

DATA MANAGEMENT



Photo by Greg Filbrandt

9. DATA MANAGEMENT

STATE IRWM REQUIREMENTS: J. Data Management. Include mechanisms by which data will be managed and disseminated to stakeholders and the public, and include discussion of how data collection will support statewide data needs. At a minimum assess the state of existing monitoring efforts for water quantity and water quality, and identify data gaps where additional monitoring is needed. If the Plan includes a water quality component, include a discussion of the integration of data into the SWRCB's Surface Water Ambient Monitoring Program and Groundwater Ambient Monitoring and Assessment Program.

9-1 DATA MANAGEMENT



Data generated and collected during the course of the ICWMP process has been and will continue to be managed to ensure that it will be available to fulfill the needs of stakeholders, the state and the general public. Data management measures are described for data collected during the ICWMP preparation and for data collected during ICWMP implementation.

DATA MANAGEMENT DURING PREPARATION OF ICWMP

All studies and technical data collected and reviewed during preparation of the ICWMP have been inventoried (see Chapter 15) and catalogued in the TBWC library. Technical data collected as part of the preparation of the ICWMP includes stormwater quality monitoring data and field assessments conducted as part of the ASBS watershed assessments. Data management for each of these efforts is summarized below, and the technical methods utilized are described in Chapter 8.

In addition to specific data management efforts described below, copies of the reports developed for these efforts will be maintained as both paper copies and electronic copies at the TBWC offices. All documentation, raw data, data conclusions and interim and summary reports will be archived and used by TBWC partners for future management decisions in the watershed. Results, conclusions and recommendations from the stormwater quality monitoring and ASBS watershed assessment efforts have been presented in the ICWMP. The results will be collated onto a single set of CDs that will also

be retained at the offices of the County of Marin Public Works Department and the National Park Service—Point Reyes National Seashore.

Stormwater Quality Monitoring Data

The work program for the ICWMP work plan calls for the completion of targeted storm water quality monitoring at selected locations within the watershed. Documents that have been or will be produced in support of this data collection effort are included in Appendix M. Data collected as part of this effort will be integrated into existing databases that are compatible with State systems as further described below. Stormwater data will be managed through the Marin County Department of Public Works. The Public Works Department is the primary agency responsible for the management of municipal runoff under the Marin County Stormwater Pollution Prevention Program (MCSTOPP). MCSTOPP is responsible for the implementation or oversight of stormwater management plans for NPDES Stormwater Phase II program in municipal areas within the Integrated Coastal Watershed Assessment Planning Area CCAs.

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's 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 is included in the implementation protocol (see Appendix M).

Data collected as part of this effort will be housed at three locations: Marin County Public Works Department, USNPS and TBWC. All records generated by the project will be stored at the TBWC main office in Olema, CA. Copies of all records held by the lab will be provided to TBWC and stored in their files, as well. Copies of the records will be maintained at Analytical Sciences for five years after project completion, then discarded, except for the database, which will be maintained without discarding. TBWC stores paper and electronic files permanently, in support of creating a durable and chronologically coherent data resource. All records will be passed to the State Board Contract Manager at project completion.

ASBS Watershed Assessment Data

The work program for the ICWMP work plan calls for the completion of watershed assessments for the four ASBS areas within the Tomales Bay planning area. Field survey forms (as described in Chapter 8) have been included as part of the ASBS report (see Appendix K).

DATA MANAGEMENT DURING IMPLEMENTATION

As part of the implementation of ICWMP, a project monitoring system will be developed to track components of project implementation progress. A component will be the identification and dissemination of data that is generated by specific projects, including water quality monitoring results

for those projects that have monitoring components. Other data generated to develop and/or support ICWMP projects also will be compiled, maintained and distributed. As discussed in Chapter 6, Implementation, performance criteria will be established to assess project performance. Data collected during plan implementation will be compiled in a database and submitted to stakeholders as part of monthly, quarterly and/or annual reports. Water quality data will be included within regional and State databases as described in this chapter.

9-2 DATA DISSEMINATION

The mechanisms for data dissemination that have been employed to date are described below. It is anticipated that all of these mechanisms will continue into the future.

TBWC MEMBER DISTRIBUTION PROCESS

Copies of data developed for the ICWMP will be distributed to all parties involved with the project, upon request from their TBWC representative. At present the following members have indicated a desire to have the full electronic and paper record of the stormwater monitoring effort: SPAWN, County of Marin, USNPS/Point Reyes National Seashore local office, and the BCPUD. Additional members may ask for this same set of data.

PUBLIC DISSEMINATION OF DATA

At each public meeting held during ICWMP preparation, the public has been notified of the availability and location of the files supporting preparation of the Plan. As public review drafts of the ICWMP are circulated during the public review, a notice within the report will reiterate the TBWC policy of open files, as well as the location and process for accessing both electronic and paper files.

Public notices for the project, beginning in April 2007, will also make note of the availability of data (related to stormwater sampling, background conditions). The results of ongoing data development and collection efforts by TBWC members also will be made available as they are completed.

PUBLIC ACCESS TO DATA

As previously indicated, copies of all data, summaries and reports will be maintained as both paper copies and electronic copies at the TBWC offices. The TBWC offices are, and will continue to be, open to the public, currently on Tuesday and Thursday afternoons and during regular working days by appointment. This will continue to be true in the future. Additionally, copies of all data and background materials developed not only for the stormwater monitoring but for all aspects of ICWMP preparation will be made available to TBWC members and members of the general public upon request. A full set of electronic backup materials will be housed off-site to protect them from loss if there is a fire or other emergency at the TBWC offices. All summary reports, as well as the ICWMP and its supporting appendices, will be provided on CD to each TBWC member for online posting and distribution.

9-3 EXISTING AND NEEDED MONITORING

A number of water quality monitoring efforts are underway or planned for the region that include efforts by the SFBRWQCB, the National Park Service (USNPS), the County of Marin, SPAWN, and MMWD. Additionally, TBWC recently received funding for a three-year water quality monitoring program that includes coordination of data and creation of a database. The SFBRWQCB completed water quality sampling in 2001 as part of the “Surface Water Ambient Monitoring Program” (SWAMP). SWAMP is a statewide monitoring effort designed to assess conditions of surface waters throughout the state. The SWAMP report that includes the Tomales Bay region is due to be released in the near future. Other historical efforts conducted by other agencies and entities are summarized in Appendix E.

RWQCB – Pathogens TMDL Monitoring

The main objectives of the Monitoring Program of the “Pathogens TMDL Report” (RWQCB, San Francisco Region, July 2005) 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.

The TMDL Study recommends that water quality sampling be conducted at 30 monitoring stations for the Tomales Bay watershed and the bay itself, as summarized below.

- Lagunitas Watershed: 11 locations on Woodacre, East Fork Woodacre, West Fork Woodacre, San Geronimo, Lagunitas, Arroyo, and Montezuma Creeks;
- Olema Creek: 6 locations;
- Walker Watershed: 4 locations on Walker, Keys, and Upper Chileno Creeks;
- West Shore: 3 locations at Inverness Public Utility District’s sampling station;
- East Shore: 2 locations at Millerton Creek and drainage at Milepost 36.17 on Highway 1; and
- Tomales Bay: 4 stations at inner-bay, south end, southeast corner, and northeast corner.

Table 9-1 outlines the locations, constituents, sampling frequency, analytical methods, and the responsible parties for the long-term water quality monitoring program. The SFBRWQCB, in coordination with the responsible parties and interested third parties—such as National Park Service, Department of Health Services, commercial shellfish growers, the Inverness Public Utility District, and Salmon Protection and Watershed Network (SPAWN)—will conduct the proposed long-term water quality monitoring. All water quality monitoring (including Quality Assurance [QA] and Quality

Control [QC] procedures) will be performed pursuant to the State Water Board's Quality Assurance Project Plan for the Surface Water Ambient Monitoring Program.

National Park Service

In addition to the sites sampled by the SFBRWQCB as part of its Pathogen TMDL monitoring, the National Park Service (USNPS) samples three additional sites on a monthly basis: one site on Cheda Creek and two sites on Olema Creek tributaries. In addition to pathogens (total fecal coliform and E. coli), nitrate, ammonia and other core constituents (temperature, pH, dissolved oxygen, salinity) also are sampled. This data is managed as part of the IVPSTORET database. Older past data also is being integrated into this database. The last annual report was in 2001, but annual reporting is planned to be resumed (Ketcham, personal communication, April 2007).

As part of the "Tomales Bay Wetlands Restoration and Monitoring Program" that was recently funded by the SWRCB for restoration of the National Park Service's Giacomini Ranch, a comprehensive ambient water quality plan will be implemented. The data collection and analysis will be consistent with SWAMP and QAPP requirements. The Water Quality Plan, anticipated to be initiated this year, will conduct long-term and source area monitoring for parameters including bacteria, DO, nutrients, pH, conductivity, salinity, temperature, turbidity and suspended sediment levels and duration. Trend monitoring will generate water quality data to assess long-term shifts in water quality within Tomales Bay and tributaries. Source area monitoring will focus on identifying sources and quantities of water pollutants to Tomales Bay and its freshwater tributaries to evaluate and prioritize past and future water quality improvement efforts. The monitoring will include post-restoration sampling to document the physical and ecological response to this significant wetlands restoration project (Tomales Bay Watershed Council, June 2006).

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.

SPAWN

The Salmon Protection and Watershed Network (SPAWN), in partnership with the SFBRWQCB and SWRCB, has conducted a citizen-based (volunteer) water quality monitoring program in the Lagunitas Creek watershed since 2003. The focus of the study was to collect data for key pollutants (including sediment, nutrients, and fecal coliform) to determine exceedances of water quality standards and potential source categories as a preliminary step in determining TMDLs for the Tomales Bay region. Several monitoring stations were established to assess nonpoint source pollution impacts attributed to residential and commercial developments in the watershed that have a relatively high density of septic systems and marginal site conditions (i.e., areas of high groundwater). Samples are taken at 7 locations in the summer and 9 locations in the winter on Lagunitas Creek and its tributaries. All sites are sampled according to protocols approved by the SWRCB. The program documents conditions and source areas within the San Geronimo watershed. Constituents sampled include: fecal coliform,

nitrate + nitrate and orthophosphates, as well as dissolved oxygen (DO), pH, and conductivity for both sampling seasons, as well as TDS and temperature during the summer sampling period.

**TABLE 9-1
SUMMARY OF RWQCB MONITORING PARAMETERS**

Constituent	Location	Frequency	Analytical Method	Sampling Entities
TOMALES BAY				
Fecal Coliform ^a	Four of the 17 designated DHS monitoring stations at shellfish growing lease areas	Weekly for five weeks from January to early February; Monthly from March through December Weekly for five weeks during summer months	U.S. EPA Standard Multiple Tube Fermentation Method; 9221B	DHS, Shellfish Growers
TOMALES BAY WATERSHED				
Fecal coliform Stream Flow	Olema Creek	Weekly for five weeks from January to early February; Monthly from March through December Weekly for five weeks during summer months	U.S. EPA SM 9221B USNPS gauging station	National Park Service
Fecal coliform	West Shore	Same as above	U.S. EPA SM 9221B	Inverness PUD
Fecal coliform	East Shore	Same as above	U.S. EPA SM 9221B	Water Board
Fecal coliform Stream Flow	Lagunitas Creek	Same as above	U.S. EPA SM 9221B USGS gauging station	Water Board, SPAWN
Fecal coliform Stream Flow	Walker Creek	Same as above	U.S. EPA SM 9221B USGS gauging station	Water Board
<p>a. <i>E. coli</i> monitoring may be used in the future to assess general water quality trends and exceedances. If <i>E. coli</i> is used instead of fecal coliform to assess general water quality trends and exceedances, samplers also will collect duplicate samples (10% of the total number of samples) to be analyzed for fecal coliform, in order to obtain a Tomales Bay-specific correlation factor between fecal coliform and <i>E. coli</i>.</p>				

Available stream ambient water quality data in the community of Woodacre has been collected by the Salmon Protection and Watershed Network (SPAWN) through the Lagunitas Watershed Citizen Water Quality Monitoring Program (June 2004–June 2006). This program, funded by the SFBRWQCB, was implemented to conduct physical and biological water quality monitoring in support of efforts to

monitor the creek's run of spawning coho salmon. SPAWN data will be evaluated in the ICWMP, along with the monitoring data collected under the Monitoring Plan, as part of the Tomales Bay Watershed Council ICWMP implementation.

County of Marin

The County of Marin, through the MCSTOPPP, is conducting some ASBS water quality monitoring at Duxbury Reef, and stormwater sampling as initiated with this ICWMP planning grant award, both of which are further described below. Additionally, the County of Marin Environmental Health Division samples at coastal locations (beach discharge points) along the Tomales Bay shoreline. The sampling occurs weekly between April 1 and October 31. The constituents tested for are total coliform, E. coli and enterococcus.

As part of the preparation of this ICWMP, a separate work effort was initiated to set up stormwater monitoring stations and prepare a "Municipal Stormwater Assessment and Recommendations" report, which is contained in Appendix M. The purpose of the ICWMP stormwater quality monitoring effort is to improve management of water resources throughout West Marin County and, in particular, provide direction for improving the quality of stormwater entering area streams from rural community stormwater systems. The overall goals of this work effort are to:

- Determine the types and level of contamination that are present in the stormwater system in the targeted communities.
- Enable an assessment of the effect of stormwater infrastructure on water quality characteristics of the targeted areas.
- Direct development and implementation of site-specific remediation recommendations by the appropriate TBWC partners.

The specific objective of the water quality monitoring effort is to determine whether and to what extent contaminants are transported through selected West Marin County community stormwater systems, including priority contaminants from wastewater and surface water.

A stormwater network mapping effort has been completed for Point Reyes Station, Tomales, and Woodacre, and limited stormwater water quality monitoring has been conducted in Bolinas. MCSTOPPP plans to continue stormwater network mapping and condition assessments in the future.

Data collected during the 2006/2007 season is limited due to a low rainfall year. Once the data has been analyzed and interpreted, it will assist the TBWC and responsible agencies to move forward with site-specific and regional planning efforts to address potential water quality problems identified by the study.

Marin Municipal Water District

MMWD conducts ongoing water quality monitoring at multiple locations in the Lagunitas Creek and Walker Creek watersheds. Monitoring of Soulajule, Nicasio, Kent, Alpine, Bon Tempe and Lagunitas reservoirs is conducted on a quarterly basis for temperature, pH, conductivity, turbidity, alkalinity,

hardness, metals, oxygen, nutrients, Total Coliform, E. Coli, and total dissolved solids. Nicasio and Kent reservoirs are sampled each twice per year for pharmaceuticals, hormones, and estrogen mimicking compounds.

Annual sampling of the above named reservoirs includes, in addition to the parameters mentioned in the quarterly monitoring above, surfactants, pesticides and industrial contaminants. During the summer, Kent, Bon Tempe, and Nicasio reservoirs are also monitored at least once every month for pH, dissolved oxygen, temperature, and conductivity.

Inflow streams to Nicasio Reservoir are monitored five times per year during the winter at 7 different sites, 5 of which are located on Halleck and Nicasio Creeks. Monitoring at these sites includes sampling for temperature, pH, turbidity, conductance, coliform, total organic carbon, nutrients, suspended solids, Total Coliform and E. Coli.

MMWD also conducts monthly sampling at four creek sites in the Lagunitas and Walker Creek watersheds. These sites include: Lagunitas Creek below Kent Reservoir (at Shafter Bridge), San Geronimo Creek, Nicasio Creek below Nicasio Reservoir, and Arroyo Sausal/Walker Creek below Soulajule Reservoir. This water quality monitoring program analyzes samples for nine parameters, including: temperature, pH, turbidity, alkalinity, hardness, copper, total suspended solids, oxygen, and settleable solids.

TBWC Water Quality Monitoring Plan

In December 2003, the Tomales Bay Watershed Council developed a Water Quality Monitoring Plan in response to lack of long-term comprehensive water quality monitoring at a watershed level. Numerous stakeholders and regulatory agencies have conducted comprehensive monitoring for short durations 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.

The TBWC Water Quality Monitoring 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.

Trend monitoring will be conducted to 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 and the Shellfish Lease monitoring by California Department of Health Services. This component of the monitoring program will give the watershed community the needed benchmarks to determine the success of management efforts.

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; one site on the east shore of Tomales Bay (Millerton Creek); and one site on the west shore. East and west shore sites will include at least one reference stream that flows through subwatersheds with minimal human land use activities. Sampling locations will include four bay sites to represent the tidal conditions and separation of the Bay. 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 SFBRWQCB, Department of Health Services, and other agencies.

Water quality samples collected in Tomales Bay and tributary creeks will be analyzed for fecal coliform, 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. 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.

Source area monitoring efforts will be focused on identifying sources and quantities of water pollutants to Tomales Bay and its freshwater tributaries. 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 efforts to improve water quality on private and public lands. The source area monitoring program will target winter and spring runoff events when nonpoint source pollution loading is most prevalent. Primary sub-watershed and Bay groupings (which will be used to compare data and to focus management efforts) are: Lagunitas Creek, San Geronimo Creek, Olema Creek, West Side Bay Tributaries, East Side Bay Tributaries, Walker Creek, Chileno Creek, and Keyes Creek.

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.

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 MRCD, SPAWN, PRNS, NRCS, Marin County, and others).

In March 2006 the TBWC began monitoring efforts at three local swimming locations and source area monitoring in Inverness, Third Valley Creek and at Chicken Ranch Beach.

MONITORING DATA GAPS

Water quality monitoring data gaps identified in TBWC's 2003 *Tomales Bay Stewardship Management Plan* that are still relevant include:

- The SFBRWQCB developed specific recommendations for study and monitoring programs (SWAMP) for Walker Creek and Lagunitas Creek watersheds (RWQCB, 2001):
 1. Develop a monitoring program to study nutrient, pathogens and sediment movement in Keys, Chileno, Arroyo Sausal, Salmon, and Walker Creek to evaluate the effects of grazing.
 2. Develop a monitoring program for pathogens and nutrients at Laguna Lake to determine the input from the headwaters of Chileno Creek.
 3. Develop a monitoring program for pathogens and nutrients below the town of Tomales to evaluate the septic system leaks into Keys Creek.
 4. Develop a monitoring program to evaluate the impact of flow, temperature, dissolved oxygen and sediment on the salmonid fishery below Soulaule Reservoir.
 5. Design a sampling program above Peters Dam to establish reference conditions in a protected upper watershed for flow, temperature, dissolved oxygen, and biological indicators.
 6. Develop a monitoring program to evaluate water quality (DO, temperature and sediment) in Lagunitas Creek below Peters Dam, and in Nicasio Creek below Seeger Dam and San Geronimo and Olema Creeks.
 7. Develop a monitoring program for sediment deposition up and downstream from the confluence of Lagunitas and San Geronimo Creeks to evaluate erosion control programs.
 8. Monitor for pathogens and nutrients from septic tank leaks along San Geronimo Creek.
 9. Conduct nutrient and pesticide testing below the golf courses on Bon Tempe Lake and on San Geronimo Creek.

- The database on bacterial contamination in the bay and watershed is well developed but there are still a number of data gaps that include:
 1. Contributions made by natural background sources (e.g., large, over-wintering and resident bird populations, marine mammals) and the extent of human waste input (e.g., failing septic systems, boat and recreational uses) into the watershed and bay;
 2. Comparative studies of the eastern shoreline sub-watersheds that have low fecal coliform counts with those sub-watersheds that have high fecal coliform levels in order to establish background conditions;

3. Address the concern about increases in summer primary productivity in Tomales Bay by designing studies to determine spatial and temporal dynamics of phytoplankton in the various sections of the bay.
- Evaluation of nutrient levels is far behind monitoring activities related to bacterial contamination. Most of the effort to understand toxic contamination has been centered on mercury released from the Gambonini mine in the Walker Creek watershed. Ongoing and future studies will fill some of the data gaps include:
 1. Continue to monitor the release of mercury from the mine site to determine the success of the remediation program.
 2. Evaluate mercury contaminated sediment transport out of the Walker Creek drainage into Tomales Bay.
 3. Investigate the storage of contaminated sediment in the drainage and estimate possible release times for pulsed levels of sediment reaching the bay.
 4. Continue the investigation of contamination pathways through various biological trophic levels in the bay system.
 5. Investigate the extent of contaminated sediment movement within Tomales Bay.
 6. Investigate the natural levels of mercury entering the bay system from the Lagunitas sub-watershed and other smaller tributaries.
 7. Develop a monitoring plan to examine the bioaccumulation of metals and synthetic organic compounds to establish a long-term baseline in Tomales Bay.
 - Sediment studies recommended in the Stewardship Plan appendix include:
 1. Analyze the sediment transport functions in the Lagunitas Creek system with respect to their impact on instream habitat and on sediment delivery to Tomales Bay. In Lagunitas Creek, such analysis will increase understanding of how the sediment transport function influences critical habitat features such as pool riffle complexes and bed material composition. This information is critical to the design of effective restoration projects. This work has been undertaken by the County of Marin and should be nearing completion.
 2. Inventory and prioritize sediment sources in upper Devil's Gulch and mainstem Lagunitas Creek below Tocaloma. Include a road assessment on the areas of the watershed not covered by the current MMWD effort.
 3. Conduct a fluvial geomorphic analysis of the Walker Creek stream system. The analysis will provide a scientific basis for selection, design, implementation and monitoring of future fisheries habitat enhancement and sediment reduction projects. Coordinated with RWQCB monitoring efforts, it will also provide critical information on the movement of mercury-laden sediments through Walker Creek to Tomales Bay.
 4. Develop a, comprehensive, hydrodynamic watershed-wide sediment budget and monitoring program to assess the impacts of enhancement measures both within the watershed and Tomales Bay that includes: 1) water column, 2) bedload, 3) upland sources and 4) habitat monitoring. Evaluate the MMWD sediment monitoring program in Lagunitas Creek and determine what it can contribute to the larger program. Analyze the data collected to date.

Implementation of the TBWC Water Quality Plan will provide a basis for establishing baseline data. The development of a comprehensive water quality monitoring program is only the first step in water-

shed monitoring for Tomales Bay. Along with baseline monitoring (to characterize existing conditions) and effectiveness monitoring (to determine the success of existing or newly implemented projects or management practices), bio-indicators should be identified and monitored.

A coordinated water quality monitoring system is needed in which standard data gathering and reporting measures are used by all agencies and organizations, with the development of a database in which all data from various agencies can be collected and accessed to develop better analyses on water quality conditions and trends. Various agencies would keep their own data, but also combine it and make it available somewhere for all. Items to consider in developing such a database include:

- **TBWC Database As A Model.** Implementation of the TBWC Water Quality Plan will provide a basis for coordinating water quality data collection. The TBWC database, in addition to being a repository for data, will be able to conduct data analyses related to specific sites, aggregate data, and provide water quality graphs and other outputs that are fairly sophisticated. Also, this repository will support inclusion of legacy water quality data, in addition to providing a single comprehensive database for all current and future monitoring efforts .
- **Compatibility and Consistency in Data.** There is a need to review how the various agencies collect and maintain their data such that they can be compatible and/or combinable (e.g., SPAWN, USNPS, TBWC). Currently, there are two sizeable water quality databases— the TBWC and the National Park Service—and they are consistent. Water quality data collected through the TBWC is consistent in format to the USNPS database, and they could be combined.

Data Sensitivity. There are data sensitivity issues with water quality databases that contain information collected on or about private property, especially if site-specific information is included. There needs to be careful discussion about the types of information that are included in a comprehensive database and who can access the data, prior to data collection and data compilation. The variety, quality and quantity of data collected will vary significantly between projects; however, it is critical to remember that in order to better understand our effectiveness and trends in water quality, we will all benefit when sufficient information is provided to be able to determine if progress is being made or not.

In some circumstances, is important to pair data collection and monitoring with solution oriented projects that can assist with funding to implement the necessary changes that may be considered as a result of the data collected. Implementation of the ICWMP would include as much information on locations (e.g., GPS) as possible, and will employ the strategy that monitoring and data collection are typically easier and more effective if they are linked to implementation funding.

- **Need Long-term Data Gathering and Monitoring for Each Local Priority.** Monitoring data and review are needed for each of the ICWMP's three regional priorities: water quality, ecosystem restoration and habitat improvement, and water supply. Long-term data collection and monitoring is a key element in monitoring ICWMP performance and integrating watershed

management efforts in the Tomales Bay area. In this regard, the TBWC has been a leader in efforts to expand and coordinate a comprehensive water quality program.

- **Long-Term Project Management.** In addition to development of a database, there is a need to update and manage it. This requires a discussion about who does this management in the longer term. There needs to be further TBWC discussion. The TBWC has been made aware of this need and is discussing their possible role.

Other potential monitoring needs identified by some stakeholders during preparation of the ICWMP include standard salmon monitoring methods and fish growth. Other data gaps and issues/questions raised during the preparation of the ICWMP are summarized in Chapter 3 and included in Appendix H.

9-4 SUPPORT OF STATEWIDE NEEDS

The ASBS watershed assessments build on the SWRCB Discharge Report completed summer 2003, and these assessments were used to develop the ICWMP and project recommendations. It should be noted that equivalent assessments of resources, stressors and watershed issues already have been conducted within the Tomales Bay, Lagunitas Creek, and Walker Creek CCAs under a variety of initiatives. Most of the issues associated with these strategies are synthesized under the Tomales Bay Watershed Stewardship Plan (TBWC 2003), the Tomales Bay Pathogen TMDL Staff Report (RWQCB 2005), and other watershed or parameter-specific assessments. The ASBS assessments document the information identified as essential through the Critical Coastal Areas Program. Data and information developed through this program will contribute to a collaborative, watershed-based management strategy to reduce and prevent impairment of state ASBS and CCAs within coastal Marin County.

The stormwater quality data directly supports the RWQCB Pathogen TMDL monitoring efforts, and will provide additional data to review success in achieving TMDL levels. This data, as well as projects included in the ICWMP, also contribute directly to recommendations included in the State's October 2004. *Watershed Management Initiative Integrated Plan Chapter* (San Francisco Bay Regional Water Quality Control Board). The monitoring data, in conjunction with other monitoring efforts, will be reviewed continually and thus will assist in the ongoing review of the success of various projects, programs and measures in contributing to water quality improvement, especially to achieve identified TMDL objectives and ultimately eliminate the impairment status for listed water bodies. In this way, the data generated during Plan development and through implementation of projects also will contribute to maintaining the desired water quality for "beneficial uses" identified in the *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin*. (San Francisco Bay Regional Water Quality Control Board, November 2004.)

9-5 DATA INTEGRATION INTO SWRCB SURFACE WATER AMBIENT MONITORING PROGRAM

The goal of the SWAMP-funded program in the San Francisco Bay Region is to monitor and assess water quality in all of the watersheds in the region to determine whether beneficial uses are protected. Specific objectives of the monitoring program are to: 1) measure environmental stressors (pollutants or other water quality parameters), biological effects, and ecological indicators to evaluate whether beneficial uses are being protected; 2) use a design that allows for evaluation of spatial and temporal trends in the watersheds of the region; 3) identify minimally disturbed reference conditions; 4) determine whether impacts are associated with specific land uses and/or water management; 5) use standard sampling protocols, QA procedures and the SWAMP database to provide statewide consistency and availability of data; 6) evaluate monitoring tools in watersheds; 7) generate data to develop indices to evaluate ecological indicators; and 8) use a rotating watershed approach to collect data in each hydrologic unit at least once every five years (San Francisco Bay State Water Resources Control Board, October 2004). The SWAMP report that includes the Tomales Bay region is due to be released in the near future.

Stormwater quality measurement and collection of field parameter values will be in accordance with approved protocols including those in the State Water Resources Control Board's Surface Water Ambient Monitoring Program (SWAMP) and the National Park Service's SFANI&M WQ Program. These parameters include: pH, electrical conductivity, dissolved oxygen, temperature, discharge, 24-hour rainfall (from existing gauges within the watershed), annual cumulative rainfall (from existing gauges within the watershed), and salinity.

The stormwater quality data will be submitted to the SWRCB's SWAMP database. The USNPS will work with database managers to develop a template for upload to the state SWAMP database. As a preliminary step, all data will be compiled in a Microsoft EXCEL spreadsheet as raw data. Currently the TBWC is using a version of USNPS's Storet and will integrate the data from this program into that database. This system was developed by the National Park Service for water quality data management. The program is a Microsoft ACCESS-driven database that has an export template for upload to EPA STORET. This will enable the data to be made available to the public.