CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

RESOLUTION R2-2005-0046

AMENDING THE WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY REGION TO ESTABLISH A TOTAL MAXIMUM DAILY LOAD AND IMPLEMENTATION PLAN FOR PATHOGENS IN TOMALES BAY WATERSHED

WHEREAS an updated Water Quality Control Plan for the San Francisco Bay Region (Basin Plan) was adopted by the San Francisco Bay Regional Water Quality Control Board (Water Board) on June 21, 1995, approved by the State Water Resources Control Board on July 20, 1995, and approved by the Office of Administrative Law (OAL) on November 13, 1995, and has since been revised; and

WHEREAS the Basin Plan may be amended in accordance with California Water Code § 13240, et seq.; and

WHEREAS Tomales Bay and some of its tributaries have been identified under federal Clean Water Act § 303(d) as impaired waterbodies due to pathogens; and

WHEREAS Tomales Bay and its tributaries are not meeting the Basin Plan's numeric bacteriological water quality objectives; and

WHEREAS the Water Board finds that elevated water quality coliform bacteria levels in Tomales Bay and it tributary waters indicate the presence of human and animal waste and associated pathogens. The discharge of human and animal waste poses a threat to humans who recreate in Tomales Bay and tributary waters and consume Bay shellfish; and

WHEREAS under Clean Water Act § 303(d) the Water Board is required and authorized to establish the total maximum daily load (TMDL) for those pollutants identified as causing impairment of waters on the § 303(d) list. Additionally, the Water Board is authorized to develop a implementation program for achieving water quality objectives, such as the numeric bacteriological water quality objectives; and

WHEREAS a Basin Plan Amendment has been prepared in accordance with California Water Code § 13240 that will establish the TMDL and Implementation Plan to reduce pathogens related risks to humans and restore and protect water quality beneficial uses; and

WHEREAS 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 the TMDL and implementation plan do not constitute a violation of discharge prohibitions; and

WHEREAS the Basin Plan Amendment, including specifications on its physical placement in the Basin Plan, is set forth in Exhibit A hereto; and

WHEREAS regulatory elements of the Basin Plan Amendment were reviewed by external peer reviewer Dr. Patricia Holden, University of California, Santa Barbara. The Water Board staff revised the proposed Basin Plan amendment in response to the comments provided by the reviewer, or provided a written response which explained the basis for not incorporating her comments; and

WHEREAS a draft Basin Plan Amendment, Staff Report, and Environmental Checklist were prepared and distributed for public review and comment on March 4, 2005 and again on July 8, 2005, in accordance with applicable state and federal laws and regulations; and

WHEREAS the Water Board held public hearings on April 20, 2005, June 15, 2005, and on September 21, 2005, to consider the Basin Plan Amendment and supporting documents, and the changes made thereto in response to public comments. A Notice of Public Hearing was given to interested persons and was published in accordance with applicable state and federal laws and regulations; and

WHEREAS the process of basin planning has been certified by the Secretary for Resources as exempt from the requirements of the California Environmental Quality Act (CEQA) (Public Resources Code § 21000 et seq.) to prepare an Environmental Impact Report or Negative Declaration; and

WHEREAS the Water Board has duly considered the Environmental Checklist, Staff Report, and supporting documentation with respect to environmental impacts and finds that the Basin Plan Amendment will not have a significant impact on the environment. The Basin Plan Amendment will result in no potential for adverse effect on wildlife. The Water Board has also considered the environmental analysis contained in the Staff Report of the reasonably foreseeable methods of compliance with the Basin Plan Amendment, including economics; and

WHEREAS the Water Board has carefully considered all comments and testimony received, including responses thereto, on the Basin Plan Amendment, as well as all of the evidence in the administrative record; and

WHEREAS the Basin Plan Amendment must be submitted for review and approval by the State Water Resources Control Board, OAL, and the United States Environmental Protection Agency (USEPA). Once approved by the State Water Resources Control Board, the amendment will be submitted to OAL and USEPA. The Basin Plan Amendment will become effective upon approval by OAL and USEPA; and

WHEREAS the regulatory components of the Basin Plan Amendment meet the "Necessity" standard of the Administrative Act, Government Code § 11353, Subdivision (b).

NOW, THEREFORE BE IT RESOLVED that the Water Board adopts the Basin Plan Amendment, as set forth in Exhibit A hereto, that establishes the TMDL and Implementation Plan for pathogens in Tomales Bay Watershed; and

BE IT FURTHER RESOLVED that the Executive Officer is directed to forward copies of the Basin Plan Amendment to the State Water Resources Control Board in accordance with the requirement of California Water Code § 13245; and

BE IT FURTHER RESOLVED that the Water Board requests that the State Water Resources Control Board approve the Basin Plan Amendment in accordance with the requirements of California Water Code § 13245 and § 13246 and forward it to the OAL and USEPA for approval; and

BE IT FURTHER RESOLVED that if, during the approval process, the State Water Resources Control Board or OAL determines that minor, non-substantive corrections to the language of the amendment and supporting documentation are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Water Board of any such changes; and

BE IT FURTHER RESOLVED that since the Basin Plan Amendment will involve no potential for adverse effect, either individually or cumulatively, on wildlife, the Executive Officer is directed to sign a Certificate of Fee Exemption for a "De Minimis" Impact Finding and to submit the exemption in lieu of payment of the Department of Fish and Game CEQA filing fee.

I, Bruce H. Wolfe, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on September 21, 2005.

Bruce H. Wolfe

BRUCE H. WOLFE
Executive Officer

Attachment

Exhibit A - Basin Plan Amendment to Establish a Total Maximum Daily Load and Implementation Plan for pathogens in Tomales Bay Watershed

Exhibit A

Proposed Basin Plan Amendment

Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL)

Proposed Basin Plan Amendment

California Regional Water Quality Control Board
San Francisco Bay Region
September 14, 2005

Proposed Basin Plan Amendment

The following text is to be inserted in Chapter 4, right after the introduction of a section entitled "Surface Water Protection and Management—Nonpoint Source Control."

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 the TMDL. 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.

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

Sources

If not properly managed, the following Tomales Bay Watershed source categories 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 not a significant source.

Numeric Targets

Table 4-20 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 coliform levels 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 4-20

Water Quality Targets[a] for Tomales Bay and Its Tributaries

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

Total Maximum Daily Load

Table 4-21 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 4-21
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] 90th Percentile < 43 [b]
Major Tributaries: Walker Creek Lagunitas Creek Olema Creek	Fecal coliform	Log mean <200 [a] 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.

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 4-22a presents density-based load allocations for Tomales Bay watershed pathogens source categories that implement tributary targets, and Table 4-22b 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 4-22a) and the applicable geographic-based allocations (Table 4-22b).

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.

Table 4-22a

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 4-22B

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.

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[1] and human waste discharge prohibitions (Prohibitions 5 and 15, Table 4-1).

This plan specifies required implementation measures (Table 4-23) for each of the source categories (Table 4-22). 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 4-23. 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.

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 4-24 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.

[1] State Water Resources Control Board. 2004. *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Prevention Control Program.*

TABLE 4-23
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
	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

[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.

Source Category	Action	Implementing Party	Completion Dates
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 Discharge[1] 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
	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

[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.

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TABLE 4-24 REGULATORY FRAMEWORK FOR DISCHARGES BY SOURCE CATEGORY	
Source Category	Regulatory Tool
On-site Sewage Disposal Systems (OSDS)	Waiver[a] of Waste Discharge Requirements Prohibition of Human Waste Discharge
Small Wastewater Treatment Facilities	Individual Waste Discharge Requirements 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 4-20) and load allocations (Table 4-22).

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 4-23. 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 4-25 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 4-25 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 **Weekly for five weeks during summer months**	Shellfish Growers
		Tributaries	
Fecal coliform **Stream Flow**	**Olema Creek (tributary to Lagunitas)**	**Weekly for five weeks beginning in January; Monthly March - December** **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 **Stream Flow**	**Lagunitas Creek**	**Same as above**	**Water Board, Salmon Protection and Watershed Network**
Fecal coliform **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?

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 widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should the TMDL be modified?
4. 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?
5. How does estuarine mixing and dilution of tributary waters vary by flow and season?
6. What is the relationship between precipitation, runoff, tributary loads, Bay coliform levels, and water quality exceedances and shellfish harvesting closures?
7. 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.

The following table will be added to the section at the end of Chapter 4 entitled "Continuing Planning," right after the table for the San Francisco Bay Mercury TMDL.

Water Board Resource Allocation

The items below have been identified in this review as specific areas for which Water Board planning resources should be allocated. The items are divided into categories and each item is followed by an estimate of the frequency at which the item will be reviewed. Resolution of these items may result in future Basin Plan amendments.

TOTAL MAXIMUM DAILY LOAD	FREQUENCY
Review the Tomales Bay Watershed Pathogens TMDL and evaluate new and relevant information from monitoring and scientific literature. Determine if modifications to the targets, allocations, or Implementation Plan are necessary.	Every five years