load

Table 7.5.1-2 shows Richardson Bay's density-based pathogens TMDL, expressed as fecal coliform bacteria concentrations.

**Table 7.5.1-2. Total maximum daily load for pathogen indicators (fecal coliforms) for Richardson Bay**

| Indicator Parameter | TMDL |
|---|---|
| Fecal coliform | Median [a] < 14 MPN/100 mL<br>90th Percentile [b] < 43 MPN/100 mL |

a. Based on a minimum five consecutive samples equally spaced over a 30-day period.
b. No more than 10% of total samples during any 30-day period may exceed this number.

### 7.5.1.5 Load Allocations

Density-based fecal coliform allocations for each potential pathogen source category in Richardson Bay are presented in Table 7.5.1-3. Each discharger in the Richardson Bay watershed is responsible for

meeting its source category allocation. All potential dischargers are also responsible for complying with applicable waste discharge requirements, or waste discharge prohibitions (Table 4-1, Prohibitions 5, 15, and 18).

All discharges of raw or inadequately treated human waste, including sewage from vessels, are prohibited. All sources of untreated or inadequately treated human waste have an allocation of zero.

**Table 7.5.1-3 Density-Based Pollutant Wasteload and Load Allocations[a] for Richardson Bay**

| Categorical Pollutant Source | Wasteload and Load Allocations Fecal Coliform (MPN/100 mL) | |
|---|---|---|
| | For Direct Discharges to the Bay | |
| | Median [b] | 90th Percentile[c] |
| Stormwater Runoff [d] | <14 | < 43 |
| Wildlife [e] | <14 | < 43 |
| Sanitary Sewer Systems | 0 | 0 |
| Houseboats | 0 | 0 |
| Vessels (Recreational, Live-aboard, Anchor-out Boats) | 0 | 0 |

[a.] These allocations are applicable year-round.
[b.] Based on a minimum of five consecutive samples equally spaced over a 30-day period.
[c.] No more than 10% of total samples during any 30-day period may exceed this number.
[d.] Wasteload allocation for discharges from municipal separate storm sewer systems (NPDES Permit Nos. CAS000004 and CAS000003).
[e.] Wildlife is not believed to be a readily controllable source of pathogens; therefore, no management measures are required.

### 7.5.1.6 Implementation Plan

The Richardson Bay Pathogens TMDL Implementation Plan builds upon previous and ongoing successful efforts to reduce potential pathogen loads in Richardson Bay and its tributaries. The plan requires actions consistent with the California Water Code (CWC 13000 et seq.), the state's Nonpoint Source Pollution Control Program Plan (CWC Section 13369), the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program, and human waste discharge prohibitions (Table 4-1, Prohibitions 5, 15, and 18).

Table 7.5.1-4 lists the required implementation measures for the source categories listed in Table 7.5.1-3. These measures include evaluation of operating practices, identification of comprehensive, site-specific pathogens control measures and an associated implementation schedule, and submittal of progress reports to the Water Board documenting actions taken.

**Table 7.5.1-4 Trackable implementation measures for the Richardson Bay pathogens TMDL**

| Source Category | Implementing Party | Action | Completion Dates |
|---|---|---|---|
| Sanitary Sewer Systems | Marin County Sanitary District No. 5, Sewerage Agency of Southern Marin, Tamalpais Community Services District, City of Mill Valley, Homestead Valley Sanitary District, Alto Sanitary District, Almonte Sanitary District, City of Sausalito, Sausalito Marin City Sanitary District, Richardson Bay Sanitary District | 1. Comply with the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems. | As specified in applicable WDR permit |
| Stormwater Runoff | Marin County, City of Sausalito, City of Mill Valley, City of Tiburon, City of Belvedere, Caltrans | 1. Implement applicable stormwater management plan. | As specified in approved stormwater management plan and in applicable NPDES permit |
| | | 2. Update/amend applicable stormwater management plans, as appropriate, to include specific measures to reduce pathogen loading, including additional education and outreach efforts, and installation of additional pet waste receptacles. | |
| | | 3. Report progress on implementation of pathogen reduction measures to Water Board. | |

**Table 7.5.1-4 Trackable implementation measures for the Richardson Bay pathogens TMDL**

| Source Category | Implementing Party | Action | Completion Dates |
|---|---|---|---|
| Houseboats | RBRA; Marin County; local cities | 1. Submit to the Executive Officer for approval a plan and schedule for 1) evaluating adequacy and performance of sewage collection systems (onboard sewage systems, pumps, sewer lines, etc.) for all houseboats in Richardson Bay, 2) biennial evaluation of sewage collection system operation and maintenance for all houseboats once they have been repaired/upgraded such that they do not discharge any sewage into the Bay. | July 2009 |
| | | 2. Conduct evaluation per submitted plan. | July 2010 |
| | | 3. Report progress on implementation of the plan to Water Board. | Annually |
| | Houseboat marina owners | 1. Submit to the Executive Officer for approval a plan and schedule for 1) repairing/upgrading identified substandard/malfunctioning sewage collection systems (onboard sewage systems, pumps, sewer lines, etc.) such that they do not discharge any sewage into the Bay, 2) long-term operation and maintenance of the systems. | July 2011 |
| | | 2. Report progress on implementation of the plan to Water Board. | Annually |
| | Houseboat owners, houseboat marina owners | 1. Repair/Upgrade identified substandard/malfunctioning sewage collection systems (onboard sewage systems, pumps, sewer lines, etc.) such that they do not discharge any sewage into the Bay. | July 2013 |
| | | 2. Operate and maintain sewage collection systems such that they do not discharge any sewage into the Bay. | Ongoing |

| Source Category | Implementing Party | Action | Completion Dates |
|---|---|---|---|
| Vessels | RBRA; Marin County; local cities | 1. Submit to the Executive Officer for approval a plan and implementation schedule for 1) evaluating adequacy and performance of sewage collection systems (sewage dump stations, sewage pumpout stations, onboard sewage systems, sewer lines, etc.) for all vessel marinas and vessels with toilet facilities in Richardson Bay, 2) biennial evaluation of sewage collection system operation and maintenance for all vessel marinas and vessels once they have been repaired/upgraded such that they do not discharge any sewage into the Bay. | July 2009 |
| | | 2. Conduct evaluation per submitted plan. | July 2010 |
| | | 3. Report progress on implementation of the plan to Water Board. | Annually |
| | Vessel marina owners | 1. Submit to the Executive Officer for approval a plan and schedule for 1) installing, as needed, an adequate number of sewage pumpout and dump stations. If no new sewage pumpout and dump stations are needed, provide an explanation as why they are not needed, 2) repairing/upgrading identified leaky/malfunctioning sewage collection systems (sewage dump stations, sewage pumpout stations, onboard sewage systems, sewer lines, etc.) such that they do not discharge any sewage into the Bay, 3) long-term operation and maintenance of the systems such that they do not discharge any sewage into the Bay. | July 2011 |
| | | 2. Report progress on implementation of the plan to Water Board. | Annually |
| | Vessel owners, vessel marina owners | 1. Repair/upgrade identified leaky/malfunctioning sewage collection systems (sewage dump stations, sewage pumpout stations, onboard sewage systems, sewer lines, etc.) such that they do not discharge any sewage into the Bay. | July 2013 |
| | | 2. Operate and maintain sewage collection systems such that they do not discharge any sewage into the Bay. | Ongoing |
| | | 3. Enroll in RBRA's mobile sewage collection and disposal service for all live-aboards (both anchor-outs and marina-berthed vessels). | July 2010 |

### *Regulatory Framework*

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires that current and proposed nonpoint source discharges be regulated under waste discharge requirements, waivers of waste discharge requirements, Basin Plan discharge prohibitions, or some combination of these tools. Municipal and highway stormwater runoffs are regulated under NPDES permits. Table 7.5.1-5 describes the regulatory mechanism by which dischargers in each source category will be regulated.

**Table 7.5.1-5. Regulatory Framework**

| Source Category | Regulatory Tool |
|---|---|
| Sanitary Sewer Systems | General WDR permit |
| Stormwater Runoff | NPDES permit |
| Houseboats | Existing prohibition of human waste discharge (Table 4-1, Prohibitions 5 and 15) |
| Vessels | Existing prohibition of human waste discharge (Table 4-1, Prohibitions 5, 15, and 18) |

### *Ongoing Water Quality Monitoring in Richardson Bay*

Water quality monitoring will be conducted to assess water quality improvements and obtain additional information for further refinement of the TMDL. The main objectives of the ongoing monitoring program are to:

- Assess attainment of TMDL targets
- Evaluate spatial and temporal water quality trends in the Bay
- Obtain additional information about significant potential pathogen source areas
- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of source control actions

All water quality monitoring (including Quality Assurance and Quality Control procedures) will be performed pursuant to the State Water Board's Quality Assurance Management Plan for the Surface Water Ambient Monitoring Program.

### *Adaptive Implementation*

In 2013, the Water Board will evaluate monitoring results and assess progress toward attaining TMDL targets (Table 7.5.1-1) and load allocations (Table 7.5.1-3). The Water Board will also evaluate compliance with the trackable implementation measures specified in Table 7.5.1-4, as documented by submitted progress reports.

If evaluation and monitoring show that source control actions have been fully implemented throughout the watershed, but the TMDL targets (water quality objectives) are not attained, the Water Board may re-evaluate the attainability/applicability of designated water quality objectives.

The Water Board will review the Richardson Bay Pathogens TMDL and evaluate new and relevant information from monitoring, special studies, and scientific literature. At a minimum, these reviews will aim to find answers to the following questions. Additional questions may be developed in collaboration with stakeholders.

1. Is Richardson Bay progressing toward TMDL targets? If progress is unclear, how can monitoring efforts be modified to detect trends? If there has not been adequate progress, how might the implementation actions be modified?

1. What are the pollutant contributions for the various source categories? How have these contributions changed over time? How do they vary seasonally? How might source control measures be modified to improve load reduction? If the answers to these questions are not clear, how can monitoring efforts be modified to answer these questions?

2. Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, or implementation actions? If so, how should the TMDL be modified?

Modifications to the targets or implementation plan will be incorporated into the Basin Plan via an amendment process.

## 7.6 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE SOUTH BAY BASIN (SEE FIGURE 2-6)

*This section intentionally left blank.*

## 7.7 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE SANTA CLARA BASIN (SEE FIGURE 2-7)

### 7.7.1 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.

#### 7.7.1.1 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.

#### 7.7.1.2 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.

#### 7.7.1.3 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.

#### 7.7.1.4 Total Maximum Daily Loads

The TMDLs, shown in Table 7.7.1-1, are expressed as methylmercury and mercury concentrations in water and sediment.

**Table 7.7.1-1: Total Maximum Daily Loads**

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

### 7.7.1.5 Load and Wasteload Allocations

Concentration-based pollutant allocations by source category, equal to the TMDLs in Table 7.7.1-1, are shown in Table 7.7.1-2.

**Table 7.7.1-2: 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:[j] | | |
| 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 7.7.1-1.

[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 7.7.1-1.

#### 7.7.1.6 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 [effective date of the amendment], 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 no later than [six months from the effective date] 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 [two years from the effective date].
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 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 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 no later than [one year from the effective date] for review and approval by the Executive Officer. 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 [one year from the effective date], 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 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 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, the 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?

## 7.8 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE SAN PABLO BASIN (SEE FIGURE 2-8)

### 7.8 1 Sonoma Creek Pathogens Total Maximum Daily Load (TMDL)

Sonoma Creek and its tributaries are impaired by pathogens. The overall goal of this TMDL is to minimize human exposure to waterborne disease-causing pathogens and to protect uses of water for recreational activities such as wading, swimming, fishing, and rafting.

The most common sources of pathogens are wastes from warm-blooded animals, including humans, livestock, domestic pets, and wildlife. The following sections establish a density-based pathogen TMDL for Sonoma Creek and its tributaries, and identify actions and monitoring necessary to implement the TMDL. The TMDL defines allowable density-based bacteria concentrations and prohibits discharge of raw or inadequately treated human waste. The implementation plan specifies actions necessary to protect and restore water contact recreation beneficial uses.

This TMDL strives to achieve a balance that allows ongoing human activities including agriculture and recreation to continue, while restoring and protecting water quality. As outlined in the adaptive implementation section, the effectiveness of implementation actions, results of monitoring to track progress toward targets, and the scientific understanding of pathogens will be reviewed periodically, and the TMDL may be adapted to future conditions as warranted.

In addition to pathogens, both animal and human wastes contain nutrients that in excess pose a threat to aquatic ecosystem beneficial uses; Sonoma Creek is also listed as impaired by excess nutrients. By eliminating the discharge of human waste and controlling the discharge of animal waste, this TMDL will also protect the beneficial uses of the Sonoma Creek watershed's aquatic ecosystem, such as cold and warm freshwater habitat, and wildlife habitat. Controlling human and animal wastes discharges will also reduce risks from other harmful constituents such as steroids and pharmaceuticals.

#### 7.8.1.1 Problem Statement

Due to the presence of pathogens in Sonoma Creek and its tributaries, the beneficial uses of water contact and noncontact recreation are impaired. Waterborne pathogens pose a risk to human health. In ambient waters, the presence of human and animal fecal waste and associated pathogens is inferred from high concentrations of fecal coliform and *E. coli* bacteria. Bacteria levels in Sonoma Creek and its tributaries are higher than the bacteria water quality objectives established to protect people who swim, wade, and fish in these waters (Tables 3-1 and 3-2). Consequently, humans who recreate in Sonoma Creek and its tributaries are at risk of contracting waterborne disease.

#### 7.8.1.2 Sources

The following source categories have the potential to discharge pathogens to surface waters in the Sonoma Creek watershed:

- On-site sewage disposal systems (septic systems)
- Sanitary sewer systems
- Municipal runoff
- Grazing lands
- Dairies
- Municipal wastewater treatment facility

- Wildlife

Water quality monitoring data indicate that on-site sewage disposal systems are potentially a significant pathogen source to Sonoma Creek downstream of the community of Kenwood. Municipal runoff and sanitary sewer lines are the primary pathogen sources in the urban areas. Livestock grazing and dairies are potentially significant pathogen sources in the more rural portions of the watershed.

Discharger monitoring reports from 2001-2005 indicate that the one municipal wastewater treatment facility is not a significant pathogen source. This facility is considered a potential source due to the possibility of spills or treatment system malfunction.

Wildlife are not a significant, widespread pathogen source, as evidenced by low indicator bacteria levels at sites that contain wildlife but are minimally impacted by human activities. Wildlife may be a significant source on a limited, localized basis.

### 7.8.1.3 Numeric Targets

The numeric water quality targets listed in Table 7.8.1-1 are derived from water quality objectives for coliform bacteria in contact recreational waters, and from U.S. EPA's bacteriological criteria (Tables 3-1 and 3-2). The last target, "zero discharge of untreated or inadequately treated human waste," is consistent with Discharge Prohibition 15 (Table 4-1). The zero human waste discharge target is necessary because human waste is a significant source of pathogenic organisms including viruses; and attainment of fecal coliform targets alone may not be sufficient to protect human health. These bacteria targets, in combination with the human waste discharge prohibitions, are the basis for the TMDL and load allocations, and fully protect beneficial uses.

**Table 7.8.1-1 Water Quality Targets[a] for Sonoma Creek**

| |
|---|
| *E. coli* density: Geometric mean < 126 CFU/100 mL[b] ; 90$^{th}$ percentile < 409 CFU/100 mL[c] |
| Fecal coliform density[d]: Geometric mean < 200 CFU/100 mL[b] ; 90$^{th}$ percentile < 400 CFU/100 mL[c] |
| Total coliform density[d]: Median < 240 CFU/100 mL[b] ; no sample to exceed 10,000 CFU/100 mL |
| Zero discharge of untreated or inadequately treated human waste |

[a]These targets are applicable year-round.
[b]Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period
[c]No more than 10 percent of total samples during any 30-day period may exceed this number.
[d]The water quality targets for total and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal water quality objectives in the Basin Plan with *E.coli* based water quality objectives for contact recreation.

### 7.8.1.4 Total Maximum Daily Load

The TMDL, as indicated in Table 7.8.1-2, is expressed as density-based total coliform, fecal coliform, and *E. coli* bacteria limits.

**Table 7.8.1-2 Total Maximum Daily Loads of Pathogen Indicators for Sonoma Creek**

| Indicator | TMDL (CFU/100 mL) |
|---|---|
| *E. coli* | Geometric mean < 126 [a]<br>90$^{th}$ percentile < 409 [b] |

| | |
|---|---|
| Fecal coliform[c] | Geometric mean < 200 [a]<br>90th percentile < 400 [b] |
| Total coliform[c] | Median < 240 [a]<br>No sample to exceed 10,000 |

[a]Based on a minimum of five consecutive samples collected at approximately equa intervals over a 30-day period.
[b]No more than 10 percent of total samples during any 30-day period may exceed this number.
[c]The Total Maximum Daily Loads for total and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal water quality objectives in the Basin Plan with *E.coli*-based water quality objectives for contact recreation.

### 7.8.1.5 Load Allocations

Density-based pollutant allocations for pathogen source categories are presented in Table 7.8.1-3. This table also presents the wasteload allocation for the single municipal wastewater discharger in the watershed, Sonoma Valley County Sanitation District, and for municipal runoff. Due to the inherent uncertainty in estimating pathogen loading from nonpoint sources and municipal runoff, allocations for these source categories incorporate a 10 percent margin of safety. Each entity in the watershed is responsible for meeting its source category allocation. All facilities are also responsible for meeting the requirements of applicable waste discharge requirements, waivers, or prohibitions.

All discharges of raw or inadequately treated human waste are prohibited. All sources of untreated or inadequately treated human waste have an allocation of zero.

Discharging entities will not be held responsible for uncontrollable discharges originating from wildlife. If wildlife contributions are found to be the cause of exceedances, the TMDL targets and allocation scheme will be revisited as part of the adaptive implementation program.

**Table 7.8.1-3 Density-Based Pollutant Load and Wasteload Allocations[a] for Dischargers of Pathogens in the Sonoma Creek Watershed**

**Load Allocations[a]**

| Categorical Pollutant Source | E. coli | | Fecal coliform[b] | | Total coliform[b] | |
|---|---|---|---|---|---|---|
| | Geometric mean[c] | 90th percent-ile[d] | Geometric mean[c] | 90th percent-ile[d] | Median[c] | Single sample maximum |
| On-site sewage disposal systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Sanitary sewer systems | 0 | 0 | 0 | 0 | 0 | 0 |
| Grazing lands | < 113 | < 368 | < 180 | < 360 | < 216 | 9,000 |
| Dairies | <113 | <368 | <180 | <360 | <216 | 9,000 |
| Wildlife[e] | < 113 | < 368 | < 180 | < 360 | < 216 | 9,000 |

**Wasteload Allocations[a]**

| Categorical Pollutant Source | E. coli | | Fecal coliform[b] | | Total coliform[b] | |
|---|---|---|---|---|---|---|
| | Geometric mean[c] | 90th percent-ile[d] | Geometric mean[c] | 90th percent-ile[d] | Median[c] | Single sample maximum |
| Sonoma Valley County Sanitation District NPDES Permit No. CA0037800 | <126 | <409 | <200 | <400 | <240 | 10,000 |
| Municipal runoff (NPDES Permit No. CAS00004)[f] | <113 | <368 | <180 | <360 | <216 | 9,000 |

[a]These allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a NPDES permit. Load allocations and the wasteload allocation for municipal runoff reflect a 10 percent Margin of Safety.
[b] The allocations for total and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal water quality objectives in the Basin Plan with E.coli based water quality objectives for contact recreation.
[c]Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period.
[d] No more than 10 percent of total samples during any 30-day period may exceed this number.
[e] Wildlife are not believed to be a significant source of pathogens and their contribution is considered natural background; therefore, no management measures are required.
[f] Municipal runoff permitees are: Sonoma County Water Agency, County of Sonoma, City of Sonoma, Sonoma Developmental Center, and any other entities designated per the criteria specified in NPDES General Permit No. CAS00004.

### 7.8.1.6 Implementation Plan

This implementation plan builds upon previous and ongoing successful efforts to reduce pathogen loads in Sonoma Creek and its tributaries, and requires actions consistent with the California Water Code (CWC Section 13000 et seq.); the state's Nonpoint Source Pollution Control Program Plan (CWC Section 13369) and its Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program; and the human waste discharge prohibition.

Table 7.8.1-4 contains the required implementation measures for each of the source categories listed in Table 7.8.1-3. These measures include evaluation of operating practices: development of comprehensive, site-specific pathogen control measures and a corresponding implementation schedule: and submittal of

progress reports documenting actions undertaken. Progress reports may be submitted directly to the Water Board or to third parties if designated. These progress reports will serve as documentation that source reduction measures are being implemented.

It is important to note that the numeric targets and load allocations in the TMDL are not directly enforceable. To demonstrate attainment of applicable allocations, responsible parties must demonstrate that they are in compliance with specified implementation measures and any applicable waste discharge requirements (WDRs) or waiver conditions.

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires that current and proposed nonpoint source discharges be regulated under (WDRs), waiver of WDRs, Basin Plan prohibitions, or some combination of these tools. Table 7.8.1-5 specifies the regulatory framework for each discharger source category. The Water Board intends to work with stakeholders to develop conditions for waiving WDRs for grazing lands by 2009.

**Table 7.8.1-4 Trackable Implementation Measures for the Sonoma Creek Pathogen Total Maximum Daily Load**

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| On-Site Sewage Disposal Systems (Septic Systems) | Submit to the Water Board Executive Officer for approval a plan and implementation schedule to evaluate septic system performance and correct deficiencies in septic systems identified as potentially discharging to surface waters. Priority should be given to systems identified as posing water quality risks | Sonoma County Permit and Resource Management Department | January 2008 |
| | Report progress on implementation of septic system evaluation and repair program, as related to pathogen reduction | | January 2011 and biennially thereafter |
| | Comply with applicable County, Water Board, or State Board requirements | Septic system owners | As specified in applicable requirement |
| | Apply for coverage under the State Water Board's general WDRs for sanitary sewer systems. Comply with provisions of WDRs. | Sonoma Valley County Sanitation District | As specified in general WDRs |
| | Report progress on inspection and evaluation of sewer systems[a]. Priority should be given to areas identified as posing water quality risks. | | Annually |
| Grazing Lands | Submit a Report of Waste Discharge[b] to the Water Board that provides the following: a description of the facility; identification of necessary site-specific grazing management measures to reduce animal waste runoff; and an implementation schedule for identified management measures | Ranchers (landowners and lessees). These Reports may be submitted individually or jointly or through a third party[c]. | January 2010 |
| | Comply with applicable WDRs, waiver conditions, or prohibitions | Ranchers (landowners and lessees). | As specified in applicable WDRs or waiver conditions |
| | Report progress on implementation of grazing-management measures that reduce animal waste runoff. | Ranchers (landowners and leasees). These reports may be submitted individually or jointly through a third party[c]. | As specified in applicable WDRs or waiver of WDRs |

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| Dairies | Comply with applicable WDRs or waiver of WDRs. | Dairy Facility Owners | As specified in applicable WDRs or waiver of WDRs. |
| | Report progress on implementation of management measures that reduce animal waste runoff | | As specified in applicable WDRs or waiver of WDRs |
| Municipal Runoff | Comply with approved stormwater management plans and update/amend stormwater management plans as needed to include specific measures to reduce discharge of human and animal wastes | Sonoma County Water Agency, County of Sonoma, City of Sonoma, Sonoma Developmental Center, and any other entities designated per the criteria specified in NPDES General Permit No. CAS00004. | As specified in approved stormwater management plan and in applicable NPDES permit |
| | Report progress on implementation of human and animal waste runoff reduction measures | | |
| Municipal Wastewater Discharges | Comply with applicable NPDES permit. | Sonoma Valley County Sanitation District Facility | As specified in applicable NPDES permit |

a) Reports may be incorporated into annual SSMP audit reports.
b) WDRs waiver conditions may allow for other submittals in lieu of a Report of Waste Discharge.
c) While third parties may provide valuable assistance in TMDL implementation, the discharger is the entity responsible for compliance with the specified regulations and regulatory controls

| Table 7.8.1-5 Regulatory Framework for Discharges by Source Category | |
|---|---|
| **Source Category** | **Regulatory Tool** |
| On-site sewage disposal systems (septic systems) | General waste discharge requirements (WDRs), individual WDRs, or waiver WDRs, as appropriate[a]<br>Prohibition of human waste discharge |
| Sanitary sewer systems | General WDRs or individual WDRs, as appropriate<br>Prohibition of human waste discharge |
| Grazing lands | Waiver of WDRs[b] |
| Dairies | Waiver of WDRs or individual WDRs, as appropriate |
| Municipal runoff | NPDES permit |
| Municipal wastewater discharges | NPDES permit |

[a]Regulatory tool(s) employed will be consistent with State Board regulatory actions.
[b]The Water Board retains the option of requiring general or individual waste discharge requirements or compliance with a discharge prohibition, as appropriate.

### *Cost estimate: Agricultural Water Quality Control Program*

Because the implementation measures for grazing lands constitute an agricultural water quality control plan, the cost of that program is estimated below, consistent with California Water Code requirements (Section 13141).

The average annual program implementation cost to agricultural dischargers is estimated to range from $35,000 to $134,000 for the next ten years. These costs will be shared by Sonoma Creek watershed grazing land operators (approximately 10). This estimate includes the cost of implementing animal waste control and grazing management measures, and is based on costs associated with technical assistance and evaluation, installation of water troughs, and livestock control fencing along up to 25 percent of streams in grazing lands. Besides fencing, other acceptable methods of managing livestock access to streams are not included in this cost estimate due to variability in costs and site-specific applicability. In addition to private funding, potential sources of financing include federal and state water quality grants and federal agricultural grants.

### *Evaluation and Monitoring*

Beginning in 2011 and approximately every five years thereafter, the Water Board will evaluate site specific, subwatershed-specific, and watershed-wide compliance with the trackable implementation measures specified in Table 7.8.1-4. In evaluating compliance with the trackable implementation measures, the Water Board will consider levels of participation for each source category as well as for individual dischargers (as documented by Water Board staff or third parties).

In addition to the programmatic monitoring described above, Water Board staff, in collaboration with stakeholders, will conduct water quality monitoring to evaluate *E. coli* concentration trends in Sonoma Creek and its tributaries. Five years after TMDL adoption, the Water Board will evaluate monitoring results and assess progress made toward attaining TMDL targets (Table 7.8.1-1) and load allocations (Table 7.8.1-3). The main objectives of the Monitoring Program are to:

- Assess attainment of TMDL targets
- Evaluate spatial and temporal water quality trends
- Further identify significant pathogen source areas

- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of source control actions.
- Collect sufficient data to evaluate the costs of pathogen source control measures and the existence of other pollutant reduction benefits (e.g., nutrients or sediments), if any.

Table 7.8.1-6 presents locations for baseline water quality monitoring. Each site will be sampled for *E. coli* ten times each year. Five samples will be collected weekly during one 30-day period in each wet season (November through March) and one 30-day period in each dry season (May through September). All water quality monitoring (including quality assurance and quality control procedures) will be performed pursuant to the State Water Board's Quality Assurance Management Plan for the Surface Water Ambient Monitoring Program. Additional monitoring will be conducted as needed if funds are available.

| Table 7.8.1-6 Baseline Monitoring Sites |
|---|
| Sonoma Creek at Highway 12 |
| Sonoma Creek Below Kenwood |
| Sonoma Creek at Sonoma Developmental Center |
| Sonoma Creek at Maxwell Park |
| Sonoma Creek at Watmaugh Road |
| Nathanson Creek at Nathanson Park |
| Nathanson Creek at Watmaugh Road |
| Schell Creek at Highway 121 |

If source control actions are fully implemented throughout the watershed and the TMDL targets are not met, the Water Board may consider whether the TMDL targets are attainable, and re-evaluate or revise the TMDL and allocations as appropriate. Alternatively, if the required actions are not implemented or are only partially implemented, the Water Board may consider regulatory or enforcement action against dischargers not in compliance.

### *Adaptive Implementation*

Approximately every five years, the Water Board will review the Sonoma Creek Pathogen TMDL and evaluate new and relevant information from monitoring, special studies, and the scientific literature. At a minimum, the following questions will be used to conduct the reviews. Additional questions will be developed in collaboration with stakeholders during each review cycle.

- Are the Creek and the tributaries 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 might the implementation actions or allocations be modified?
- What are the pollutant loads for the various source categories (including naturally occurring background pathogen contributions and the contribution from open space lands), how have these loads changed over time, how do they vary seasonally, 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?

Reviews will be coordinated through the Water Board's continuing planning program, with stakeholder participation. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan via an amendment process. In evaluating necessary modifications, the

Water Board will favor actions that reduce sediment and nutrient loads, pollutants for which the Sonoma Creek watershed is also impaired.

### 7.8.2 Napa River Pathogens Total Maximum Daily Load (TMDL)

The Napa River and its tributaries are impaired by pathogens. The overall goal of this TMDL is to minimize human exposure to waterborne disease-causing pathogens and to protect uses of water for recreational activities such as wading, swimming, fishing, and rafting.

The most common sources of pathogens are wastes from warm-blooded animals, including humans, livestock, domestic pets, and wildlife. The following sections establish a density-based pathogen TMDL for the Napa River and its tributaries, and identify actions and monitoring necessary to implement the TMDL. The TMDL defines allowable density-based bacteria concentrations and prohibits discharge of raw or inadequately treated human waste. The implementation plan specifies actions necessary to protect and restore water contact recreation beneficial uses.

This TMDL strives to achieve a balance that allows ongoing human activities including agriculture and recreation to continue, while restoring and protecting water quality. As outlined in the adaptive implementation section, the effectiveness of implementation actions, results of monitoring to track progress toward targets, and the scientific understanding of pathogens will be reviewed periodically, and the TMDL may be adapted to future conditions as warranted.

In addition to pathogens, both animal and human wastes contain nutrients that in excess pose a threat to aquatic ecosystem beneficial uses; the Napa River is also listed as impaired by nutrients. By eliminating the discharge of human waste and controlling the discharge of animal waste, this TMDL will also protect the beneficial uses of the Napa River watershed's aquatic ecosystem, such as cold and warm freshwater habitat, and wildlife habitat. Controlling human and animal waste discharges will also reduce risks from other harmful constituents such as pharmaceuticals and steroids.

#### 7.8.2.1 Problem Statement

Due to the presence of pathogens in the Napa River and its tributaries, the beneficial uses of water contact and noncontact recreation are impaired. Waterborne pathogens pose a risk to human health. In ambient waters, the presence of human and animal fecal waste and associated pathogens is inferred from high concentrations of fecal coliform and E. coli bacteria. Bacteria levels in the Napa River and its tributaries are higher than the bacteria water quality objectives established to protect people who swim, wade and fish in these waters (Tables 3-1 and 3-2). Consequently, humans who recreate in the Napa River and its tributaries are at risk of contracting waterborne disease.

#### 7.8.2.2 Sources

The following source categories have the potential to discharge pathogens to surface waters in the Napa River watershed:

- On-site sewage disposal systems (septic systems)
- Sanitary sewer systems
- Municipal runoff
- Grazing lands
- Confined animal facilities
- Municipal wastewater treatment facilities

- Wildlife

Water quality monitoring data indicate that on-site sewage disposal systems are potentially a significant pathogen source, primarily in the Murphy Creek, Browns Valley Creek, and Salvador Channel subwatersheds. Sanitary sewer lines are a likely source, primarily in the Browns Valley Creek and Salvador Channel sub watersheds. Municipal runoff is a significant source in all urban areas, and livestock grazing and confined animal facilities are considered to be potential sources throughout the watershed.

Both discharger monitoring reports and in-stream water quality monitoring indicate that municipal wastewater treatment facility discharges are not significant pathogen sources in the Napa River watershed. These facilities are considered potential sources due to the possibility of spills or treatment system malfunction.

Wildlife are not a significant, widespread pathogen source, as evidenced by low indicator bacteria levels at sites that contain wildlife but are minimally impacted by human activities. Wildlife may be a significant source on a limited, localized basis.

### 7.8.2.3 Numeric Targets

The numeric water quality targets listed in Table 7.8.2-1 are derived from water quality objectives for coliform bacteria in contact recreational waters, and from U.S. EPA's bacteriological criteria (Tables 3-1 and 3-2). The last target, "zero discharge of untreated or inadequately treated human waste," is consistent with Discharge Prohibition 15 (Table 4-1). The zero human waste discharge target is necessary because human waste is a significant source of pathogenic organisms including viruses; and attainment of fecal coliform targets alone may not be sufficient to protect human health. These bacteria targets, in combination with the human waste discharge prohibitions, are the basis for the TMDL and load allocations, and fully protect beneficial uses.

**Table 7.8.2-1 TMDL Water Quality Targets[a] for the Napa River**

| |
|---|
| *E. coli* density: Geometric mean < 126 CFU/100 mL[b] ; 90$^{th}$ percentile < 409 CFU/100 mL[c] |
| Fecal coliform density[d]: Geometric mean < 200 CFU/100 mL[b] ; 90$^{th}$ percentile < 400 CFU/100 mL[c] |
| Total coliform density[d]: Median < 240 CFU/100 mL[b] ; no sample to exceed 10,000 CFU/100 mL |
| Zero discharge of untreated or inadequately treated human waste |

[a]These targets are applicable year-round.
[b]Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period.
[c]No more than 10 percent of total samples during any 30-day period may exceed this number.
[d]The numeric targets for total coliform and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal coliform water quality objectives in the Basin Plan with *E.coli*-based water quality objectives for contact recreation.

### 7.8.2.4 Total Maximum Daily Load

The TMDL, as indicated in Table 7.8.2-2, is expressed as density-based total coliform, fecal coliform, and *E. coli* bacteria limits.

**Table 7.8.2-2 Total Maximum Daily Loads of Pathogen Indicators for the Napa River**

| Indicator | TMDL (CFU/100 mL) |
|---|---|
| *E. coli* | Geometric mean < 126 [a]<br>90th percentile < 409 [b] |
| Fecal coliform[c] | Geometric mean < 200 [a]<br>90th percentile < 400 [b] |
| Total coliform[c] | Median < 240 [a]<br>No sample to exceed 10,000 |

[a]Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period.
[b]No more than 10 percent of total samples during any 30-day period may exceed this number.
[c]The Total Maximum Daily Loads for total coliform and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal coliform water quality objectives in the Basin Plan with *E.coli*-based water quality objectives for contact recreation.

### 7.8.2.4 Load Allocations

Density-based pollutant allocations for pathogen source categories (except wastewater treatment facilities) are shown in Table 7.8.2-3. Table 7.8.2-4 presents wasteload allocations for individual municipal wastewater dischargers. Due to the inherent uncertainty in estimating pathogen loading from nonpoint sources and municipal runoff (Table 7.8.2-3), allocations for these source categories incorporate a 10 percent margin of safety. Each entity in the watershed is responsible for meeting its source category allocation.

All discharges of raw or inadequately treated human waste are prohibited. All sources of untreated or inadequately treated human waste have an allocation of zero.

Discharging entities will not be held responsible for uncontrollable discharges originating from wildlife. If wildlife contributions are found to be the cause of exceedances, the TMDL targets and allocation scheme will be revisited as part of the adaptive implementation program.

**Table 7.8.2-3 Density-Based Pollutant Load Allocations and Wasteload Allocations[a] for Pathogen Dischargers in the Napa River Watershed**

| Categorical Pollutant Source | *E. coli* | | Fecal coliform[b] | | Total coliform[b] | |
|---|---|---|---|---|---|---|
| | Geometric mean[c] | 90th percent-ile[c] | Geometric mean[c] | 90th percent-ile | Median[c] | Single sample maximum |
| **On-site sewage disposal systems** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Sanitary sewer systems** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal runoff** | < 113 | < 368 | < 180 | < 360 | < 216 | 9,000 |
| **Grazing lands** | < 113 | < 368 | < 180 | < 360 | < 216 | 9,000 |
| **Confined animal facilities** | < 113 | < 368 | < 180 | < 360 | < 216 | 9,000 |
| **Wildlife[d]** | < 113 | < 368 | < 180 | < 360 | < 216 | 9,000 |

[a] These allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a NPDES permit. Allocations reflect a 10% margin of safety. Wasteload allocations for wastewater treatment facilities are shown in Table 7.8.2-4.
[b]The allocations for total coliform and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal coliform water quality objectives in the Basin Plan with *E.coli*-based water quality objectives for contact recreation.
[c]Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period.
[d]Wildlife are not believed to be a significant source of pathogens and their contribution is considered natural background; therefore, no management measures are required.

**Table 7.8.2-4 Density-Based Wasteload Allocations[a] for Municipal Wastewater Treatment Facilities**

| Facility | *E. coli* Density (CFU/100 mL) | | | | | | NPDES Permit # |
|---|---|---|---|---|---|---|---|
| | *E. coli* | | Fecal coliform[b] | | Total coliform[b] | | |
| | Geometric mean[c] | 90th %ile[c] | Geometric mean[c] | 90th %ile | Median[c] | Single sample max | |
| Napa Sanitation District | < 126 | < 409 | < 200 | < 400 | < 240 | 10,000 | CA0037575 |
| Town of Yountville | < 126 | < 409 | < 200 | < 400 | < 240 | 10,000 | CA0038121 |
| City of St. Helena | < 126 | < 409 | < 200 | < 400 | < 240 | 10,000 | CA0038016 |
| City of Calistoga | < 126 | < 409 | < 200 | < 400 | < 240 | 10,000 | CA0037966 |
| City of American Canyon | < 126 | < 409 | < 200 | < 400 | < 240 | 10,000 | CA0038768 |
| Napa River Reclamation District #2109 | < 126 | < 409 | < 200 | < 400 | < 240 | 10,000 | CA0038644 |

[a]These allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a NPDES permit.
[b]The allocations for total coliform and fecal coliform shall sunset and shall no longer be effective upon the replacement of the total and fecal coliform water quality objectives in the Basin Plan with *E.coli*-based water quality objectives for contact recreation.
[c]Based on a minimum of five consecutive samples collected at approximately equal intervals over a 30-day period.

### 7.8.2.5 Implementation Plan

This plan builds upon previous and ongoing successful efforts to reduce pathogen loads in the Napa River and its tributaries, and requires actions consistent with the California Water Code (CWC Section 13000 et seq.); the state's Nonpoint Source Pollution Control Program Plan (CWC Section 13369) and its Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program; and the human waste discharge prohibition.

Table 7.8.2-5 contains the required implementation measures for each of the source categories listed in Table 7.8.2-3 and 7.8.2-4. These measures include evaluation of operating practices; development of comprehensive, site-specific pathogen control measures and a corresponding implementation schedule; and submittal of progress reports documenting actions undertaken. Progress reports may be submitted directly to the Water Board or to third parties if designated. These reports will serve as documentation that source reduction measures are being implemented.

It is important to note that the numeric targets and load allocations in the TMDL are not directly enforceable. To demonstrate attainment of applicable allocations, responsible parties must demonstrate that they are in compliance with specified implementation measures and any applicable waste discharge requirements (WDRs) or waiver conditions.

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires that current and proposed nonpoint source discharges be regulated under WDRs, waivers of WDRs, Basin Plan prohibitions, or some combination of these tools. Table 7.8.2-6 specifies the regulatory framework for each discharger source category. The Water Board intends to work with stakeholders to develop conditions for waiving WDRs for grazing lands by 2009.

## Table 7.8.2-5 Trackable Implementation Measures for the Napa River Pathogen Total Maximum Daily Load

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| On-Site Sewage Disposal Systems (OSDS) | Submit to the Water Board Executive Officer for approval a plan and implementation schedule for evaluating OSDS performance and correcting deficiencies in OSDSs identified as potentially discharging to surface waters. Priority should be given to the Browns Valley Creek, Murphy Creek, and Salvador Channel subwatersheds | Napa County | January 2008 |
| | Report progress on implementation of OSDS evaluation and repair program | | January 2011 and biennially thereafter |
| | Comply with applicable County, Water Board, or State Water Board requirements | Septic system owners | As specified in applicable requirements |
| Sanitary Sewer Systems | Apply for coverage under the State Water Board's general WDRs for sanitary sewer systems Board (Order No. 2006-0003). Comply with provisions of WDRs. | Napa Sanitation District, City of Calistoga, City of St. Helena, Yountville Joint Treatment Plant, City of American Canyon, Napa River Reclamation District #2109 | As specified in general WDRs |
| | Report progress on inspection and evaluation of sewer systems[a] | | Annually |
| Grazing Lands | Submit a Report of Waste Discharge[c] to the Water Board that provides the following: a description of the facility; identification of necessary site-specific grazing management measures to reduce animal waste runoff; and an implementation schedule for identified management measures | Ranchers (landowners and lessees). These reports may be submitted individually or jointly or through a third party[dc]. | January 2010 |
| | Comply with applicable WDRs, waiver conditions, or prohibitions | Ranchers (landowners and lessees) | As specified in WDRs or waiver conditions |
| | Report progress on implementation of grazing management measures that reduce animal waste runoff | Ranchers (landowners and lessees). These reports may be submitted individually or jointly or through a third party[c]. | As specified in applicable WDRs or waiver of WDRs |

| Source Category | Action | Implementing Party | Completion Dates |
|---|---|---|---|
| Confined Animal Facilities | Submit a Report of Waste Discharge[b] to the Water Board that provides the following: a description of the facility; identification of necessary site-specific management measures to reduce animal waste runoff; and a schedule for implementation of identified management measures | Confined animal facilities. These reports may be submitted individually or jointly or through a third party. | January 2010 |
| | Comply with applicable WDRs or waiver conditions | Confined animal facilities | As specified in applicable WDRs or waiver of WDRs. |
| | Report progress on implementation of management measures that reduce animal waste runoff | Confined animal facilities. These reports may be submitted individually or jointly or through a third party. | As specified in applicable WDRs or waiver of WDRs |
| Municipal Runoff | Comply with approved stormwater management plans. Update/amend storm water management plans as needed to include specific measures to reduce discharge of human and animal wastes | Napa County, City of Napa, Town of Yountville, City of St. Helena, City of Calistoga, City of American Canyon | As specified in approved stormwater management plan and in applicable NPDES permit |
| | Report progress on implementation of human and animal waste runoff reduction measures | | |
| Municipal Wastewater Discharges | Comply with applicable NPDES permits | Napa Sanitation District, City of Calistoga, City of St. Helena, Yountville Joint Treatment Plant, City of American Canyon, Napa River Reclamation District #2109 | As specified in applicable NPDES permits |
| | [a.] Reports may be incorporated into annual SSMP audit reports.<br>[b.] WDRs waiver conditions may allow for other submittals in lieu of a Report of Waste Discharge.<br>[c.] While third parties may provide valuable assistance in TMDL implementation, the discharger is the entity responsible for compliance with the specified regulations and regulatory controls. | | |

| Table 7.8.2-6 Regulatory Framework for Discharges by Source Category | |
|---|---|
| **Source Category** | **Regulatory Tool** |
| On-site Sewage Disposal Systems | General Waste Discharge Requirements (WDRs), Individual WDRs, or Waiver of WDRs, as appropriate[a]<br>Prohibition of Human Waste Discharge |
| Sanitary Sewer Systems | General WDRs or Individual WDRs, as appropriate<br>Prohibition of Human Waste Discharge |
| Grazing Lands | Waiver of WDRs [b] |
| Confined Animal Facilities | Waiver of WDRs [b] |
| Municipal Runoff | NPDES Permit |
| Municipal Wastewater Treatment Facilities | NPDES Permit |
| [a]Regulatory tool(s) employed will be consistent with State Water Board regulatory actions.<br>[b]Water Board retains the option of requiring general or individual waste discharge requirements or compliance with a discharge prohibition, as appropriate. | |

### *Cost estimate: Agricultural Water Quality Control Program*

Because the implementation measures for grazing lands constitute an agricultural water quality control program, the cost of that program is estimated below, consistent with California Water Code requirements (Section 13141).

The average annual program implementation cost to agricultural dischargers is estimated to range between $60,000 and $250,000 for the next 10 years. These costs will be shared by Napa River watershed grazing lands operators (approximately 20). This estimate includes the cost of implementing animal waste controls and grazing management measures, and is based on costs associated with technical assistance and evaluation, installation of water troughs, and livestock control fencing along up to 25 percent of streams in grazing lands. Besides fencing, other acceptable methods of managing livestock access to streams are not included in this cost estimate due to variability in costs and site-specific applicability. In addition to private funding, potential sources of financing include federal and state water quality grants and federal agricultural grants.

### *Evaluation and Monitoring*

Beginning in 2011 and approximately every five years thereafter, the Water Board will evaluate site-specific, subwatershed-specific, and watershed-wide compliance with the trackable implementation measures specified in Table 7.8.2-5. In evaluating compliance with the trackable implementation measures, the Water Board will consider levels of participation for each source category as well as for individual dischargers (as documented by Water Board staff or third parties).

In addition to the programmatic monitoring described above, Water Board staff, in collaboration with stakeholders, will conduct water quality monitoring to evaluate *E. coli* concentration trends in the Napa River and its tributaries. Five years after TMDL adoption, the Water Board will evaluate monitoring results and assess progress made toward attaining TMDL targets (Table 7.8.2-1) and load allocations (Table 7.8.2-3). The main objectives of the Monitoring Program are to:

- Assess attainment of TMDL targets
- Evaluate spatial and temporal water quality trends
- Further identify significant pathogens source areas

- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of source control actions
- Collect sufficient data to evaluate the costs of pathogen source control measures and the existence of other pollutant reduction benefits (e.g., nutrients or sediment), if any

Table 7.8.2-7 presents locations for baseline water quality monitoring. Each site will be sampled for *E. coli* ten times each year. Five samples will be collected weekly during one 30-day period in each wet season (November through March) and one 30-day period in each dry season (May through September). All water quality monitoring (including quality assurance and quality control procedures) will be performed pursuant to the State Water Board's Quality Assurance Management Plan for the Surface Water Ambient Monitoring Program. Additional monitoring will be conducted as needed if funds are available. In lieu of the monitoring plan described in Table 7.8.2-6, one or more implementing parties may submit an alternative monitoring plan for Executive Officer approval.

| **Table 7.8.2-7 Baseline Monitoring Sites** |
|---|
| Napa River at Third Street, Napa |
| Napa River at Zinfandel Lane |
| Napa River at Calistoga Community Center |
| Browns Valley Creek at Browns Valley Road |
| Browns Valley Creek at Borrette Lane |
| Murphy Creek at Coombsville Road |
| Murphy Creek at upstream location to be determined[a] |
| Salvador Channel at Solano Avenue |
| Salvador Channel at Dry Creek Road |
| Four additional tributaries to be determined[a], rotated each year |
| [a]Sites will be determined by Water Board staff in coordination with stakeholders. |

If source control actions are fully implemented throughout the watershed and the TMDL targets are not met, the Water Board may consider whether the TMDL targets are attainable, and re-evaluate or revise the TMDL and allocations as appropriate. Alternatively, if the required actions are not implemented or are only partially implemented, the Water Board may consider regulatory or enforcement action against dischargers not in compliance.

### *Adaptive Implementation*

Approximately every five years, the Water Board will review the Napa River Pathogen TMDL and evaluate new and relevant information from monitoring, special studies, and the scientific literature. At a minimum, the following questions will be included in the reviews. Additional questions will be developed in collaboration with stakeholders during each review cycle.

1. Are the river and the tributaries 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 might the implementation actions or allocations be modified?
2. What are the pollutant loads for the various source categories (including naturally occurring background pathogen contributions and the contribution from open space lands)? How have these loads changed over time, how do they vary seasonally, and how might source control measures be modified to improve load reduction?

3. Is there new, reliable, and generally accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should the TMDL be modified?

Reviews will be coordinated by the Water Board's continuing planning program, with stakeholder participation. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan via an amendment process. In evaluating necessary modifications, the Water Board will favor actions that reduce sediment and nutrient loads, pollutants for which the Napa River watershed is also impaired.

### 7.8.3 Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan

The goals of the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan (Plan) are to:

- Conserve the steelhead trout population
- Restore water quality to meet water quality standards, including attaining beneficial uses
- Enhance the overall health of the native fish community
- Protect and enhance habitat for native aquatic species
- Enhance the aesthetic and recreational values of the creek and its tributaries

To achieve these goals, specific actions are needed to:

1. Reduce sediment loads, and fine sediment in particular, to Sonoma Creek and its tributaries
2. Attain and maintain suitable gravel quality in freshwater reaches of Sonoma Creek and its tributaries
3. Reduce and prevent channel incision
4. Reduce erosion and sedimentation
5. Repair large sources of sediment supply (e.g., landslides)
6. Enhance channel complexity (e.g., by adding and encouraging retention of large woody debris and restoring riparian vegetation)

The following sections establish:

1. A sediment total maximum daily load (TMDL) defining the allowable amount of sediment that can be discharged into Sonoma Creek, expressed as mass, and as a percentage of the natural background sediment delivery rate to channels
2. An implementation plan to achieve the TMDL and related habitat enhancement goals

#### 7.8.3.1 Problem Statement

Steelhead populations in the Sonoma Creek watershed have declined substantially since the late 1940s. Results of recent analyses of fisheries and sediment sources indicate that:

1. Excessive amounts of fine sediment have been deposited in the streambed at potential steelhead spawning and rearing sites. Excess fine sediment in the streambed can cause poor incubation conditions for fish eggs, resulting in high mortality prior to emergence. Fine sediment also compromises the quality of pools as rearing habitat, and reduces winter rearing habitat by filling the spaces between cobbles and boulders.
2. Changes in physical habitat structure that appear to be caused by erosion of bed and banks (incision) in Sonoma Creek are resulting in significant adverse changes to steelhead habitat. Analysis of in-stream shelter in Sonoma Creek yielded a low score when considering the watershed-wide average

(38, which is 13 percent of the maximum score), indicating low quality of rearing habitat for juvenile steelhead. A steelhead census performed in 2002 indicates only 10 percent of steelhead are surviving past the juvenile rearing stage. These conditions are limiting the success of steelhead fish in Sonoma Creek.

3. Stressful water temperatures, low summer flows, and migration barriers also impact the health of Sonoma Creek's coldwater fishery.

Due to excess erosion and sedimentation in the Sonoma Creek Watershed, the narrative water quality objectives for sediment and settleable material are not being met and cold freshwater habitat, wildlife habitat, fish spawning, recreation, and preservation of rare and endangered species beneficial uses are impaired. In addition, channel incision has caused habitat simplification, which has reduced and quantity and quality of spawning and rearing habitat for salmonids and other native aquatic species. Channel incision is a controllable water quality factor that is contributing to a violation of the narrative water quality objective for population and community ecology.

### 7.8.3.2 Numeric Targets and Desired Condition

Meeting the numeric targets and desired condition listed in Table 7.8.3-1 will allow water quality in Sonoma Creek and its tributaries to achieve the Basin Plan's narrative water quality objectives for sediment, settleable material, and population and community ecology.

**Table 7.8.3-1 TMDL Sediment Targets for Sonoma Creek and its Tributaries**

| | |
|---|---|
| Spawning gravel permeability | Median value ≥ 7000 cm/hr[a] |
| Pool filling | Decreasing trend in the volume of fine sediment deposited in pools |
| Substrate Composition- Percent Fines | Percent of fine sediment less than 0.85 mm in diameter is less than or equal to 14 percent of the total bulk core sample (≤14% fines < 0.85 mm)[b] |
| | Percent of fine sediment less than 6.40 mm in diameter is less than or equal to 30 percent of the total bulk core sample (≤30% fines < 6.40 mm)[b] |
| [a]Target applies to all potential spawning sites for steelhead and salmon in Sonoma Creek and its tributaries.<br>[b]Target applies to wadeable streams and rivers with gradient less than 3 percent. A wadeable stream is one which an average human can safely cross on foot during the summer, low flow season while wearing chest waders. | |

### 7.8.3.3 Sources

Field assessments and sediment load modeling provide credible estimates of average rates of sediment delivery to Sonoma Creek. As shown in Table 7.8.3-2, the average annual sediment load to the freshwater reach of Sonoma Creek is estimated to be 117,000 tons per year, or 360 tons per $km^2$ per year. The natural background sediment delivery rate to Sonoma Creek is 52,000 tons per year, or 160 tons per $km^2$ per year. Therefore, the current sediment delivery rate is estimated to be 225 percent of the natural background rate.

**Table 7.8.3-2. Average Annual Sediment Delivery to Sonoma Creek (tons/year)[a]**

| Source Categories | Estimated Rate[c] (tons/year) |
|---|---|

| Source Categories | | Estimated Rate[c] (tons/year) |
|---|---|---|
| Natural Processes | Channel Erosion, Incision[b] | 25,400 |
| | Colluvial Bank Erosion (Soil Creep) | 16,600 |
| | Surface Erosion[b] | 6,200 |
| | Landslides[b] | 4,100 |
| | Total- Natural Processes | 52,300 |
| Human Actions | Channel Incision and Gully Erosion[b] | 43,300 |
| | Roads and Stream Crossings | 11,200 |
| | Surface Erosion[b] from vineyards, other row crops, and rangelands | 8,600 |
| | Urban Stormwater Runoff | 1,100 |
| | Landslides[b] | 900 |
| | Total- Human Actions | 65,100 |
| GRAND TOTAL | | 117,400 |

[a] Sediment delivery rates are rounded to the nearest hundred.
[b] Channel erosion and incision, surface erosion, and landslides are occur due to both Natural Processes and Human Actions. For these sources, each component (natural processes vs. human actions) is displayed separately.
[c] The timeframe associated with the average annual rate varies from long-term average rates which were estimated for landslides, channel incision, and gully erosion to those for urban stormwater, surface erosion, and road-related erosion, which are estimated based on current/contemporary conditions.

### 7.8.3.4 Total Maximum Daily Load and Allocations

The Sonoma Creek sediment TMDL is established at 65,400 tons per year, which is approximately 125 percent of natural background load. Natural background load depends upon natural processes, and varies significantly. Therefore, the TMDL and allocations are expressed both in terms of sediment mass and percent of natural background. The percentage based TMDL, 125% of natural background, applies throughout the watershed. In order to achieve the TMDL, controllable sediment delivery resulting from human actions needs to be reduced by approximately 80 percent from current proportion of the total load (Table 7.8.3-3). TMDL attainment will be evaluated at the limit of tidal influence in the Sonoma Creek watershed, which approximates the downstream boundary of freshwater habitat for steelhead. Sonoma Creek has several tributaries that join the mainstem below the tidal limit; therefore, several points will be used to evaluate TMDL attainment. These points are: mainstem Sonoma Creek just downstream of the Fowler/Carriger Creek confluence, and the freshwater portions (above tidal influence) of Schell, Ramos, Carneros, and Merazo Creeks. Attainment of the TMDL will be evaluated over a 5-to-10-year averaging period. The TMDL equal to 125 percent of natural background load, can be achieved if human-related sources are reduced to the level of the allocations shown in
Table 7.8.3-3.

**Table 7.8.3-3. Sonoma Creek Sediment Load and Wasteload Allocations (tons/year)[a]**

| | Source Category | Current (2005) Load[b] | Estimated Reductions Needed (Percentage) | Allocation | |
|---|---|---|---|---|---|
| | | | | tons/year | Percent Natural Background |
| Load Allocations | Natural Processes | | | | |
| | Channel Erosion, Incision | 25,400 | 0 | 25,400 | 49 |
| | Colluvial Bank Erosion (Soil Creep) | 16,600 | 0 | 16,600 | 32 |
| | Surface Erosion | 6,200 | 0 | 6,200 | 12 |
| | Landslides | 4,100 | 0 | 4,100 | 8 |
| | Human Actions | | | | |
| | Channel Erosion, Incision | 43,300 | 81 | 8,100 | 15 |
| | Roads and Stream Crossings | 11,200 | 81 | 2,100 | 4 |
| | Surface Erosion, including vineyards, grazed lands, unmanaged areas, and minor agriculture | 8,600 | 81 | 1,600 | 3 |
| | Landslides | 900 | 81 | 200 | 0.4 |
| | TOTAL | 116,300 | | 64,300 | 123 |
| Wasteload Allocations[c] | Municipal Stormwater - NPDES Permit No. CAS000004 | 600 | 0 | 600 | 1 |
| | Construction Stormwater - NPDES Permit No. CAS000002 | 300 | 0 | 300 | 0.6 |
| | Industrial Stormwater – NPDES Permit No. CAS000001 | 100 | 0 | 100 | 0.2 |
| | Caltrans Stormwater – NPDES Permit No. CAS000003 | 100 | 0 | 100 | 0.2 |
| | TOTAL | 1,100 | | 1,100 | 2 |
| TOTAL ALLOCATIONS = TMDL = 125 % of Natural Background | | | | 65,400 | 125 |

[a] Sediment loads and allocations are rounded to the nearest hundred. Some totals may not appear to add up due to rounding.
[b] Table 7.8.3-2 also displays the estimated current (2005) sediment loads. Total current (2005) estimated sediment load = 117,400 tons/year.
[c] Source categories included in the wasteload allocations (e.g., municipal stormwater) are described as "urban stormwater" in Table 7.8.3-2. The term "urban stormwater" in Table 7.8.3-2 incorporates municipal, construction, industrial, and Caltrans stormwater.

### 7.8.3.5 Implementation Plan

The implementation actions described below are to achieve TMDL targets and allocations and habitat enhancement goals. In addition, actions specified in this plan are expected to enhance steelhead population. It is important to note that the allocations in the TMDL are not directly enforceable. To demonstrate attainment of applicable allocations, responsible parties must demonstrate that they are in compliance with required implementation measures and any applicable waste discharge requirements (WDRs), WDR waiver conditions, or NPDES permits.

#### *Regulatory Tools*

The State's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires regulation of nonpoint source discharges using the Water Board's administrative permitting authorities, including WDRs, waivers of WDRs, Basin Plan Discharge Prohibitions, or some combination of these. Consistent with this policy, Tables 7.8.3-4 – 7.8.3-7 specify actions and performance standards by nonpoint source category, as needed to achieve TMDL sediment targets and allocations in the Sonoma Creek watershed. The Water Board will consider adopting conditions for waiving WDRs that apply to the nonpoint sources (vineyards, grazing, roads, etc.) listed in Tables 7.8.3-4 – 7.8.3-7, address all pollutants of concern, protect all beneficial uses, and balance the agricultural, environmental, recreational, and residential needs of the watershed.

The wasteload allocations contained in Table 7.8.3-3 apply to point sources of sediment that are regulated by NPDES permits. Table 7.8.3-8 shows implementation measures required of these sources, which include municipal stormwater, runoff from state highways, and from industrial and construction sites.

Problems associated with channel incision, related rapid bank erosion, and loss of essential habitat features, reflect and integrate multiple historical and ongoing disturbances, some of which are local and direct, and others that are indirect and distal. Effectively addressing these issues will require cooperative and coordinated actions by multiple landowners, working with public agencies, over significant distances along the creek. The most effective means of controlling channel incision and reducing related fine sediment delivery to the creek is a channel restoration program that re-establishes width-to-depth ratios and sinuosity values conducive to formation of alternate bars and a modest flood plain. The Water Board will work with stakeholders along Sonoma Creek, through local stewardship groups, to implement such channel restoration/habitat enhancement projects. Tables 7.8.3-9 to 7.8.3-11 (Recommended Measures to Protect or Enhance Habitat), specify actions to address adverse impacts of channel incision on salmonid habitat quantity and quality, and to accomplish habitat enhancement goals for flow, temperature, and fish passage for steelhead.

Individual landowners or coalitions may work with "third parties" to develop and implement sediment pollutant control programs. With regard to achievement of actions to protect or enhance baseflow, fish passage, habitat complexity, and stream temperature, the effectiveness of the recommended actions specified in Tables 7.8.3-9 through 7.8.3-11, will be evaluated as part of the adaptive implementation program.

**Agricultural Water Quality Control Program Costs**

Implementation measures for grazing lands and vineyards constitute an agricultural water quality control program and therefore, consistent with California Water Code requirements (Section 13141), the cost of this program is estimated herein. This cost estimate includes the cost of implementing all actions to reduce sediment discharges and enhance habitat complexity as specified in the implementation plan, and is based on costs associated with technical assistance and evaluation, project design, and implementation of actions needed to achieve the TMDL. In estimating costs, the Water Board has assumed that owners of agricultural businesses own 75 percent of total land area on hillside parcels, and

95 percent of the land along Sonoma Creek and lower reaches of its tributaries. Based on these assumptions, the estimated total cost for program implementation for agricultural sources is $1.3-to-2.3 million per year throughout the 20-year implementation period. More than three-quarters of these potential costs are associated with addressing channel incision and enhancing habitat conditions (to reverse the impacts of channel incision) in Sonoma Creek and its tributaries. Considering potential benefits to the public in terms of ecosystem functions, aesthetics, recreation, and water quality, it is anticipated that at least 75 percent of the cost of these actions will be paid for with public funds. Therefore, the total cost to agricultural businesses associated with efforts to reduce sediment supply and enhance habitat in Sonoma Creek is $300,000-$600,000 per year over the 20-year implementation period.

### *Evaluation and Monitoring*

In collaboration with stakeholders in the watershed, Water Board staff will develop a detailed monitoring program to assess progress of TMDL attainment and provide a basis for reviewing and revising TMDL elements or implementation actions. As an initial milestone, by fall 2011, the Water Board and watershed partners will complete monitoring plans to evaluate: a) attainment of water quality targets; and b) suspended sediment and turbidity conditions. Initial data collection, based on the protocols established in these monitoring plans is anticipated to begin in the winter of 2011-2012.

As a whole, the monitoring program will be designed to:

1. *Assess channel response and progress towards achieving water quality targets.* In-channel effectiveness monitoring will be conducted to evaluate: a) progress toward achieving water quality targets, and b) channel response to management measures and natural processes. Parameters that will be monitored to assess progress toward achieving water quality targets are streambed permeability, pool filling, and percent fines composition of the substrate. The number of sites to be monitored will be selected based on availability/presence of the applicable habitat feature (i.e., spawning gravels and pools), as well as the number of samples needed to have a high degree of statistical confidence in estimated values. Frequency of monitoring should be once every five years, at a minimum, for streambed permeability and pool filling. If resources are available, desired monitoring frequency for all TMDL target parameters is once every two to three years. Pool filling should be monitored every two to three years to allow a trend analysis. The Water Board may establish alternative water quality parameters and/or numeric target values at a future date as part of the adaptive implementation process, when/if information becomes available to conclude with a high degree of confidence that one or more alternative parameters or target values provide a superior basis for determining attainment of water quality objectives for sediment, and the protection of fisheries-related beneficial uses.

2. *Further evaluate potential impacts of suspended sediment and related turbidity.* To further study potential impacts of suspended sediment and related turbidity, monitoring of turbidity should continue. The Sonoma Ecology Center maintains a continuous and automated monitoring station at the Sonoma Valley Watershed Station in Eldridge, CA. Monitoring of suspended sediment should continue to further understanding of turbidity and suspended sediment concentrations in ambient conditions, and during and after storms. Turbidity/suspended sediment data should be analyzed to determine the length of time it takes for turbidity levels to drop to pre-storm levels after a storm event.

   It is expected that as sediment reduction and habitat enhancement measures (including reducing channel incision) are undertaken, suspended sediment concentrations and turbidity levels will decrease. This expectation should be confirmed with continued turbidity monitoring. In addition, turbidity monitoring can provide information regarding the effectiveness of sediment reduction measures because it is a sensitive measure of the effects of land use on streams.

3. *Assess whether required sediment reduction measures are undertaken.* Implementation monitoring will be conducted by landowners or designated agents, per the compliance monitoring and reporting provisions of applicable waivers of WDRs, WDRs, and NPDES permits.
4. *Evaluate effectiveness of selected sediment reduction measures (both structural and management-related).* The Water Board will conduct upslope effectiveness monitoring to evaluate sediment delivery to channels from land use activities and natural processes. The first sediment source analysis update will occur by 2020, when sediment delivery associated with human activities may be reduced by 25 percent or more. A subsequent update may occur, assuming the water quality targets for sediment are not already achieved, by 2025, when sediment supply associated with human activities may be reduced by 40 percent or more. An additional goal for future updates of the source analysis is to reduce uncertainty associated with estimates of sediment delivery rates.
5. *Evaluate effectiveness of recommended habitat enhancement measures and assess progress towards goals of the Habitat Enhancement Plan.* The Water Board and local partners should monitor habitat complexity-related water quality indicators to assess progress towards achievement of a balanced sediment budget (where the amount of fine and course sediment input to a given channel reach is equal to the amount that is transported downstream).

   Monitoring should occur to determine whether there is an increasing trend in the percent of the length of mainstem of Sonoma Creek, and in the lower alluvial reaches of its tributaries, that attain the following conditions:

   a. The bankfull channel width-to depth ratio is $\geq$ 12:1.
   b. The average spacing between alluvial and/or forced gravel bars within the active channel is $\leq$ 7 times the width of the bankfull channel.
   c. Available shear stress at bankfull flow does not exceed the amount required to initiate motion of the streambed by more than approximately 20 percent.
   d. Floodplain width is $\geq$ 4 times bankfull channel width.

Monitoring should also assess whether there is:

   e) An increasing trend through time in the mean area and frequency of riffles and gravel bars within the mainstem channel; and
   f) A decreasing trend through time in the percent of the length of the mainstem of Sonoma Creek, and in the lower alluvial reach of its tributaries, where banks or bed are hardened, and/or where constructed levees contribute to channel instability.

The information gained from monitoring will guide adaptive implementation.

#### 7.8.3.6 Adaptive Implementation

In concert with the monitoring program, described above, the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan will be regularly updated. Results of in-progress or anticipated studies that enhance understanding of the population status of steelhead trout in the Sonoma Creek watershed, and/or factors controlling those populations, may also trigger changes to the plan and TMDL. At a minimum, data in response to the following questions will be considered to guide research and monitoring efforts and focus each subsequent update of the TMDL.

*Key Questions to be considered in the course of Adaptive Implementation:*

- What is the population status of steelhead in the watershed? Is there an increase in the number or percentage of steelhead that survive past the juvenile rearing life stage as sediment reduction and habitat enhancement measures are implemented? An improved understanding of the current status of steelhead populations in the Sonoma Creek watershed is essential for guiding adaptive updates to the management actions recognized in this plan. Two types of monitoring data may be needed to evaluate the current population status in the watershed: 1) "smolt" production and sizes, and 2) adult spawning run-size. Smolt refers to the life stage when juvenile salmonids migrate from freshwater to the ocean. These two types of monitoring would provide a basis for assessing the influences of ocean and freshwater rearing habitat on steelhead run-size.
- Are Sonoma Creek and its tributaries progressing toward TMDL targets as expected? If there has not been adequate progress, how might the implementation actions, targets or allocations be modified?
- What are expected benefits of various actions to enhance habitat for steelhead? Which actions, and in which locations, would enhancement measures have the most benefit and be the most cost-effective?
- Are the specified sediment reduction measures and recommended habitat enhancement measures resulting in an improving trend in channel stability?
- What effect will climate change have on hydrology, sediment transport, and habitat for the watershed's aquatic species? Is there evidence that TMDL implementation actions, together with climate change, may affect Bay tidal habitats? How will climate change effect the outcome of required and recommended measures, and how should these measured be adjusted in response?
- Are there new data or information available that warrants revision of water quality targets, allocations, or implementation measures?

## Table 7.8.3-4 Required and Trackable TMDL Implementation Measures for Sediment Discharges Associated with Vineyards[1]

| Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|
| **Surface Erosion associated with vineyards**: Comply with the Sonoma County Vineyard Erosion and Sediment Control Ordinance (Sonoma County Code, Chapter 30, Article V) and minimize erosion from existing vineyards; **and**<br><br>**Roads**: Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels; **and**<br><br>**Gullies and/or shallow landslides:** Promote natural recovery and minimize human-caused increases in sediment delivery from unstable areas; **and**<br><br>**Effectively attenuate significant increases in storm runoff.** Runoff from vineyards shall not cause or contribute to downstream increases in rates of bank or bed erosion. | Submit a Report of Waste Discharge[2] to the Water Board that provides, at a minimum, the following: a description of the vineyard; identification of site-specific erosion control measures needed to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures.<br><br>OR<br><br>Implement farm plan certified under Fish Friendly Farming Environmental Certification Program or other farm plan certification program approved as part of a WDR waiver policy. All dischargers applying for coverage under a WDR waiver policy also will be required to file a notice of intent (NOI) for coverage, and to comply with all conditions of the WDR waiver policy [4]. | Vineyard owner and/or operator | June 2014 |
| | Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs. | Vineyard owner and/or operator | As specified in applicable WDRs or waiver of WDRs |
| | Report progress on implementation of site specific erosion control measures.[3] | Vineyard owner and/or operator | As specified in applicable WDRs or waiver of WDRs |

[1] As needed to achieve TMDL allocations and consistent with the State Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program
[2] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[3] Reports may be submitted individually or jointly through a recognized third party.
[4] This Basin Plan amendment recognizes farm plans certified under the Fish Friendly Farming Environmental Certification Program as effective with regard to control of pollutant discharges associated with vineyards. Additional conditions will be required under a General WDR and/or waiver program consistent with the State Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program, and/or as needed to avoid potentially significant environmental impacts.

## Table 7.8.3-5 Required TMDL Implementation Measures for Sediment Discharges Associated with Grazing

| Source(s) and Performance Standard(s) | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|
| **Surface erosion associated with livestock grazing**: Attain or exceed minimal residual dry matter values consistent with University of California Division of Agriculture and Natural Resources guidelines; **and**<br><br>**Roads**: Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels; **and**<br><br>**Gullies and/or shallow landslides**: Promote natural recovery and minimize human-caused increases in sediment delivery from unstable areas. | Submit a Report of Waste Discharge[1] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures. | Landowner and/or ranch operator | June 2014 |
| | Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs. | Landowner and/or ranch operator | As specified in applicable WDRs or waiver of WDRs |
| | Report progress on implementation of site specific erosion control measures.[2] | Landowner and/or ranch operator | As specified in applicable WDRs or waiver of WDRs |

[1] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[2] These reports may be prepared individually or jointly or through a recognized third party.

**Table 7.8.3-6 Required TMDL Implementation Measures for Sediment Discharges Associated with Rural Lands[1,]**

| Sources and Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|
| Roads: Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels ; and<br><br>Gullies and/or shallow landslides: Promote natural recovery, and minimize human caused increases in sediment delivery from unstable areas. | Submit a Report of Waste Discharge[2] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures. | Landowners | June 2014 |
| | Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. | Landowners | As specified in applicable WDRs or waiver of WDRs |
| | Report progress on implementation of site specific erosion control measures.[3] | Landowners | As specified in applicable WDRs or waiver of WDRs |

1. Rural lands include: non-farmed and non-grazing portions of parcels >10 acres that contain one or more residences, and/or a winery; vacant residential parcels >10 acres; and/or portions of 10-acres or larger parcels with secondary vineyard, orchard, and/or grazing. Parcels smaller than 10 acres, but that are identified by Water Board staff as posing a threat to water quality, may also be required to implement the specified actions.
2. Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board
3. These reports may be prepared individually or jointly or through a recognized third party.

## Table 7.8.3-7 Required TMDL Implementation Measures for Sediment Discharges associated with Parks and Open Space, and/or Municipal Public Works

| Landowner Type | Sources and Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| *PARKS AND OPEN SPACE AND PUBLIC WORKS* | **Roads**: Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels; **and**<br><br>**Gullies and/or shallow landslides**: Promote natural recovery, and minimize human caused increases in sediment delivery from unstable areas. | Submit a Report of Waste Discharge[1] to Water Board that provides, at a minimum, the following: description of the road network and/or segments; identification of erosion and sediment control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified control measures. For paved roads, erosion and sediment control actions could primarily focus on road crossings to meet the performance standard.<br><br>Adopt and implement best management practices for maintenance of unimproved (dirt/gravel) roads, and conduct a survey of stream-crossings associated with paved public roadways, and develop a prioritized implementation plan for repair and/or replacement of high priority crossings/culverts to reduce road-related erosion and protect stream-riparian habitat conditions. | Sonoma County Stormwater Management Program (SWMP)<br><br>State of California, Department of Parks and Recreation<br><br>State of California, Department of Transportation<br><br>County of Sonoma Transportation and Public Works | June 2014 |
| | | Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. | Landowners | As specified in applicable WDRs or waiver of WDRs, and/or the SWMP |
| | | Report progress on development and implementation of best management practices to control road-related erosion.[2] | Landowners | As specified in applicable WDRs or waiver of WDRs, and/or SWMP |

[1] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.

[2] These reports may be prepared individually or jointly or through a recognized third party.

**Table 7.8.3-8 Required TMDL Implementation Measures for Sediment Discharges associated with Urban Land Uses**

| Source | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| *Construction Stormwater Runoff* | Control and minimize sediment and erosion from construction sites through appropriate use of Best Management Practices. | Comply with the requirements of the General Permit for Discharges of Storm Water Associated with Construction Activity (NPDES Permit No. CAS000002) or updated versions of the Construction General Permit.<br><br>Develop, maintain, and implement a Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs to be used to control erosion and sedimentation.<br><br>Develop and implement a sediment monitoring plan if the construction site discharges directly to Sonoma Creek or its tributaries. | Owners or Operators of Sites under Construction | As specified in the Construction General Permit (NPDES Permit No. CAS000002) |
| *Industrial Stormwater Runoff* | Control discharges from industrial facilities to the standard of "best available technology economically achievable" and the "best conventional pollutant control technology". | Comply with the requirements of the General Permit for Discharges of Stormwater Associated with Industrial Activities (NPDES Permit No. CAS000001).<br><br>Develop a SWPPP and monitoring plan to identify sources of pollutants (including sediment) and the means to control them to reduce stormwater pollution. | Owners or Operators of Industrial Facility Sites | As specified in the Industrial Stormwater General Permit (NPDES Permit No. CAS000001) |

| | | | | |
|---|---|---|---|---|
| ***Municipal Stormwater Runoff*** | Reduce discharge of pollutants, including sediment, to the maximum extent practicable (MEP)[1] | Comply with approved stormwater management plans.<br><br>Comply with Municipal Stormwater Permit (NPDES Permit No. CAS000004). | Sonoma County Water Agency, County of Sonoma, City of Sonoma, Sonoma Developmental Center, and any other designated entities | As specified in approved stormwater management plan and in applicable NPDES permit (NPDES Permit No. CAS000004). |
| | Attenuate peak flows and durations from new and redevelopment projects to MEP standards. | Amend and implement stormwater management plans to control peak flow rates and durations | Sonoma County Water Agency, County of Sonoma, City of Sonoma, Sonoma Developmental Center, and any other designated entities | No later than June 2014 |
| ***State Highways Stormwater Runoff*** | Control runoff from state highways and associated construction activities. | Comply with the Caltrans Statewide Stormwater Permit (NPDES Permit No. CAS000003). | California Department of Transportation (Caltrans) | As specified in applicable NPDES permit (NPDES Permit No. CAS000003). |

[1] MEP is the performance standard specified in Section 402(p) of the Clean Water Act. What constitutes MEP evolves with technology and feasibility, and therefore may change in the future. As of 2008, we consider MEP to be those standards specified in the Phase I Municipal Regional Stormwater Permit Revised Tentative Order (NPDES Permit No. CAS612008, provision C.3).

**Table 7.8.3-9 Recommended Actions to Reduce Sediment Load and Enhance Habitat Complexity in Sonoma Creek and its Tributaries**

| Recommended Action | Management Objective(s) | Actions | Implementing Parties | Completion Dates and Notes |
|---|---|---|---|---|
| **Prevent and Reduce Channel Incision** | Reduce rates of sediment delivery (associated with incision and associated bank erosion) to channels, by 80 percent.<br><br>Enhance channel habitat as needed to support self-sustaining run of steelhead and enhance the overall health of the native fish community.<br><br>Stabilize channel banks and riparian areas to reduce sediment loads from landslides. | Develop and prioritize channel restoration projects to address unstable areas, based on level of incision and/or landslide instability. | Landowners and/or designated agents, and reach-based stewardships | Comply with conditions of Clean Water Act Section 401 certifications |
| **Enhance Physical Habitat Structure** | Enhance quality of rearing habitat for juvenile salmonids by increasing riparian canopy, large woody debris, and frequency and depth of pool habitat. | Develop, prioritize, and implement plans to increase channel complexity, including increasing riparian canopy, pool habitat, and large woody debris. | Landowners and/or designated agents, and reach-based stewardships | |

**Table 7.8.3-10 Recommended Actions to Protect or Enhance Baseflow**

| Recommended Action | Management Objective | Action(s) | Implementing Parties | Schedule/Notes |
|---|---|---|---|---|
| Enhance Summer Base Flows | Maintain suitable conditions for juvenile rearing, and smolt migration to Sonoma Creek estuary. | Implement a groundwater management plan to: 1) maintain groundwater levels for the support of beneficial uses, 2) increase water recycling and conservation in order to enhance summer base-flows, 3) identify and protect groundwater recharge areas, 4) enhance the recharge of groundwater where appropriate; and 5) protect against adverse interactions between groundwater and surface water flows.<br><br>Identify potential groundwater recharge areas and develop pilot projects. | Sonoma County Water Agency, Valley of the Moon Water District, City of Sonoma, Basin Advisory Panel[1], and interested collaborators | The Sonoma Valley Groundwater Management Plan[2] was adopted by the Sonoma County Water Agency in November 2007. The plan includes an implementation schedule to achieve recommended actions to protect or enhance baseflow. |

[1]The Basin Advisory Panel was formed to act as the groundwater management plan stakeholder group for the Sonoma Valley Basin

[2] The Sonoma Valley Groundwater Management Plan (developed by the Sonoma County Water Agency, Valley of the Moon Water District, and City of Sonoma) is a non-regulatory plan aimed at locally managing, protecting, and enhancing groundwater resources.

**Table 7.8.3-11 Recommended Actions to Restore to Fish Passage**

| Recommended Action | Management Objective(s) | Action(s) | Implementing Parties | Schedule/Notes |
|---|---|---|---|---|
| Address Fish Passage Barriers | No significant structural impediments to salmonid migration or passage in mainstem or key tributaries.<br><br>Reduce the number of stream miles inaccessible to fish. | Design, replace or retrofit road crossings to allow fish passage according to fish-friendly guidance such as those developed by FishNet 4C, Department of Fish and Game, or other appropriate entity with expertise in salmonid habitat restoration. | Local public agencies, watershed groups and landowners | |
| | | Develop, prioritize, and implement plans to remove identified barriers to fish passage. | Local public agencies, watershed groups, and landowners | |

### 7.8.4 Napa River Sediment Reduction and Habitat Enhancement Plan

The goals of the Napa River Sediment Reduction and Habitat Enhancement Plan (Plan) are to:

- Conserve the steelhead trout population
- Establish a self-sustaining Chinook salmon population
- Enhance the overall health of the native fish community
- Enhance the aesthetic and recreational values of the river and its tributaries

To achieve these goals, specific actions are needed to:

- Attain and maintain suitable gravel quality and diverse streambed topography in freshwater reaches of Napa River and its tributaries
- Protect and/or enhance base flows in tributaries and the mainstem of the Napa River
- Reduce the number and significance of human-made structures in channels that block or impede fish passage
- Maintain and/or decrease summer water temperatures in tributaries to the Napa River

The following sections establish:

1. A sediment total maximum daily load (TMDL) defining the allowable amount of sediment that can be discharged into the Napa River, expressed as a percentage of the natural background sediment delivery rate to channels
2. An implementation plan to achieve the TMDL and related habitat enhancement goals

#### 7.8.4.1 Problem Statement

Steelhead and salmon populations in the Napa River and its tributaries have declined substantially since the late 1940s. Results of recent analyses of fisheries and sediment sources indicate that:

**1. Spawning and juvenile rearing habitat for salmon and steelhead are adversely affected by high concentrations of fine sediment (primarily sand) deposited in the bed of the Napa River and its tributaries.**

Successful reproduction by salmon and steelhead depends on adequate flow through streambed gravels (permeability) in order for eggs to hatch and larvae to grow. As the concentration of fine sediment (primarily sand) in the streambed increases, permeability decreases, which in turn increases egg and larval mortality, and ultimately causes a decrease in the number of young fish that emerge from the streambed. Similarly, as the concentration of sand in the streambed increases, the frequency and extent of streambed scour is intensified, further increasing mortality between spawning and emergence by washing eggs and/or larvae out of the bed during common high flow events.

Even small increases in the concentration of fine sediment in the streambed may degrade the quality of rearing habitat for juvenile steelhead and salmon. Young steelhead need open spaces between clusters of large cobbles and boulders in order to escape high flows and predation during the winter. Similarly, as the concentration of fine sediment in the streambed increases, growth and survival of juvenile steelhead and salmon decreases as a consequence of lower biomass of aquatic insect prey species, and increasing activity level, aggressive behavior, and attacks between juvenile salmon and steelhead as they compete for food.

**2. Channel incision has greatly reduced the quantity and quality of spawning and rearing habitat for Chinook salmon in Napa River watershed. Habitat losses as a result of incision exert a significant negative influence on freshwater growth and survival of juvenile salmon, and therefore, on the number of Chinook salmon that ultimately return to spawn.**

Channel incision, the progressive lowering over time of streambed elevation as a result of net erosion, has lowered the streambed of the mainstem of the Napa River by more than two meters since the start of the current episode of incision, which began sometime after 1965. As a result, habitat is being degraded. The channel has become isolated from its flood plain and there has been a large reduction in the size and frequency of riffles, gravel bars, side channels, and sloughs. These habitats provide essential spawning and juvenile rearing habitat for Chinook salmon. Human activities that have contributed to channel incision in the River, including (but not necessarily limited to) levee building, development projects that have increased peak runoff during storms, construction of large tributary dams, straightening of some mainstem channel reaches, filling of side channels, historical gravel mining, dredging to reduce flood risk, and intensive removal of large woody debris.

**3. Low flows and stressful water temperatures during the spring and dry season, and fish migration barriers exert a significant negative influence on the number (and fitness) of juvenile steelhead that migrate to the ocean from the watershed, and as such, on the number of adults that successfully return to spawn.**

Drifting aquatic insects produced in riffles often are the primary source of food for juvenile steelhead. Low or no flow over riffles during the spring and dry season greatly reduces this food source. An association between low and/or negative growth rates in juvenile steelhead and poor baseflow persistence was documented in the summer and fall of 2001 in Napa River watershed. Summer water temperatures in tributaries also are often stressful to juvenile steelhead, likely contributing to poor growth rates that were documented. If low growth rates in summer are not mitigated by high rates of growth during other times of the year, significant reductions in survival rates during all subsequent life stages may result.

Poor access to and from potential spawning and rearing habitat due to man-made structures built in channels (e.g., dams, road crossings, weirs, etc.) and human water uses have reduced the size of the steelhead run in the Napa River watershed. For example, approximately 30 percent of the land area in the Napa River watershed drains into over 400 on-channel reservoirs.

Due to excess erosion and sedimentation in the Napa River watershed, the narrative water quality objectives for sediment and settleable material are not being met, and cold freshwater habitat, wildlife habitat, fish spawning, recreation, and preservation of rare and endangered species beneficial uses are impaired. In addition, channel incision has reduced the quantity of gravel bars, riffles, side channels, and sloughs, which threatens Chinook salmon and other fish and aquatic wildlife species. Channel incision is a controllable water quality factor that is contributing to a violation of the narrative water quality objective for population and community ecology.

### 7.8.4.2 Numeric Targets

Meeting the numeric targets listed in Table 7.8.4-1 will allow water quality in the Napa River and its tributaries to achieve the Basin Plan's narrative water quality objectives for sediment, settleable material, and population and community ecology.

**Table 7.8.4-1. TMDL sediment targets for the Napa River and its Tributaries**

| | |
|---|---|
| Spawning gravel permeability | Median value ≥ 7000 cm/hr[a] |
| Streambed scour | Mean depth of scour ≤ 15 cm[b] |

[a] Target applies to all potential spawning sites for steelhead and salmon in the Napa River and its tributaries, excluding those upstream of municipal water supply reservoirs.

[b] Target applies to the response of the streambed to peak flows less than the bankfull event at all potential spawning sites for salmon in gravel-bedded reaches of: 1) mainstem Napa River; and 2) alluvial reaches of tributaries where streambed slope is between 0.001 and 0.02. Potential spawning sites can be identified based on the following: 1) dominant substrate size in the streambed surface layer is between 8 and 128 mm; 2) minimum surface area of gravel deposit is 0.2 square meters in tributaries and 1.0 square meter in mainstem Napa River; or 3) located within mainstem Napa River at a riffle head, pool tail, and/or pool margin or in tributary reaches where streambed slope < 0.03, or in tributary reaches where streambed slope > 0.03 in pool tails, backwater pools, and/or in gravel deposits associated with flow obstructions (e.g., woody debris, boulders, banks, etc.).

### 7.8.4.3 Sources

Field inventories conducted throughout the watershed provide credible estimates of the rates and sizes of sediment delivered to Napa River watershed channels between 1994 and 2004. Based on this work, and application of channel and reservoir mapping, the Water Board concludes that:

- More than half of fine sediment delivered to Napa River during the 1994–2004 period is associated with land use activities, including roads, human-caused channel incision, vineyards, intensive historical livestock grazing, and urban stormwater runoff.
- In addition to its prominence in the sediment budget, channel incision is the primary agent for isolation of the channel from its flood plain and a reduction in the quantity and frequency of spawning and rearing habitat for salmon and steelhead in Napa River and the lower reaches of its tributaries.
- Channel sediment loads vary greatly depending upon nature of underlying bedrock or sediment deposits, land use activities, and the location of dams.
- Thirty percent of the watershed drains into reservoirs constructed in tributary channels. These reservoirs capture all of the gravel and sand, and most of the finer sediment input to upstream channels. Nonetheless, anthropogenic activities, downstream of dams, are contributing enough sediment such that the fine sediment load is substantially elevated in the Napa River downstream of the reservoirs.

Mean annual sediment delivery rate to channels is estimated to have been 272,000 metric tons per year during the period from 1994 to 2004, which when considered in relation to the land area draining into the Napa River at Soda Creek (e.g., 584 km2), equals 466 metric tons per km2 per year (Table 7.8.4-2). The natural background rate of sediment delivery during this period, absent dams and human-caused erosion is estimated to have been 252 metric tons per km2 per year, which is calculated from Table 7.8.4-2 as follows:

48,000 metric tons/year–sediment deposited in tributary reservoirs

7,000 metric tons/year–sediment discharged through dams on tributaries

92,000 metric tons/year–input to channels downstream of reservoirs

147,000 metric tons/year

147,000 metric tons/584 $km^2$–land area draining to Napa R. at Soda Creek

=252 metric tons/$km^2$/year

Therefore total sediment load in the Napa River at Soda Creek is estimated to have been 185 percent of natural background (e.g., 466/252 = 185%) during 1994-2004. Table 7.8.4-2 breaks down the sediment sources to the Napa River, with annual average rate calculated at Soda Creek over the 10-year study period.

**Table 7.8.4-2. Mean Annual Sediment Delivery to Napa River at Soda Creek (1994-2004)**

| Source | Estimated Mean Annual Delivery Rate (metric tons/yr) |
|---|---|
| **Land areas upstream of dams** (fine sediment discharged from reservoirs) | |
| ▪ Natural Processes | 7,000 |
| ▪ Human Actions | 11,000 |
| **Land areas downstream of dams** | |
| ▪ Natural Processes: | 92,000 |
| ▪ Human Actions: | |
| o Channel incision and associated bank erosion | 37,000 |
| o Road-related sediment delivery (all processes) | 55,000 |
| o Surface erosion associated with vineyards and/or livestock grazing | 37,000 |
| o Gullies and shallow landslides associated with vineyards, and/or intensive historical grazing | 30,000 |
| o Urban stormwater runoff and wastewater discharges | 2,500 |
| TOTAL | 272,000 |
| Notes: Drainage area for Napa River at Soda Creek = 584 $km^2$. Estimates above do not include sediment deposited and retained in tributary reservoirs, which includes all gravel and sand, and most of the finer sediment input to channels located upstream of the reservoirs. Approximately 104,000 metric tons per year of sediment are deposited in tributary reservoirs, 48,000 metric tons per year of which is derived from natural processes (Above estimates are rounded to the nearest thousand). | |

### 7.8.4.4 Total Maximum Daily Load and Allocations

The Napa River sediment TMDL is established at 185,000 metric tons per year, which is approximately 125 percent of natural background load (based on sediment load estimates from the 1994-2004 period) calculated at Soda Creek. Natural background load depends upon natural processes, and varies significantly. Therefore, the TMDL and allocations are expressed both in terms of sediment mass and percent of natural background. The percentage based TMDL, 125% of natural background, applies throughout the watershed. In order to achieve the TMDL, controllable sediment delivery resulting from human actions needs to be reduced by approximately 50 percent from current proportion of the total load (Tables 7.8.4-3a and 7.8.4-3b). TMDL attainment will be evaluated at the confluence of Napa River with Soda Creek, which approximates the downstream boundary of freshwater habitat for salmon and steelhead. Attainment of the TMDL will be evaluated over a 5-to-10-year averaging period.

Because dams trap almost all upstream sediment inputs to channels, natural sediment input to channels downstream of dams equals only 62 percent of the total natural background load (e.g., amount that would have been input to Napa River absent dams and human caused erosion). Almost 50 percent of the TMDL can be allocated to human-caused sources. The TMDL equal to 125 percent of natural background load, can be achieved if human-related sources are reduced to the level of the allocations shown in Tables 7.8.4-3a and 7.8.4-3b).

**Table 7.8.4-3a. Load Allocations**

| Source category | Load during 1994-2004 | | Estimated reductions needed (percentage) | Load allocations | |
|---|---|---|---|---|---|
| | Metric tons/year | Percentage of Natural Background | | Metric tons/year | Percentage of Natural Background |
| **Land areas upstream of dams** | | | | | |
| ▪ Natural processes | 7,000 | 4.8 | 0 | 7,000 | 4.8 |
| ▪ Human actions | 11,000 | 7.5 | 51 | 5,000 | 3.6 |
| **Land areas downstream of dams** | | | | | |
| ▪ Natural processes | 92,000 | 63 | 0 | 92,000 | 63 |
| ▪ Human actions: | | | | | |
| o Channel incision and associated bank erosion | 37,000 | 25 | 51 | 18,000 | 12 |
| o Roads | 55,000 | 38 | 51 | 27,000 | 18 |
| o Surface erosion associated with vineyards and grazing | 37,000 | 25 | 51 | 18,000 | 12 |
| o Gullies and shallow landslides associated with vineyards, and/or intensive historical grazing | 30,000 | 20 | 51 | 15,000 | 10 |
| **TOTAL** | 269,000 | | | 182,000 | 123 |
| Note: Above estimates for loads, percent reductions, and allocations are rounded to two significant figures | | | | | |

**Table 7.8.4-3b. Wasteload Allocations for Urban Runoff and Wastewater Discharges**

| Point Source Category | Current Load | | Reductions needed (percentage) | Wasteload Allocations | |
|---|---|---|---|---|---|
| | Metric tons/year | Percentage of Natural Background | | Metric tons/year | Percent of Natural Background |
| Construction Stormwater-NPDES Permit No. CAS000002 | 500 | 0.3 | 0 | 500 | 0.3 |
| Municipal Stormwater NPDES Permit No. CAS000004 | 800 | 0.5 | 0 | 800 | 0.5 |
| Industrial Stormwater NPDES Permit No. CAS000001 | 500 | 0.3 | 0 | 500 | 0.3 |
| Caltrans Stormwater-NPDES Permit No. CAS000003 | 600 | 0.4 | 0 | 600 | 0.4 |
| **Wastewater Treatment Plant Discharges[a]** | | | | | |
| City of St. Helena NPDES Permit No. CA0038016 | 30 | <0.1 | 0 | 30 | <0.1 |
| Town of Yountville/CA Veteran's Home NPDES Permit No. CA0038121 | 30 | <0.1 | 0 | 30 | <0.1 |
| City of Calistoga NPDES Permit No. CA0037966 | 40 | <0.1 | 0 | 40 | <0.1 |
| **TOTAL** | **2500** | **2** | | **2500** | **2** |

a. For wastewater treatment plant discharges, compliance with existing permit effluent limit of 30 mg/L of TSS is consistent with these wasteload allocations

Note: Above estimates for loads, percent reductions, and allocations are rounded to two significant figures

### 7.8.4.5 Implementation Plan

The actions described below, including the processes by which sediment and runoff control practices are proposed and implemented, are necessary to achieve TMDL targets and allocations and habitat enhancement goals. In addition, actions specified in this plan are expected to enhance steelhead run size and facilitate establishment of a self-sustaining Chinook salmon run.

#### *Regulatory Tools*

The only point sources of sediment identified in Tables 7.8.4-2 and 7.8.4-3b are those associated with urban stormwater runoff (e.g., municipal stormwater, runoff from State highways, and industrial and construction discharges) and wastewater treatment plants, which are regulated by NPDES permits. Table 7.8.4-4 shows implementation measures required of these sources.

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires regulation of nonpoint source discharges using the Water Board's administrative permitting authorities, including waste discharge requirements (WDRs), waiver of WDRs, Basin Plan Discharge Prohibitions, or some combination of these. Consistent with this policy, Tables 7.8.4-4a – 4d specify actions and performance standards by nonpoint source category, as needed to achieve TMDL sediment targets and allocations in Napa River watershed. The Water Board will consider adopting conditions for waiving WDRs that apply to the nonpoint sources (vineyards, grazing, roads, etc.) listed in Tables 7.8.4-4a – 4d, address all pollutants of concern, protect all beneficial uses, and balance the agricultural, environmental, recreational, and residential needs of the watershed.

**Table 7.8.4-4 TMDL Implementation Measures for Sediment Discharges Associated with Urban Stormwater Runoff and Wastewater Discharges**

| Source Category | Actions | Implementing Parties |
|---|---|---|
| Urban stormwater runoff and wastewater discharges | Comply with applicable NPDES permits | Napa County, City of Napa, Town of Yountville, City of St. Helena, City of Calistoga, City of American Canyon, State of California, Department of Transportation, California Veterans' Home, owners or operators of industrial facilities and construction projects > 1 acre |

Problems associated with channel incision, related rapid bank erosion, and loss of essential habitat features, reflect and integrate multiple historical and ongoing disturbances, some of which are local and direct, and others that are indirect and distal. Effectively addressing these issues will require cooperative and coordinated actions by multiple landowners, working with public agencies, over significant distances along the river. The most effective means of controlling channel incision and reducing related fine sediment delivery to the river is a channel restoration program that re-establishes width-to-depth ratios and sinuosity values conducive to formation of alternate bars and a modest flood plain. The Water Board will work with stakeholders along the Napa River, through local stewardship groups, to implement such channel restoration/habitat enhancement projects. Tables 7.8.4-5a to 7.8.4-5d (Recommended Measures to Protect or Enhance Habitat), specify actions to address adverse impacts of channel incision on salmon habitat quantity and quality, and to accomplish habitat enhancement goals for flow, temperature, and fish passage for steelhead and salmon.

Individual landowners or coalitions may work with "third parties" to develop and implement sediment pollutant control programs. With regard to achievement of actions to protect or enhance baseflow, fish passage, habitat complexity, and stream temperature, the effectiveness of the recommended actions specified in Tables 7.8.4-5a through 7.8.4-5d, will be evaluated as part of the adaptive implementation program.

### *Minimization of Potential Impacts to Sensitive Natural Communities*

In order to minimize potential impacts to sensitive natural communities that may not be fully protected through County regulations, Basin Plan amendment compliance actions will not be required or approved beyond the development footprint authorized by local land-use authorities in any of the following sensitive natural communities within the Napa River watershed:

- Redwood forest
- Ponderosa Pine alliance
- Tanbark Oak alliance
- Oregon white oak woodland
- Mixed serpentine chaparral
- Wet meadow grasses NFD super alliance.

Locations for these sensitive natural communities and/or land-cover types in the Napa River watershed can be determined by review of the Vegetation Map of Napa County, California (Thorne et al., 2004; http://cain.ice.ucdavis.edu/regional/napavegmap/), the Baseline Data Report (Chapter 4, Jones & Stokes, 2005) and/or the California Natural Diversity Database (http://www.dfg.ca.gov/biogeodata/cnddb/).

## Table 7.8.4-4a Required and Trackable TMDL Implementation Measures for Sediment Discharges Associated with Vineyards[1]

| Land Use Category | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| **Vineyards** | **Surface Erosion associated with vineyards**: Control excessive rates of sediment delivery to channels resulting from vineyard surface erosion[5]; **and**<br><br>**Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period; **and**<br><br>**Gullies and/or shallow landslides:** Accelerate natural recovery and prevent human-caused increases in sediment delivery from unstable areas; **and**<br><br>**Effectively attenuate significant increases in storm runoff**, so that the runoff from vineyards shall not cause or contribute to downstream increases in rates of bank or bed erosion. | Submit a Report of Waste Discharge[2] (RoWD) to the Water Board that provides, at a minimum, the following: a description of the vineyard; identification of site-specific erosion control measures needed to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures.<br><br>Or<br><br>Develop and begin implementing a farm plan certified under Fish Friendly Farming Environmental Certification Program or other farm plan certification program, approved as part of a waiver of WDRs. All dischargers applying for coverage under a waiver of WDRs also will be required to file a notice of intent (NOI) for coverage, and to comply with all conditions of the WDR waiver.[4] | Vineyard owner and/or operator | October 2014 |
| | | Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs. | Vineyard owner and/or operator | As specified in applicable WDRs or waiver of WDRs |
| | | Report progress on implementation of site specific erosion control measures.[3] | Vineyard owner and/or operator | As specified in applicable WDRs or waiver of WDRs |

[1]To achieve TMDL allocations and consistent with the *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (State Board, 2004).
[2]Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[3]Reports may be submitted individually or jointly through a recognized third party.
[4]Additional conditions may be required under a General WDR and/or waiver program consistent with *the Policy for Implementation and Enforcement of the Non-Point Source Control Program* (State Board 2004), and/or as needed to avoid potentially significant environmental impacts.
[5]Napa County Conservation Regulations (County Code, Chapter 18.108) are effective in the control of excessive rates of sediment delivery resulting from vineyard surface erosion. Rates of sediment delivery are "excessive" when the predicted soil loss rate exceeds the tolerable soil loss rate (T), calculations as described in "The Universal Soil Loss Equation, Special Applications for Napa County, California" (USDA, 1994).

**Table 7.8.4-4b Required TMDL Implementation Measures for Sediment Discharges Associated with Grazing[1]**

| Land Use Category | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| **Grazing** | **Surface erosion associated with livestock grazing**: Attain or exceed minimal residual dry matter values consistent with University of California Division of Agriculture and Natural Resources Guidelines[4]; **and**<br><br>**Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period; **and**<br><br>**Gullies and/or shallow landslides: Gullies and/or shallow landslides:** Accelerate natural recovery and prevent human-caused increases in sediment delivery from unstable areas. | Submit a Report of Waste Discharge[2] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures. | Landowner and/or ranch operator | October 2014 |
| | | Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs. | Landowner and/or ranch operator | As specified in applicable WDRs or waiver of WDRs |
| | | Report progress on implementation of site specific erosion control measures.[3] | Landowner and/or ranch operator | As specified in applicable WDRs or waiver of WDRs |

[1]To achieve TMDL allocations and consistent with the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (State Board, 2004).
[2]Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[3]These reports may be prepared individually or jointly or through a recognized third party.
[4] University of California 2002, California guidelines for residual dry matter (RDM) management on coastal and foothill annual rangelands. Rangeland Monitoring Series Publication 8092.

**Table 7.8.4-4c Required TMDL Implementation Measures for Sediment Discharges Associated with Rural Lands[1, 3]**

| Land Use Category | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| **Rural Lands** | **Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period; **and**<br><br>**Gullies and/or shallow landslides:** Accelerate natural recovery and prevent human-caused increases in sediment delivery from unstable areas. | Submit a Report of Waste Discharge[2] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures. | Landowners | October 2014 |
| | | Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. | Landowners | As specified in applicable WDRs or waiver of WDRs |
| | | Report progress on implementation of-site specific erosion control measures.[4] | Landowners | As specified in applicable WDRs or waiver of WDRs |

[1]To achieve TMDL allocations and consistent with the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (State Board, 2004).
[2]Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[3]Rural lands, per Napa County definition include: non-farmed and non-grazing portions of parcels >10-ac that contain one or more residences and/or a winery; vacant residential parcels >10-acres; and/or portions of 10-acre or larger parcels with secondary vineyard, orchard, and/or grazing
[4]These reports may be prepared individually or jointly or through a recognized third party.

**Table 7.8.4-4d Required TMDL Implementation Measures for Sediment Discharges associated with Parks and Open Space, and/or Municipal Public Works[1]**

| Landowner Type | Performance Standards | Actions | Implementing Parties | Completion Dates |
|---|---|---|---|---|
| *PARKS AND OPEN SPACE AND PUBLIC WORKS* | **Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period[2]; **and**<br><br>**Gullies and/or shallow landslides:** Accelerate natural recovery and prevent human-caused increases in sediment delivery from unstable areas. | Submit a Report of Waste Discharge[2] to Water Board that provides, at a minimum, the following: description of the road network and/or segments; identification of erosion and sediment control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified control measures. For paved roads, erosion and sediment control actions could primarily focus on road crossings to meet the performance standard.<br><br>Adopt and implement best management practices for maintenance of unimproved (dirt/gravel) roads, and conduct a survey of stream-crossings associated with paved public roadways, and develop a prioritized implementation plan for repair and/or replacement of high priority crossings/culverts to reduce road-related erosion and protect stream-riparian habitat conditions. | Napa County Stormwater Management Program<br><br>State of California, Department of Parks and Recreation<br><br>State of California, Department of Transportation | October 2014 |
| | | Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. | Landowners | As specified in applicable WDRs or waiver of WDRs, and/or the SWMP |
| | | Report progress on development and implementation of best management practices to control road-related erosion.[3] | Landowners | As specified in applicable WDRs or waiver of WDRs, and/or SWMP |

[1]To achieve TMDL allocations and consistent with the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (State Board, 2004).
[2]Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[3]These reports may be prepared individually or jointly or through a recognized third party.

**Table 7.8.4-5a Recommended Actions to Reduce Sediment Load and Enhance Habitat Complexity in Napa River and its Tributaries**

| Stressor | Management Objective(s) | Actions | Implementing Parties | Completion Dates and Notes |
|---|---|---|---|---|
| **Habitat degradation** as a result of mainstem Napa River and lower reaches of its larger tributaries incising. | Reduce rates of sediment delivery (associated with incision and accelerated bank erosion) to channels, by 50 percent.<br><br>Enhance channel habitat as needed to support self-sustaining run of Chinook salmon and enhance the overall health of the native fish community. | Develop and implement plans to enhance stream-riparian habitat conditions, and reduce fine sediment supply in mainstem Napa River and lower tributary reaches. | Landowners and/or designated agents, and reach-based stewardships | Comply with conditions of Clean Water Act Section 401 certifications<br>(implementation of Rutherford Project completed by fall 2017, other projects by 2027) |
| **Habitat degradation** as a result of reduction in large woody debris in stream channels. | Enhance quality of rearing habitat for juvenile salmonids. | Develop and implement performance standards for protection of ecologically significant large woody debris in stream channels. | Napa County Stormwater Management Program and State Department of Parks and Recreation | Performance standards will be developed by Fall 2010, and implemented by Fall 2011 |

**Table 7.8.4-5b Recommended actions to protect or enhance baseflow**

| Stressor | Management Objective | Action(s) | Implementing Parties | Schedule/Notes |
|---|---|---|---|---|
| Low flows during dry season | Maintain suitable conditions for juvenile rearing, and smolt migration to Napa River estuary. | Local, State, and federal agencies to participate in a cooperative partnership to develop a plan for joint resolution of water supply reliability and fisheries conservation concerns. | Local municipalities working with Water Board, State Water Board (Division of Water Rights), National Oceanic and Atmospheric Administration Fisheries Service (NOAA), and California Department Fish and Game (DFG) | Adopt plan by Fall 2012 |
| | | Install and maintain dial-up water-level gage programs and implement public education program in 10 key tributaries for steelhead. | Local public agencies | Accomplish by Spring 2012 |
| | | Develop water-level guidelines to support juvenile salmonid rearing and migration. | Local public agencies | Adopt guidelines by Spring 2012 |
| | | Conduct water rights compliance survey to protect fish and water rights. | State Water Board(Division of Water Rights) | Schedule per consultation with National Oceanic and Atmospheric Administration Fisheries Service (NOAA), California Department Fish and Game (DFG), and Water Board |

**Table 7.8.4-5c Recommended Actions to Restore to Fish Passage**

| Stressor | Management Objective(s) | Action(s) | Implementing Parties | Schedule/Notes |
|---|---|---|---|---|
| Structures in channels that block or impede fish migration (note: flow-related barriers are addressed above) | No significant structural impediments to salmonid migration in mainstem or in 10 key tributaries for steelhead (including but not limited to the following): Dry, Milliken, Redwood, Sulphur, and York.<br><br>Designation of remaining tributaries will be determined in consultation with Napa County RCD, CDFG, NOAA Fisheries, and USEPA. | Enhance conditions for adult and juvenile salmon and juvenile steelhead passage at Zinfandel Lane. | Local public agencies and landowners | Project completed by Fall 2012 |
| | | Restore passage for adult and juvenile steelhead to-and-from York Creek upstream of Upper Dam. | City of St. Helena | Schedule to be determined based on consultation with NOAA, and DFG |
| | | Identify and develop a plan-to remedy all significant structural impediments to salmonid migration in ten key steelhead tributaries (including York). | Local public agencies and landowners | Complete comprehensive fish passage surveys in 10 key tributaries by Fall 2012. Schedule for barrier remediation to be determined based on consultation with NOAA and DFG |

**Table 7.8.4-5d Recommended Actions to Protect and/or Enhance Stream Temperature**

| Stressor | Management Objective(s) | Action(s) | Implementing Parties | Schedule/Notes |
|---|---|---|---|---|
| Stressful summer water temperatures in tributaries | Protect and/or enhance baseflow. | As described in Table 7.8.4-5b | As indicated in Table 7.8.4-5b | As described in Table 7.8.4-5b |
| | Enhance amount of ecologically significant large woody debris in channels. | As described in Table 7.8.4-5a | As indicated in Table 7.8.4-5a | As described in Table 7.8.4-5a |
| | Enhance potential shade along riparian corridors. | Implement management actions to accelerate recovery of native riparian tree species. | As indicated in Tables 7.8.4-4a to 4d. | As described in Tables 7.8.4-4a to 4d. |

### *Agricultural Water Quality Control Program Costs*

Implementation measures for grazing lands and vineyards constitute an agricultural water quality control program and therefore, consistent with California Water Code requirements (Section 13141), the cost of this program is estimated herein. This cost estimate includes the cost of implementing all actions to reduce sediment discharges and enhance habitat complexity as specified in the implementation plan, and is based on costs associated with technical assistance and evaluation, project design, and implementation of actions needed to achieve the TMDL. In estimating costs, the Water Board has assumed that owners of agricultural businesses (e.g., grape growers and ranchers), within the unincorporated area, own 75 percent of total land area on hillside parcels, and 95 percent of the land along Napa River and lower reaches of its tributaries. Based on these assumptions, we estimate total cost for program implementation for agricultural sources could be $1.9-to-3.4 million per year throughout the 20-year implementation period. More than two-thirds of these potential costs are associated with reducing sediment discharges and enhancing habitat conditions (to address channel incision) in Napa River. Considering potential benefits to the public in terms of ecosystem functions, aesthetics, recreation, and water quality, it is anticipated that at least 75 percent of the cost of these actions will be paid for with public funds. Therefore, the total cost to agricultural businesses associated with efforts to reduce sediment supply and enhance habitat in Napa River is $800,000 to $1.7 million per year.

### 7.8.4.5 Evaluation and Monitoring

Three types of monitoring are specified to assess progress toward achievement of numeric targets and load allocations for sediment:

1) Implementation monitoring to document that required sediment control and habitat enhancement actions are implemented

2) Upslope effectiveness monitoring to evaluate effectiveness of sediment control actions in reducing rates of sediment delivery to channels

3) In-channel effectiveness monitoring (e.g., spawning gravel permeability and redd scour) to evaluate channel response to management actions and natural processes

Implementation monitoring will be conducted by landowners or designated agents. The purpose of this type of monitoring is to document that sediment control and/or habitat enhancement actions specified herein actually occur.

The Water Board will conduct upslope effectiveness monitoring to evaluate sediment delivery to channels from land use activities and natural processes. The first update will occur on or before the fall of 2017, when sediment delivery associated with land use activities should be reduced by 25 percent or more. A subsequent update may occur, assuming the numeric targets for sediment are not already achieved, on or before the fall of 2022, when sediment supply associated with land use activities should be reduced by 37 percent or more.

In-channel effectiveness monitoring should be conducted by local government agencies with scientific expertise and demonstrated capability in working effectively with private property owners (to gain permissions for access), as needed to develop a representative sample of stream habitat conditions, in relation to sediment supply and transport within the watershed. In addition, the Water Board will conduct in-channel effectiveness monitoring as part of the Surface Water Ambient Monitoring Program. In-channel effectiveness monitoring needs to include measurements of redd scour and spawning gravel permeability to evaluate attainment of water quality objectives for sediment, settleable material, and population and community ecology. To establish a high level of statistical confidence in estimated values,

spawning gravel permeability will need to be measured at 150 or more potential spawning sites located in ten-or-more tributaries, and 50 or more potential spawning sites in the mainstem of the Napa River. Redd scour will need to be measured in the mainstem Napa River at approximately 30 or more potential spawning sites, with 4 or more scour measurements per spawning site. Desired frequency for measurement of permeability and redd scour is once every two to three years. At a minimum, repeat surveys will be conducted once every five years.

In addition to the above described monitoring program to evaluate attainment of numeric targets for sediment, the Water Board will monitor turbidity and residual pool volume. Monitoring will be conducted in a subset of the channel reaches where spawning gravel permeability and/or redd scour are measured. Stream temperature and baseflow persistence will be monitored as part of the Surface Water Ambient Monitoring Program.

#### 7.8.4.6 Adaptive Implementation

In concert with the monitoring program, described above, the Napa River Sediment Reduction and Habitat Enhancement Plan and TMDL will be regularly updated. Results of in-progress or anticipated studies that enhance understanding of the population status of steelhead trout and Chinook salmon in Napa River watershed, and/or factors controlling those populations, may also trigger changes to the plan and TMDL. At a minimum, data in response to the following questions will be considered to guide research and monitoring efforts and focus each subsequent update of the TMDL.

***Key Questions to be considered in the course of Adaptive Implementation:***

*1. What is the population status of steelhead and salmon in the watershed?* An improved understanding of the status of steelhead and salmon populations in the Napa River watershed is essential for guiding adaptive updates to the management actions recognized in this plan.

Two types of monitoring data may be needed to evaluate the population status of steelhead in the Napa River watershed: 1) "smolt" production and sizes, and 2) adult spawning run-size. Smolt refers to the life stage when juvenile salmon and trout migrate from freshwater to the ocean. Estimates of smolt production and sizes, and inter-annual variation in these parameters, can provide a strong basis for evaluating population status of ocean migrating species of trout and salmon, and influence of freshwater rearing habitat conditions on number of adults that successfully return to spawn. At least five years of monitoring (trapping) of ocean migrating smolts are needed to evaluate current steelhead population status. In addition to smolt trapping, three or more years of monitoring data are needed to estimate the number of adult steelhead returning to spawn. This information, when combined with estimates of smolt production and sizes, would provide a basis for assessing the influences of ocean and freshwater habitat on steelhead run-size, for validating smolt production estimates and predictions regarding ocean survival, and ultimately for evaluating the status of the steelhead population in the watershed.

A similar monitoring program is needed to evaluate the population status of the Chinook salmon in the Napa River watershed. Such a program might include the following elements: 1) adult spawning run-size and genetic structure; 2) smolt production; and 3) egg survival from spawning to emergence (emergence trapping). During the past two years, the Napa County Resource Conservation District has conducted surveys to estimate the number of adult salmon returning to spawn. These surveys should continue for at least three more years, both to estimate the number of spawners and inter-annual variations, and to collect fin clips, as needed to evaluate origins of the spawning adults (e.g., returning adults or strays from hatcheries or other streams). The hypothesis that Chinook salmon experience very high rates of mortality during all freshwater life stages in the Napa River watershed, could be confirmed or rejected through

direct monitoring of egg survival to emergence (emergence trapping), fry survival and growth, and smolt trapping.

*2. What are expected benefits of various actions to enhance habitat for steelhead and salmon?* For steelhead, the results of in-progress studies of juvenile growth and survival will enhance understanding of the significance of dry season base flow and temperature as potential limiters on steelhead run-size. Other information needed to refine the understanding of primary constraints on steelhead population size includes the following: a) comprehensive fish passage evaluations in all key tributaries that provide potential habitat for steelhead; b) dry season water-level monitoring in the same tributaries conducted over two-or-more consecutive years; and c) field surveys to evaluate winter rearing habitat quantity and quality. Given the above sources of information, it may be possible to accurately predict relative increases (high, medium, low) in smolt production associated with various management actions (e.g., baseflow enhancement, fish passage enhancement, reduction in fine sediment supply, etc.) in various locations throughout the watershed.

Key information sources needed to refine understanding of primary controls on Chinook salmon population size include egg survival-to-emergence and controls (e.g., redd scour, gravel permeability), fry survival and growth, and number and sizes of juvenile salmon migrating to the ocean. To this end, pre-and-post project monitoring associated with the proposed Rutherford channel enhancement project may provide an opportunity to determine the amount and types of habitat enhancement actions needed to support a self-sustaining run of Chinook salmon, and to enhance the overall health of the native fish community within the watershed. Key parameters that might be monitored to evaluate fisheries' response to channel enhancement could include: a) changes in quantity, quality, and frequency of key habitat types (e.g., riffles, pools, side channels, gravel bars); b) spawning gravel permeability and scour; c) base flow persistence and temperature; and d) relative abundance of native and introduced fish species.

## 7.9 WATER QUALITY ATTAINMENT STRATEGIES AND TMDLS FOR THE SUISUN BASIN (SEE FIGURE 2-9)

*This section intentionally left blank.*