

Tomales Bay Watershed Water Quality Monitoring Plan

Program goal: Based on the information gathered through this monitoring program, the Council will work to identify water quality problems, to develop solutions to these problems, and to provide support to realize these solutions by working with partners and landowners in the watershed to improve and protect water quality.

I. Introduction

One of three goals established in the *Tomales Bay Watershed Stewardship Plan: A Framework For Action* (TBWC, 2003) is to ensure water quality in Tomales Bay and tributary streams sufficient to support natural resources and beneficial uses. The Tomales Bay Watershed Council identified several steps to achieve this goal including the initial action of developing a water quality monitoring plan for Tomales Bay and tributary streams that will allow us to develop long-term trends and identify source areas of concern for water quality management in the bay and its tributary streams.

The water quality monitoring program will be implemented by the Tomales Bay Watershed Council (Council) and its watershed partners. To meet the technical needs associated with defining the design, monitoring and data management aspects of this program, the Council has created a Water Quality Technical Advisory Committee (WQ TAC). The WQ TAC will continue to oversee the development and implementation of this program to ensure that data is collected in efficient, effective and appropriate ways in order to meet the program objectives.

Implementation of this program by the Council members will be in accordance to their respective statutory mandates, charters, and resource availability. To that end, and in order to foster commitment between partners and the spirit of collaboration and coordination that will be necessary, the Tomales Bay Watershed Council's Water Quality Committee will develop and ratify an agreement that describes the role of key local organizations, agencies and the Council in the development and implementation of this water quality monitoring program (see Section III, Task 4). Core partners and committee members include: California Department of Health Services; S.F. Bay Regional Water Quality Control Board; Marin County Environmental Health Services; U.C. Cooperative Extension; Salmon Protection and Watershed Network; Tomales Bay Agricultural Group; Tomales Bay Shellfish Technical Advisory Committee; Gulf of the Farallones National Marine Sanctuary; California Department of Fish and Game; Pacific Coast Science and Learning Center; Point Reyes National Seashore; Point Reyes National Seashore Association; California State Parks; Marin Municipal Water District; Inverness Public Utility District; ranchers; private landowners; shellfish growers; and local non-governmental organizations.

In this plan, water quality is defined as the chemical, physical, and biological characteristics of surface waters (or these characteristics within the water column). Water quality is often described with respect to a specific activity or a legally recognized "beneficial use" like water contact recreation, water supply for residential or agricultural purposes, mariculture, estuarine and wildlife habitats, wetlands, and others. In providing this definition, it is important to remember that the focus on surface water is a starting point with the intended hope that additional monitoring interests can be coordinated to expand the program in the future.

It is the desire of the Council to provide needed water quality information that will assist individuals, organizations and agencies that are responsible for and/or advocating for water quality protection and improvement within the Tomales Bay watershed. The information collected through this program will ultimately be used to increase our collective understanding about the benefits of specific efforts to improve water quality, and our ability to effectively and adaptively manage human impacts on water quality. Data sensitivity is a significant concern amongst both public agencies and various stakeholder groups, and the appropriate use of data, data limitations, etc. will be defined prior to the collection and/or dissemination of any program data. Private property rights will be recognized, statutory responsibilities will be maintained, and voluntary cooperation will be encouraged and protected with data sensitivity considerations.

II. Plan Objectives

This plan provides direction for a water quality monitoring program with an initial 10-year timeframe. It is envisioned, however, that the design will include monitoring parameters and a sampling regime that can be carried out indefinitely. The plan and program objectives are to:

- 1) Provide the watershed community with the required data and analysis to determine improving, constant, or declining trends in bay and tributary water quality;
- 2) Form and maintain a clearinghouse of water quality data and monitoring activities that facilitates effective and efficient use of limited resources;
- 3) Serve as source of information that will direct and promote actions to improve water quality; and
- 4) Provide an understanding of source areas and categories for constituents of concern in the bay and on a sub-watershed and/or tributary scale.

III. Questions to be addressed by this monitoring program:

- 1) What are the natural ranges and the storm, seasonal and annual variability in water quality parameters in the Bay and its tributaries?
- 2) At what locations do parameters fall outside the natural range and to what duration and extent?
- 3) What are the pollutant loadings from controllable and uncontrollable sources and in the watershed, and how do the Bay and tributaries relate in this regard?
- 4) What are the trends in the levels, fate and transport of pollutants in the watershed and the Bay, and how do the Bay and tributaries relate in these regards?
- 5) How effective are actions to reduce pollutant loads?

IV. Program Components

A. Long Term Trend Monitoring

Trend monitoring will generate water quality data of sufficient duration and representation to assess long-term shifts in water quality within Tomales Bay and its tributaries. There are numerous stakeholder efforts to manage sources of pollution for which feedback is needed to assess impacts and the effectiveness of restoration efforts. There are also regulatory and statutory needs for long-term trend water quality monitoring; these include the Pathogen TMDL (SFBRWQCB, 2002), and the Shellfish Lease monitoring by California Department of Health Services. Similarly, water quality monitoring results have created the basis for regulatory attention as illustrated by the County of Marin's health advisories at popular beach and swimming areas during 2002-03. This component of the monitoring program will give the watershed community the needed benchmarks to determine the success of management efforts and efficacy of regulatory policies.

1. Current efforts

There currently is no long-term comprehensive water quality monitoring at a watershed level. Numerous stakeholders and regulatory agencies have conducted comprehensive monitoring for short duration or for a limited focus on water quality parameters or geographic boundaries. Examples of this sort of water quality monitoring would be the National Park Service's continuing monitoring of Olema Creek, and the Shellfish Technical Advisory Committee's two-year pathogen study on Tomales Bay and its tributaries.

The recent but now terminated efforts of California Department of Fish and Game to monitor ammonia concentrations in Stemple Creek and Tomales Bay watersheds is a relevant example of the type of effort and intended use of the data to be generated for this program. In that case, what was initially perceived as a regulatory threat, quickly evolved into a management tool, and eventually became documentation that the management of pollution sources was having a beneficial impact on water quality.

2. Lead

The lead organization for long-term trend monitoring will be the Tomales Bay Watershed Council. To the greatest extent possible, the Council's efforts will be coordinated with the on-going monitoring programs of its partners.

3. Subtasks

i. Parameters

Water quality samples collected in Tomales Bay and tributary creeks will be analyzed for fecal coliform, transparency, turbidity, conductivity/salinity, pH, dissolved oxygen, ammonia, and temperature. In addition to these water quality parameters or "response variables", descriptive or "explanatory variables" will be collected. These will include tidal stage, discharge, cumulative precipitation, and possibly others. Analytical methods will follow accepted procedures such as those outlined in the Standard Methods for the Examination of Water and Wastewater (Clesceri et al., 1998). If there is sufficient funding, samples will also be analyzed

for additional parameters including suspended sediment concentration, E.coli and Enterococcus.

ii. Frequency and duration

Trend sampling shall be conducted on a weekly basis, and in the future the data will be evaluated to determine if seasonally based monitoring can be used to reduce the sampling frequency. This level of sample collection will afford documentation of seasonal and annual changes in water quality. It will also allow for the development of geometric means as required under the San Francisco Bay Basin Plan, which includes Tomales Bay (CRWQCB, 1995). It will not necessarily provide documentation of variability due to storm conditions. This program component will be carried for an initial ten years with the anticipation that it will be continued for an additional 20 years if not longer.

iii. Sampling locations

a. **Tomales Bay sampling locations:** Sampling locations will include four bay sites to represent the tidal conditions and separation of the Bay (Fisher et al., 1996). These sites will be re-evaluated to ensure that variability within the Bay, from east to west and north to south, is captured. These sites will be coordinated with the existing monitoring sites in the bay that are used by the Department of Health Services, Regional Water Quality Control Board, and others. The WQ TAC will consider the forthcoming UC Berkeley hydrodynamic model of the bay, and opportunities to identify long-term monitoring sites that may be useful boundary conditions for the model development and operation. [T. Hollibough sites to be considered here]

b. **Watershed sampling locations:** Nine permanent tributary sampling locations will be established and will include one per sub-watershed. These sites will be coordinated with the four existing gauging stations (mainstem Lagunitas, Olema, Walker, and San Geronimo); Chileno Creek; 1 site on the east shore of Tomales Bay (Millerton Creek); and 1 site on the west shore (1st or 2nd Valley Creek). East and west shore sites will include at least one reference stream (milepost 36.17 on the east shore of the Bay and another on the west to be determined) that flows through sub-watersheds with minimal human land use activities to represent the two dominant geologic formations that comprise the majority of the Tomales Bay watershed.

iv. Statistical Analysis

The data generated from this effort will have a high level of variability. The descriptive variables will be used to normalize concentration results or to calculate flux and load for a given parameter. These steps will allow for comparison of results across the different locations. Admittedly, the comparison of tributary and bay locations requires additional normalization because of the simultaneous influences of discharge and tides. These data will also be valuable as boundary conditions to calibrate and test the UC Berkeley Tomales Bay hydrodynamic model.

Analysis of trends will be conducted graphically and through time series analysis. Graphical analysis will include the representation of concentration, flux, and load values as a function of time. These graphics will provide anecdotal indications of

water quality trends including seasonal and annual fluctuations. Time series analysis for upward or downward trends in concentration, flux, and load will be conducted according to Helsel and Hirsch (1995) or other suitable and accepted methods (Hahn, ___; Hirsch et al., 1991; and Helsel, 1987). This will include nonparametric statistical methods including data transformation to account for lack of normal distribution in the data.

B. Source Area Monitoring

Source area monitoring efforts will be focused on identifying sources and quantities of water pollutants to Tomales Bay and its freshwater tributaries. While trend monitoring is dependant on long-term sampling at a suite of permanent sampling sites, source area monitoring is both flexible and responsive based on the data collected. The intent of source area monitoring will be to support and prioritize future watershed or sub-watershed water quality improvement efforts, and to document conditions in order to evaluate the effectiveness of past efforts to improve water quality on private and public lands.

Sampling sites will be determined based upon the results of previous sampling. Source area monitoring will be initially concentrated at the sub-watershed scale, and as needed in the Bay. Additional sampling will be conducted where sources are identified, while sampling will be curtailed in areas where conditions were of less concern. These monitoring activities will compliment the long-term monitoring program to document general trends within the watershed and the Bay. Differentiating source areas and land use issues would be valuable for the long-term management of water quality in the Bay and tributaries.

1. Current Efforts

Point Reyes National Seashore currently conducts a source area monitoring program within the boundaries of the Seashore. The intent is to document loading from the various park watersheds, in order to concentrate long-term management and restoration efforts into areas where the watershed will benefit the most. Through this program, the Seashore has identified source areas and management or structural practices intended to reduce pollutant loading to aquatic systems.

The Salmon Protection and Watershed Network (SPAWN) is initiating a water quality monitoring program that will document conditions and source areas within the San Geronimo watershed. Their efforts, funded through the State 319(h) grant program will investigate additional water quality parameters, and may be used to determine if other parameters should be investigated in the long-run.

The community of Marshall has recently conducted a voluntary septic monitoring program via a partnership between the East Shore Planning Group (ESPG) and the County of Marin. Based on the monitoring results, the ESGP and the County have subsequently developed substantial grant funds for septic improvements in Marshall. Currently, the community and an engineering team are exploring options for septic improvements, feasibility and cost benefits. These studies will allow Marshall and Marin County to collaborate further on

decisions regarding the most cost effective use of grants and homeowner finances for septic system improvements and local community septic management.

2. *Lead(s)*

The lead organization for the source area monitoring program would be the Tomales Bay Watershed Council. These efforts would be coordinated with ongoing monitoring efforts in the watershed including the Tomales Bay Agricultural Group, SPAWN, Point Reyes National Seashore, Regional Water Quality Control Board, and others.

3. *Subtasks*

i. Identify monitoring locations

The intent of this program is to conduct monitoring at publicly accessible locations, for the purpose of understanding pollutant loading to the bay from different geographic areas. Various organizations through multiple monitoring efforts have conducted water quality sampling at more than 50 locations within the Tomales Bay watershed. Initial sites for source area monitoring will be determined from the results of the 1995-96 and 2000-2001 Shellfish TAC sampling programs. After reviewing the existing data, priority areas will be identified for the initial source area monitoring efforts, and these sites will be grouped according to the primary watersheds (see list below in *iv. Statistical data analysis*). Site sampling will be conducted by sub-watershed to ensure that similar conditions are sampled within each sub-watershed, and that the results are comparable.

ii. Parameters

The monitoring program includes collection of field sampled parameters and laboratory analyzed parameters. The water quality parameters to be sampled will be coordinated with the long-term monitoring program. In the initial years of this study, the water quality monitoring constituents will include field collected parameters (e.g. temperature, DO, conductivity, pH, etc.) as well as analytical lab analysis (e.g. fecal coliform, ammonia, etc.). Additional parameters may be added as we learn more about the system and the issues in the Tomales Bay watershed.

The source area monitoring program will target winter and spring runoff events when nonpoint source pollution loading is most prevalent. This would include two to three storm events per winter season at all sites to capture nonpoint source loading information, and additional sampling upstream of sites that show high levels of loading. In addition, a summer sampling event will also be conducted to document seasonal differences in the parameters. Stream discharge should also be measured in conjunction with water quality sampling. In this manner, loading may be estimated for different watersheds and subwatersheds. Because discharge measurements are often time consuming, installation of staff plates and estimates of flow may be deemed appropriate.

iii. Site reconnaissance and documentation

Once sites are selected, they will be spatially documented using GPS, photographs, and a narrative description of site access. Field sampling protocols are well established and will vary based upon the actual equipment used in the monitoring effort. Laboratory analysis is standardized by analytical method, but program sampling protocols and handling procedures will be similar to those identified in the long-term monitoring plan.

iv. Statistical data analysis and interpretation

Data analysis related to the source area monitoring program should provide information that may be used to identify priority watersheds. Comparative sample concentrations and loading estimates for the various sampling location should be evaluated to determine watersheds and sub-watersheds where further sampling will be implemented. TBWC will coordinate data analysis and interpretation with the intent of using information to focus watershed outreach and management efforts.

- a. Primary sub- watershed and Bay groupings (which will be used to compare data and to focus management efforts):

- Lagunitas Creek
- San Geronimo Creek
- Olema Creek
- West Side Bay Tributaries
- East Side Bay Tributaries
- Walker Creek
- Chileno Creek
- Keyes Creek
- Sites within the Bay to be determined

v. Watershed outreach and coordination

Results of the source area sampling program will be used to advise outreach and prioritization of water quality management measures supported by partners that are working on the ground to address water quality issues on public and private lands (e.g. the Marin RCD, SPAWN, PRNS, NRCS, Marin County, and others).

C. Quality Assurance (QA) and Quality Control (QC) for All Water Quality Data Collected

All QA/QC procedures will be performed pursuant to the State Water Resources Control Board's Quality Assurance Project Plan (QAPP) for the Surface Water Ambient Monitoring Program (SWAMP). These procedures are outlined in the California State Water Resources Control Board, Division of Water Quality, December 2002: *Quality Assurance Management Plan for the State of California's Surface Water Ambient Monitoring Program, 1st Version*. This includes sample collection and handling, as well as sample analysis. The QA/QC plan for implementation of this program will be included in the implementation protocol.

D. Documentation of Baseline Conditions and Formation of a Database

Research, collect and compile reliable baseline data describing the concentrations of contaminants in the waters of Tomales Bay and tributary streams. Develop a database on water quality that is compatible with data being generated in ongoing studies of Tomales Bay and tributary streams; which will include past and current water quality information, and the identification of gaps that need to be filled. The construction of a water quality monitoring database for the entire watershed, and the capacity to analyze data and to

develop trends, will benefit the agencies and organizations that are currently collecting data, and those responsible for tracking and protecting water quality.

1. Current Efforts

More than a dozen agencies and/or organizations are currently collecting or planning to collect water quality data on Tomales Bay and within the watershed (see attached table). These efforts to characterize baseline water quality are hampered by the lack of a single database and analysis protocol for all WQ data currently collected on the bay, its watersheds and sub-watersheds. Thus, a central database is needed for data storage and comprehensive analysis. The TBWC has already contacted and gained agreement from most of the groups collecting water quality. Each has agreed to contribute electronic copies of their data to a central database coordinated by the TBWC.

2. Lead(s)

The Pacific Coast Science and Learning Center (PCSLC) at Point Reyes National Seashore (PRNS) will provide WQ database development, data acquisition, and cursory spatial and temporal analysis of trends. The Point Reyes National Seashore Association (or another group identified by TBWC) will act as the fiscal agent.

3. Subtasks

Develop database, collect data from existing programs, summarize baseline data, and produce reports. This series of events should take 6 months. The final report will include graphs and cursory statistical analysis of trends (over time and grouped by season) of all WQ variables by site. Data will also be presented to aid analysis of whether additional data collection sites and frequencies are required to fully describe the water quality patterns in the watershed. Metadata including QA/QC will be maintained on all data sources as well as the database as a whole.

The following steps will be taken to develop a database fully compatible with historic and existing water quality data collection and analyses:

1. Database manager hired to work with PCSLC database staff.
2. Data obtained from WQ data collecting groups.
3. NPS WQ database template modified to incorporate types of data from donors.
4. Donor data imported into database.
5. Publication of a summary report of available water quality data including graphs, tables, etc.

E. Database Maintenance and Management

Maintain and regularly update the water quality database. Provide a clearinghouse for use by landowners, stakeholders, regulatory agencies, watershed managers and the general public through such media as the Internet (web page), published reports, and readily available, computer searchable database. Inclusion and dissemination of water quality data will respect data sensitivity defined by the partners and respective monitoring programs that have developed this data.

1. Current Efforts

No unified database exists for all of Tomales Bay watershed. This section addresses the maintenance of the database that will be constructed as an initial step in this program.

2. Lead(s)

The Pacific Coast Science and Learning Center (PCSLC) at Point Reyes National Seashore (PRNS) will provide WQ database development, data acquisition, and cursory spatial and temporal analysis of trends. PRNSA (or another group identified by TBWC) will act as the fiscal agent.

3. Subtasks

Data from partner groups collecting data will be transferred to the Tomales Bay WQ database quarterly with summary reports and trends for all variable reported on the web and electronic (PDF) copies to all interested parties. Analyses and reports will be as in Task 1 above. Individual requests for particular analyses will be performed by the database manager or, if more complex, data will be provided to a WQ specialist of the Council's choosing.

The WQ database will be maintained in Microsoft Access and reside at the PCSLC with weekly backups to local server and CD-ROMs stored off site. The WQ database will be linked to a GIS of Tomales Bay's habitats and species (in development at PCSLC) to investigate spatial relationships between WQ, habitats, species, and land use.

F. Information dissemination and outreach

Information that is gathered through the monitoring program will be used to increase the community's understanding of water quality problems in the watershed including the impacts of septic systems, recreation, agriculture, sewage ponds, the landfill, mines, and other human activities. Additionally, this program will support coordination and cooperation amongst the various partners that are collecting water quality data to ensure timely and effective information dissemination about water quality monitoring results to agencies, organizations, bay users and communities in the Tomales Bay watershed via electronic posting of results, regularly published reports, press releases, etc.

1. Current efforts

Current efforts to disseminate information about water quality in the Tomales Bay watershed include:

- Written reports compiled independently by agencies and organizations to summarize their data and findings on an irregular basis (e.g. as projects end, as annual reports are due, as funding cycles require, etc.);
- Posting of Marin County recreational water quality monitoring at http://california.earth911.org/usa/WaterQuality/default.asp?beach_id=888&cluster=6041 on a regular basis;
- Water contact advisories that are posted by Marin County or State Parks when State Water Quality Standards are exceeded at locally popular swimming holes and beaches in the watershed;

- Press releases/media coverage issued by agencies and organizations; and
- Water quality summaries/brief mention in newsletters that are produced and distributed locally.

2. Lead

The Tomales Bay Watershed Council will be the lead organization to provide a clearinghouse for coordinating and disseminating information from the Tomales Bay Watershed Water Quality Monitoring Program via its Water Quality and Outreach committees. The Council's partners will provide outreach support by bringing this information to their constituencies, staff and/or members.

G. Estimated Annual Program Budget

The estimated annual program budget is \$154,000 per year, not including the in-kind contributions of agencies, local organizations and volunteers.

To date, in-kind/cash contributions provided during 2003:

1. Volunteer time (\$25-35/hr. for program planning, meetings, etc.) \$4,500
2. Technical support (\$75-100/hr. for plan development, meetings, etc.) \$4,000
3. Coordinator time (\$40/hr. plan development, meetings, etc.) \$10,000

Future in-kind contributions on an annual basis are estimated at:

1. Database: \$4,000 for use of existing program and assistance to add water quality data
2. Use of the Pacific Coast Learning Center office (\$500/mo.): \$6,000 /year
3. Oversight by data manager: \$10,000 during the first 6-12 months of the project.
The water quality data manager will be supervised and receive technical assistance from the Tomales Bay Biodiversity Inventory Data Manager, the Director of the PCSLC, and NPS WQ monitoring coordinator. NPS will also provide a WQ database template used for the park that will be easily modified for Tomales Bay watershed data.
4. Technical support: Staff from National Parks, Regional Water Quality Control Board, University of California Cooperative Extension, and possibly others will provide technical support through the Water Quality Technical Advisory Committee on an as-needed basis during the start-up phase of this program (years 1-2).
5. Volunteer time: volunteers will participate in this program on an as-needed basis.
6. Data analysis and trend development: Researchers from the University of California and potentially other academic institutions will be asked to assist with data analysis and trend development.

Start-up costs

Certain capital expenditures will be necessary to initiate the water quality monitoring program. These include:

1. Database intern (40% time) to create the database during first 6 months: \$20,000
2. 2 sets of field sampling equipment: \$5,000

1. Program manager

One full-time employee will be necessary to oversee and implementation of this water quality program. This individual will:

- manage the water quality program,
- collect field samples,
- enter new data into the database,
- write water quality reports on a regular basis (annual summaries, with larger reports analyzing program data and developing management recommendations every 3 years),
- post or link water quality data electronically to the TBWC website, and
- facilitate outreach and education to disseminate water quality information about the Tomales Bay watershed.

This person will collect both long-term trend and source area samples, as well as remotely accessible data that is available for gauging stations, etc. During winter months when sampling frequency will be increased to capture storm events, a part-time assistant will be hired and volunteers will potentially be used to assist the program manager with sample collection. During the summer when sampling frequency is decreased, the program manager will work on the data compilation, report writing, and other related tasks. Intensive statistical analyses would require additional funding and expertise.

Annual Program Budget Detail

<i>Description</i>	<i>No. units</i>	<i>Per unit cost</i>	<i>Total</i>
Personnel			
1. Program manager/field sampler (1 FTE)	1	\$50,000/yr.	\$50,000
2. Seasonal sampling assistant (wet season)	1	\$15,000/yr.	\$15,000
3. Publications	1	\$2,500/yr.	\$2,500
Sampling and equipment			
1. <i>Long term trend monitoring</i> at 9 stations, weekly sampling (52/year) for:			
a. Bacteria, ammonia, nitrate, etc.	470	\$80/sample	\$37,600
b. Total suspended solids	470	\$5/sample	\$2,350
2. <i>Source area monitoring</i>			
a. Analysis for source area samples	100	\$50-100/sample	\$15,000
b. Equipment maintenance	1	\$1,00/year	\$1,000
Mileage/travel for field sampling	13,800	\$0.36/mile	\$5,000
Subtotal			\$128,450
Project coordination and administrative overhead (20%)			\$25,690
Total			\$154,140

References

San Francisco Bay Regional Water Quality Control Board (SFBRWQCB). 2002. *Total Maximum Daily Load for Pathogens in Tomales Bay: Preliminary Project Report*.

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Fisher, D.T.; Smith, S.V.; Churchill, R.R. 1996. *Simulation of a century of runoff across the Tomales Watershed, Marin County, California*. Journal of Hydrology. 186:253-73.

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I. A Coordinated Resource Management Plan For The Tomales Bay Watershed Water Quality Monitoring Program

The following memorandum of understanding specifies the role of each participating organization and agency and will be ratified by all participants in the program to foster collaboration and support for the long-term implementation of this monitoring program. This MOU is incorporated into a coordinate resource management plan below.

1. Purpose and Need

The undersigned are stakeholders in the Tomales Bay Watershed and are also signatories to the *Tomales Bay Watershed Stewardship Plan: A Framework for Action* (the “Plan”). The Plan envisions as its most urgent action the development of a coordinated and comprehensive water quality monitoring plan for Tomales Bay and its tributary streams, which will document baseline conditions of water quality and provide information needed to evaluate the efficacy of projects and programs to improve water quality in the Watershed. This document is intended to focus on the program by which the water quality measurements will be made, the data recorded, maintained and utilized to evaluate and design programs for the improvement of the water quality of Tomales Bay and the restoration of the environmental integrity of the entire watershed. To accomplish this we hereby enter into this coordinated resource management plan (“CRMP”) to work together to develop a long-term water quality monitoring program (“Program”), and the tools for the analysis of sources and trends in water quality.

2. Objectives

1. A summary of current monitoring activities in the Tomales Bay Watershed is presented in Table A attached hereto. This summary includes an indication of what agencies are currently doing to determine water quality in the CRMP area, and future monitoring plans. The participants herein agree to transmit to the Tomales Bay Watershed Council (the “Council”) all such data collected by the participants to the date hereof and all data collected after the date of this agreement.
2. The participants agree to collaborate to identify gaps in the available data with respect to the type of information obtained, the location at which the data is obtained and the time and date of such measurement in order to develop a comprehensive baseline view of the water quality of the Tomales Bay Watershed.
3. The participants will assist in the creation and maintenance of a database where the measurement results will be recorded and stored.
4. The participants will cooperate in the development of analytical tools for the evaluation of water quality trends in the Watershed.

3. Date of Adoption

[To be added]

4. Location and Description of Planning Area:

Tomales Bay and its watershed in Marin County, California

Please see the *Tomales Bay Watershed Stewardship Plan: A Framework for Action* (2003) for additional background information.

5. Natural Resources and Resource Uses in the Planning Area:

Please see the *Tomales Bay Watershed Stewardship Plan: A Framework for Action* (2003) for additional background information.

6. Resource Management Issues:

The CRMP area is not in a natural state with large portions having been modified by human activities. Sedimentation from tributary streams has reduced the area of the bay over the last 200 years. Salmon habitat has been diminished to less than half of the original range, and remaining habitat has been compromised by human activities over the last century. During recent years, water quality monitoring has resulted in the posting of human health advisories for the bay and tributaries for water contact, and the consumption of seven species of sport fishes regularly caught in Tomales Bay. Human activities that have affected the watershed include: residential development, agriculture, forestry, impoundment of water and the creation of large-scale reservoirs, mining, recreation, road construction, septic and waste disposal, and shellfish harvesting.

Please see the *Tomales Bay Watershed Stewardship Plan: A Framework for Action* (2003) for additional background information.

7. CRMP Strategy:

The Tomales Bay Watershed Council and its partners in this CRMP will implement the Water Quality Monitoring Program. Implementation by CRMP participants will be in accordance with their respective statutory mandates, charters and resource availability. The participants by execution of this agreement agree to collaborate in the Program and to support its development and implementation. As part of that collaboration the participants agree to consider the compatibility of their current and planned monitoring activities, and to cooperate in the coordination of those activities as part of a comprehensive monitoring program.

Additionally, the participants agree to coordinate water quality monitoring and data collection amongst the other partners in this program. The participants also agree to provide data to update the database on a regular basis.

The participants agree to work together to define the financial needs of the water quality program and to secure financial commitments (e.g. annual financial support, laboratory analysis, technical support, etc.)

... more detail to come as roles are defined.

8. Participants:

We, the undersigned, have participated in the development of the Tomales Bay Watershed Water Quality Monitoring Program Coordinated Resource Management Plan, concur with the Plan, and will act as outlined herein to implement the Plan to the best of our ability.

Meetings for the review of this Program by the participants will be scheduled and organized. The purpose of the meetings will be to discuss problems, make revisions and adjustments for implementation of planned activities.

Marin County

By: _____

Title: _____

National Park Service – Point Reyes National Seashore

By: _____

Title: _____

California State Parks

By: _____

Title: _____

California Department of Health Services

By: _____

Title: _____

Marin County Department Of Health Services

By: _____

Title: _____

San Francisco Bay Area Regional Water Quality Control Board

By: _____

Title: _____

Marin Municipal Water District

By: _____

Title: _____

North Marin Water District

By: _____

Title: _____

Inverness Public Utilities District

By: _____

Title: _____

California Department of Fish and Game

By: _____

Title: _____

University of California Cooperative Extension

By: _____

Title: _____

SPAWN

By: _____

Title: _____

Appendix A: Summary of water monitoring in the Tomales Bay watershed