The San Diego Watersheds Common Ground Project: San Diego Bay Watershed Demonstration

QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR CITIZEN MONITORING

Grant Agreement # 04-026-559-0

April 27, 2006

PLAN REVIEW AND APPROVAL FOR:
Deborah Woodward, SWRCB, 2006

PLAN PREPARED FOR:
City of San Diego, Metropolitan Wastewater Department
Storm Water Pollution Prevention Division

COMPLETED PLAN PREPARED BY:
Karen Franz: San Diego Coastkeeper, Project Director

Refer correspondance to:
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This QAPP is submitted as an addendum to the original QAPP submitted by Weston Solutions for Monitoring activities as a part of the Common Ground Project. This QAPP covers the Quality Assurance / Quality Control of the Citizen Monitoring Activities to be conducted as a part of the Common Ground Grant Contract Agreement by San Diego Coastkeeper.

Approval Signatures

GRANT ORGANIZATION

Title	Name	Signature	Date
Project Director, San City of San Diego	Chris Zirkle		
Grant Contact, San City of San Diego	Ruth Kolb		
Project Manager, MEC-Weston Solutions, Inc.	David Pohl		
Executive Director, San Diego Coastkeeper	Bruce Reznik		
Project Manager and QA Officer, San Diego Coastkeeper	Karen Franz		

STATE WATER RESOURCES CONTROL BOARD (SWRCB)

Title	Name	Signature	Date
SWRCB Grant and Contract Manager	Deborah Woodward		
SWRCB QA Officer	Tony Felix		

This is a contractual document. The signature date of the SWRCB QA Officer indicates the earliest date that the project can start.

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3. Distribution List

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SWRCB QA Officer	Tony Felix	tfelix@waterboards.ca.gov	(858) 636-3134	7

All group leaders, and technical advisors will receive copies of this Quality Assurance (QA) plan, and any approved revisions of this plan. Once approved, this QA plan will be available to any interested party by requesting a copy from the project director Mrs. Karen Franz (see address on title page).

4. Project Organization

This QAPP is a multi-organization project. The following monitoring groups will cooperate to monitor and assess the streams, storm drains, lakes, bays, etc. in San Diego County watersheds:

1. San Diego Coastkeeper
2. San Diego State University Foundation (SDSUF)

This QA plan reflects the diversity of monitoring and organizational support involved in this project. For the elements of this QA plan, we have addressed aspects that are shared with all groups as well as those aspects that are unique to individual groups. While the goals of monitoring may vary, the data quality objectives are consistent allowing us to compare data collected by different organizations. The specific organizational structure for each of the participating organizations is given below.

4.1 Quality Assurance Officer Role

The Quality Assurance (QA) Officer, Mrs. Karen Franz, is responsible for guaranteeing the overall quality of the data produced and reported by San Diego Coastkeeper. Specific duties of the QA Officer includes conducting audits of ongoing tests, data packages, and completed reports, conducting audits of the routine quality control documentation of laboratory procedures, communicating potential quality control problems to the staff, and assuring that any problems are resolved. They are responsible for issuing Quality Assurance Reports to Management, maintaining a current Quality Assurance Manual, and issuing QAPPs as required. The QA Officer also ensures that data reported by San Diego Coastkeeper have been generated in compliance with the Quality Assurance Manual and the appropriate protocols. The QA Officer is knowledgeable in the quality system standard defined under NELAC.

4.2 San Diego Coastkeeper

The San Diego Coastkeeper (Coastkeeper) is a not-for-profit organization that employs trained citizens and students from the region to conduct urban runoff and stormwater monitoring, coastal estuarine research, and beach monitoring projects. San Diego Coastkeeper will coordinate volunteer effort, organize sampling events, and training sessions.

4.2.1 Karen Franz, Project Manager and Team Leader. Karen Franz is responsible for all communications with the City of San Diego for the responsibilities of San Diego Coastkeeper, including project deliverables.

4.2.2 Kate Hanley, Field Monitor and Team Captain (Volunteers and Staff). Kate Hanley assists with the education component of the Common Grounds project and will be present to assist in conductiong trainings and to ensure that community outreach is a component of the monitoring trainings and events.

4.2.3 Lillian Luong, Data Management. Lillian Luong will collect data gathered by citizens and volunteers in the field and convert this data into SWAMP format for inclusion into the Common Ground website.

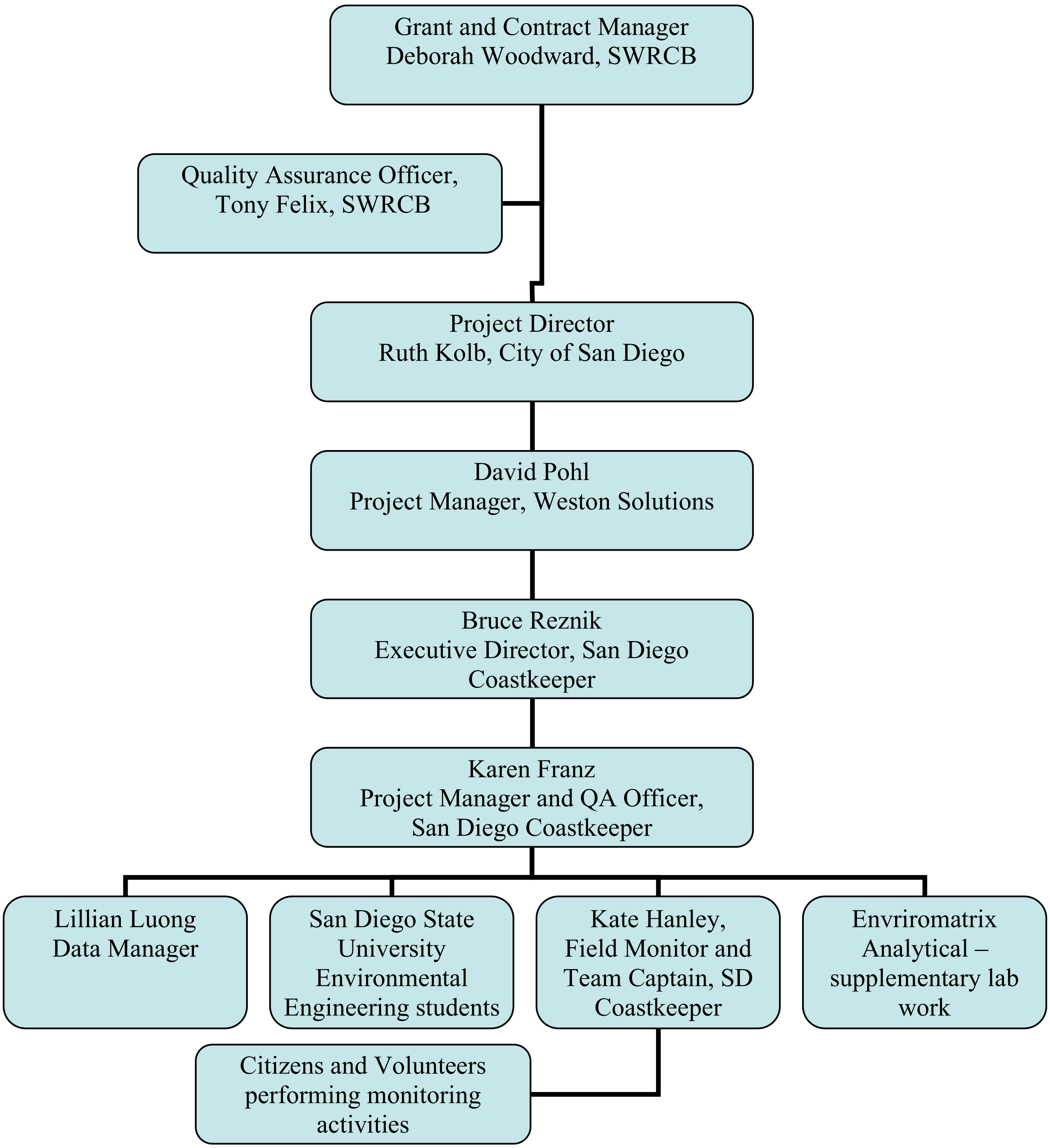
4.2.4 Karen Franz, Quality Assurance and Quality Control

4.3 Technical Advisory Committee For SDSUF and Coastkeeper

The following committee is scheduled to meet three times during project period.

1. Badri Badriyha, P.D., Assistant Professor, San Diego State University, Department of Civil and Environmental Engineering.
2. Karen Franz, San Diego Coastkeeper.

Chart 4.3 Organizational Flowchart for Citizen Monitoring Activities


Grant and Contract Manager
Deborah Woodward, SWRCB
Quality Assurance Officer,
Tony Felix, SWRCB
Project Director
Ruth Kolb, City of San Diego
David Pohl
Project Manager, Weston Solutions
Bruce Reznik
Executive Director, San Diego Coastkeeper
Karen Franz
Project Manager and QA Officer,
San Diego Coastkeeper
Lillian Luong
Data Manager
San Diego State University Environmental Engineering students
Kate Hanley,
Field Monitor and Team Captain, SD Coastkeeper
Envriromatrix Analytical – supplementary lab work
Citizens and Volunteers performing monitoring activities

5. Problem Definition/Background

5.1. Problem Statement

Despite the allocation of significant resources to monitoring efforts, there still remains an inadequate understanding of local water quality, which undermines the ability to properly manage these vital resources. The State Water Resources Control Board (SWRCB) recently reported that two-thirds of the waterbodies in San Diego County remain unassessed because not enough data exists to determine their status. A great part of this problem is that while water quality and related monitoring efforts have been undertaken in the region for many years, there is at present no method to effectively manage and utilize data collected by regulatory agencies, academic institutions, businesses and non-profit organizations. Inadequate data management
hinders the ability of local and state agencies to arrive at informed management decisions to effectively identify and abate point and non-point source pollution. Gathering and managing sufficient data to gain a comprehensive and objective view of regional water quality issues remains a formidable task. Water-monitoring data must be obtained and effectively managed in order to protect sensitive ecosystems, identify and abate pollution sources, track the effectiveness of implemented actions, and prevent further degradation of our precious water resources.

Throughout San Diego Bay, the San Diego Regional Water Quality Control Board (RWQCB) has identified areas with water quality impairments and these locations have been included on the 2002 Clean Water Act 303(d) list. Along the San Diego Bay shoreline, a few of these areas are the Downtown Anchorage, mouth of Switzer Creek and the vicinity of B Street and Broadway Piers. The Downtown Anchorage has been identified as having sediment toxicity and benthic community effects. Near the mouth of Switzer Creek, chlordane, lindane and polynuclear aromatic hydrocarbons (PAHs) are the constituents of concern. The B Street and Broadway Piers are listed for bacterial indicators, sediment toxicity and benthic community effects.

The goals of the Common Ground project are aimed at rectifying this lack of water resource information primarily though the establishment of monitoring stations, a water resource sampling program, creation of a GIS (Geographic Information System) database for water resource information, and creation of the Common Ground website to facilitate dissemination of water resource information and participation among citizen stakeholders.

Citizen monitoring is one component of the overall project monitoring that is conducted under the Common Ground Grant agreement.

5.1.1. Common Grounds Mission and Project Goals

5.1.1.1. Mission

The San Diego Watersheds Common Ground Project was created to incorporate data from water quality monitoring programs and integrate this data on a watershed level using a web-based interactive application to serve as a broad communication, education and decision-making tool; and to further develop the region's capacity to understand and assess processes affecting our water resources. Citizen monitoring is implemented is to gather environmental information which is needed to protect California's watersheds and aquatic resources. Citizen monitoring will also inform and engage the community in effective watershed stewardship.

5.1.1.2. Program Goals

The primary goals of the San Diego Watersheds Common Ground Project are to:

1. Achieve measurable water quality improvements throughout San Diego Bay by undertaking a targeted monitoring program that will support the development of three Total Maximum Daily Loads (TMDLs) in the Bay.

2. Enhance understanding and management of the San Diego Bay watershed by developing a Geographic Information Systems (GIS) and supporting data management tools to integrate and optimize monitoring data collected by local and state agencies, citizen groups, educational and research institutions and local businesses.

3. Reduce pollution into San Diego Bay by undertaking a comprehensive outreach and education program that will i ncrease awareness of watershed issues and promote adoption of non-polluting behaviors among local residents and students.

4. Build the capacity of community-based water assessment efforts to improve regional understanding of our water resources so that point and non-point pollution sources can be readily identified and abated.

The general goals of the Common Grounds Project are:
- Obtain community involvement and support
- Develop and implement the San Diego Bay Watershed Monitoring Program
- Establish a Regional Water Monitoring Training and Resource Center
- Design and implement a Geographic Information System (GIS) database for water resource information
- Develop and maintain the San Diego Watersheds Common Ground website

5.2. Intended Usage of Data

The Common Ground GIS database for water resource information will be developed in collaboration with the San Diego State University Department of Geography. Water quality data collected for the Common Ground project will be used to create the Common Ground GIS database that will integrate and optimize monitoring data collected by local and state agencies, citizen groups, educational and research institutions, and local businesses.

5.3. Water Quality or Regulatory Criteria

Monitoring in this program is not designed to identify compliance issues, or to necessarily document parameters that exceed regulatory standards. Water quality data generated throughout the course of monitoring will be compared to the Water Quality Control Plan (Basin Plan, RWQCB, 1994) for the San Diego area, Title 40 of the Code of Federal Regulations (Part 131; Water Quality Standards) (USEPA 2000a) and the City of San Diego Jurisdictional Urban Runoff Monitoring Program to determine potential impacts to San Diego Bay.

6. Project/Task Description

6.1. General Overview of Monitoring

The citizen monitoring organizations are monitoring water quality in the following San Diego County watersheds: Pueblo, Otay, and Sweetwater. Physical, chemical and biological parameters are measured, although not all groups are measuring all parameters. Table 6.1 summarizes the proposed monitoring activities, including the physical, chemical and bacteriological parameters to be measured, whether the samples will be analyzed by the monitoring group or sampled for later analysis by a professional lab, and the frequency of measurement.

Table 6.1 Summary of Proposed Monitoring Activities

Parameter	Frequency	Type	WQO
Temperature	May 2006 event	F	BPJ
Dissolved Oxygen	May 2006 event	F	5.0 mg/L
pH	May 2006 event	F	6.5-9.0
Conductivity	May 2006 event	F	BPJ
Phosphate	May 2006 event	F, L	2.0 mg/L
Total Coliform	May 2006 event	L	50,000 MPN/100 mL
E. Coli	May 2006 event	L	20,000 MPN/100 mL
Enterococci	May 2006 event	L	10,000 MPN/100 mL

BPJ = Best Professional Judgement

Codes for Table 6.1:
Type: F: field analysis, L: in-house lab analysis, P: sample only, send to outside professional lab

Water quality data generated throughout the course of monitoring will be compared to the Water Quality Control Plan (Basin Plan, RWQCB, 1994) for the San Diego area, Title 40 of the Code of Federal Regulations (Part 131; Water Quality Standards) (USEPA 2000a) and the City of San Diego Jurisdictional Urban Runoff Monitoring Program to identify potential exceedances.

This QA plan only addresses data quality objectives for the following parameters:

Flow
Temperature
Dissolved Oxygen
pH
Turbidity
Phosphate (Phosphorous)
Total Coliform Bacteria
E. coli Bacteria
Enterococcus Bacteria

7. Data Quality Objectives

This section identifies how accurate, precise, complete, comparable, sensitive and representative our measurements will be. These data quality objectives were derived by reviewing the QA plans and performance of other citizen monitoring organizations, by considering the specifications of the instruments and methods which we will employ, and by considering the utility of the data. For purposes of this QAPP the data quality is considered adequate for the determination of general water quality conditions, with a potential application of the data to Section 305(b) reporting purposes.

Data quality objectives are summarized in Tables 7-1 to 7-3. Whenever possible the methods with the greatest sensitivity and lowest detection limit will be employed as the primary methods. Methods with lesser sensitivity and higher detection limits will be used for field confirmations or as back-up methods in the case that the primary methods are not available or functioning properly for a particular sampling event. Specific DQOs were not given for in-situ continuous monitoring devices. See Section 14 for quality control protocols to be followed when continuous monitoring devices are employed.

Table 7.1. Data Quality Objectives for Conventional Water Quality Parameters

Parameter	Method/range	Units	Detection Limit	Sensitivity*	Precision	Accuracy	Complete-ness	WQO
Temperature	Thermometer (-5 to 50)	^{o}C	-5^{o}C	0.5 ^{o}C	± 0.5 ^{o}C *	± 0.5 ^{o}C	80% *	BPJ
Dissolved oxygen	Electronic meter/probe	mg/l	0.1 mg/l	0.1 mg/l	± 0.5 mg/L*	± 0.5 mg/L	80% *	5.0 mg/L
Dissolved oxygen	Vacuum ampoule Indigo carmine 1 to 12 and 2 to 10 mg/l	mg/l	1 or 2 mg/l depending on range	1.0 to 0.5 mg/l	± 10% *	± 2.0 mg/l	80% *	5.0 mg/L
pH	pH meter	pH units	2.0	0.1 unit	± 0.2 units *	± 0.2 units	80% *	6.5-9.0
pH	Non-bleeding strips (range 4.5-10.0)	pH units	4.5	0.5 unit	± 0.5 units *	± 0.5 units	80% *	6.5-9.0
Conductivity	conductivity meter	µS/cm	10	10 µS/cm	± 5 *	± 5	80% *	BPJ

NA: not applicable
*Note: Some test kits vary in sensitivity over the range of detection. The specific range of readings is noted in parentheses.
*No SWAMP Requirement

Table 7.2. Data Quality Objectives for Nutrients Using Colorimeters or Spectrophotometers

Parameter	Method/range	Units	Detection Limit	Sensitivity	Precision	Accuracy	Completeness	WQO
Phosphate	Ascorbic acid	mg/l	0.1	Laboratory duplicate, blind field duplicate	±10%	±10%	80% *	2.0 mg/L

*No SWAMP Requirement

Table 7.3. Data Quality Objectives for Biological Parameters

Parameter	Method/range	Units	Detection Limit	Sensitivity	Precision	Accuracy	Completeness
Total Coliform Bacteria	IDEXX Colisure	MPN/ 100ml	10	See IDEXX quantitray tables	Duplicates within ½ of an order of magnitude	Positive standard within ½ of an order of magnitude	SWAMP Requirement 90%
E. coli Bacteria	IDEXX Colisure	MPN/ 100ml	10	See IDEXX quantitray tables	Duplicates within ½ of an order of magnitude	Positive standard within ½ of an order of magnitude	SWAMP Requirement 90%
Entero-coccus Bacteria	IDEXX Enterolert	MPN/ 100ml	10	See IDEXX quantitray tables	Duplicates within ½ of an order of magnitude	Positive standard within ½ of an order of magnitude	SWAMP Requirement 90%

7.1. Accuracy

7.1.1. Chemical and Physical Parameters

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a sample of known concentration and comparing the known value against the measured value. The accuracy of chemical measurements will be checked by performing tests on standards each time equipment is checked out. A standard is a known concentration of a certain solution. Standards can be purchased from chemical or scientific supply companies. Standards might also be prepared by a professional partner, e.g. a commercial or research laboratory. The concentration of the standards, known to the volunteer leader, will be unknown to the monitors until after measurements are determined. The concentration of the standards should be within the mid-range of the equipment. The Data Quality Form: Accuracy, found in Appendix 1, will be used to record accuracy.

7.1.2. Bacteriological Indicators

Accuracy for bacteria will be determined by analyzing a positive control sample twice annually. A positive control is similar to a standard, except that a specific discreet value is not assigned to the bacterial concentrations in the sample. This is due to the fact that bacteria are alive and capable of mortality and reproduction. Instead of a specific value, an approximate target value of the bacterial concentration is assigned to the sample by the laboratory preparing the positive control sample.

7. 2. Comparability

Comparability is the degree to which data can be compared directly to similar studies. Citizen monitoring groups will use the methods described in the following resource documents to ensure that their data can be compared to others:

- U.S. EPA's Volunteer Monitoring Manuals for Streams, Lakes or Estuaries,
- SWRCB Clean Water Team Compendium for Water Quality Monitoring and Assessment, and
- Heal the Bay's Malibu Creek Stream Team Pilot Project, Shattering the Myths of Volunteer Monitoring
- San Francisco Estuary Institute's Volunteer Monitoring Protocols.

Before modifying these methods, or developing alternative or additional methods, technical advisors will evaluate and review the effects of the potential modification. It will be important to address their concerns about data quality before proceeding with the monitoring program.

7. 3. Completeness

Completeness is the fraction of planned data that must be collected in order to fulfill the statistical criteria of the project. Volunteer data will not be used for legal or compliance uses. There are no statistical criteria that require a certain percentage of data. However, it is expected that 80% of all measurements could be taken when anticipated. This accounts for adverse weather conditions, safety concerns, and equipment problems.

We will determine completeness by comparing the number of measurements we planned to collect compared to the number of measurements we actually collected that were also deemed valid. An invalid measurement would be one that does not meet the sampling methods requirements and the data quality objectives. Completeness results will be checked quarterly. This will allow us to identify and correct problems. The Data Quality Form: Completeness, found in Appendix 1, will be used to record completeness.

7. 4. Precision

7.4.1. Chemical and Physical Parameters

The precision objectives apply to duplicate and split samples taken as part of a QC session or as part of periodic in-field QC checks. Precision describes how well repeated measurements agree. The evaluation of precision described here relates to repeated measurements taken by either different volunteers on the same sample (at quality control sessions) or the same volunteer analyzing replicate samples (in the field). Sampling variability will not be covered in this section. The Data Quality Form: Precision, found in Appendix 1, will be used to record precision.

7.4.2. Bacteriological Indicators

Precision for bacterial parameters will be determined by having the same analyst complete the procedure for laboratory duplicates of the same sample. At a minimum this should be done once per day, or run duplicates on a minimum of 5% of the samples if there are over 20 samples run per day. The results of the duplicates should be within the confidence limits supplied by the manufacturer.

7. 5. Representativeness

Representativeness describes how relevant the data are to the actual environmental condition. Problems can occur if:

- Samples are taken in a stream reach that does not describe the area of interest (e.g. a headwaters sample should not be taken downstream of a point source),
- Samples are taken in an unusual habitat type (e.g. a stagnant backwater instead of in the flowing portion of the creek),
- Samples are not analyzed or processed appropriately, causing conditions in the sample to change (e.g. water chemistry measurements are not taken immediately).

Representativeness will be ensured by processing the samples in accordance with Section 10, 11 and 12, by following the established methods, and by obtaining approval of this document.

7. 6. Method Detection Limit and Sensitivity

The Method Detection Limit is the lowest possible concentration the instrument or equipment can detect. This is important to record because we can never determine that a pollutant was not present, only that we could not detect it. Sensitivity is the ability of the instrument to detect one concentration from the next. Detection Limits and Sensitivities are noted in Tables 7.1. - 7.3. All field and laboratory detection limits are below WQOs.

8. Training Requirements

8.1 San Diego State University Foundation and San Diego Coastkeeper Training Requirements

All citizen monitoring leaders must participate in three hands-on training sessions on water quality monitoring conducted by the San Diego Coastkeeper and San Diego State University Foundation. The outline below lists the topics that will be covered under this training:

Safety,
Sampling procedures,
Analytical techniques, Data recording, and
Quality assurance and quality control measures.

In addition to completion of the above described training course above, the citizen monitoring leaders must participate in semi-annual quality control sessions. These Quality Control Sessions will provide an opportunity for SDSUF and Coastkeeper to check the accuracy and precision of their equipment and techniques . Monitoring equipment from both SDSUF and Coastkeeper will be brought to the Quality Control Session. Citizen monitors will conduct duplicate tests on all analyses and meet the data quality objectives described in Section 7. If a monitor does not meet the objectives, the trainers will re-train and re-test the monitor. If there is insufficient time at the QC session to re-train and re-test monitors, the monitor will be scheduled for an additional training session. The monitor will be encouraged to discontinue monitoring for the analysis of concern until training is completed.

The Quality Control Trainers will examine kits for completeness of components: date, condition, and supply of reagents, and whether the equipment is in good repair. The Trainers will check data quality by testing equipment against blind standards. The trainers will also ensure that monitors are reading instruments and recording results correctly. Sampling and safety techniques will also be evaluated. The trainer will discuss corrective action with the volunteers, and the date by which the action will be taken. The citizen monitoring leader is responsible for reporting back that the corrective action has been taken. Certificates of completion will be provided once all corrective action has been completed.

Karen Franz, the QA Officer, will oversee the trainers to ensure that all QA / QC is being met through the course of the trainings.

9. Documentation and Records

All field results will be recorded at the time of completion, using the field data sheets. Data sheets will be reviewed for outliers and omissions before leaving the sample site. Data sheets will be signed after review by the citizen monitoring leader. Data sheets will be stored in hard copy form at the location specified in Section 5.2. Field data sheets are archived for three years from the time they were collected. If data entry is ever performed at another location, duplicate data sheets will be used, with the originals remaining at the headquarters site. Hard copies of all data as well as computer back-up disks are maintained at headquarters. Data sheets will be recorded electronically as well for submission to City of San Diego and inclusion in the Common Ground website.

All chain-of-custody forms, completed data quality control forms and maintenance logs will also be kept at the headquarters location specified in Section 5.2. The mainenance log details the dates of equipment inspection, battery replacement and calibrations, as well as the dates reagents and standards are replaced.

QAPPs will be distributed upon request through contacting Karen Franz. She will be responsible for the distribution of the QAPP upon approvial to members outlines in Section 3 of this document. In addition, she will be responsible for the distribution os the final report following its completion and approval.

Lillian Luong, the data manager, is responsible for collecting and synthesizing the field data, converting it into SWAMP format, and submitting the data to the City in order to ensure its inclusion in the Common Grond website.

10. Sampling Process Design

10.1 Rationale for Selection of Sampling Sites

Potential sampling sites are indicated on the maps in Appendix 2 The following criteria were evaluated when choosing sampling locations:

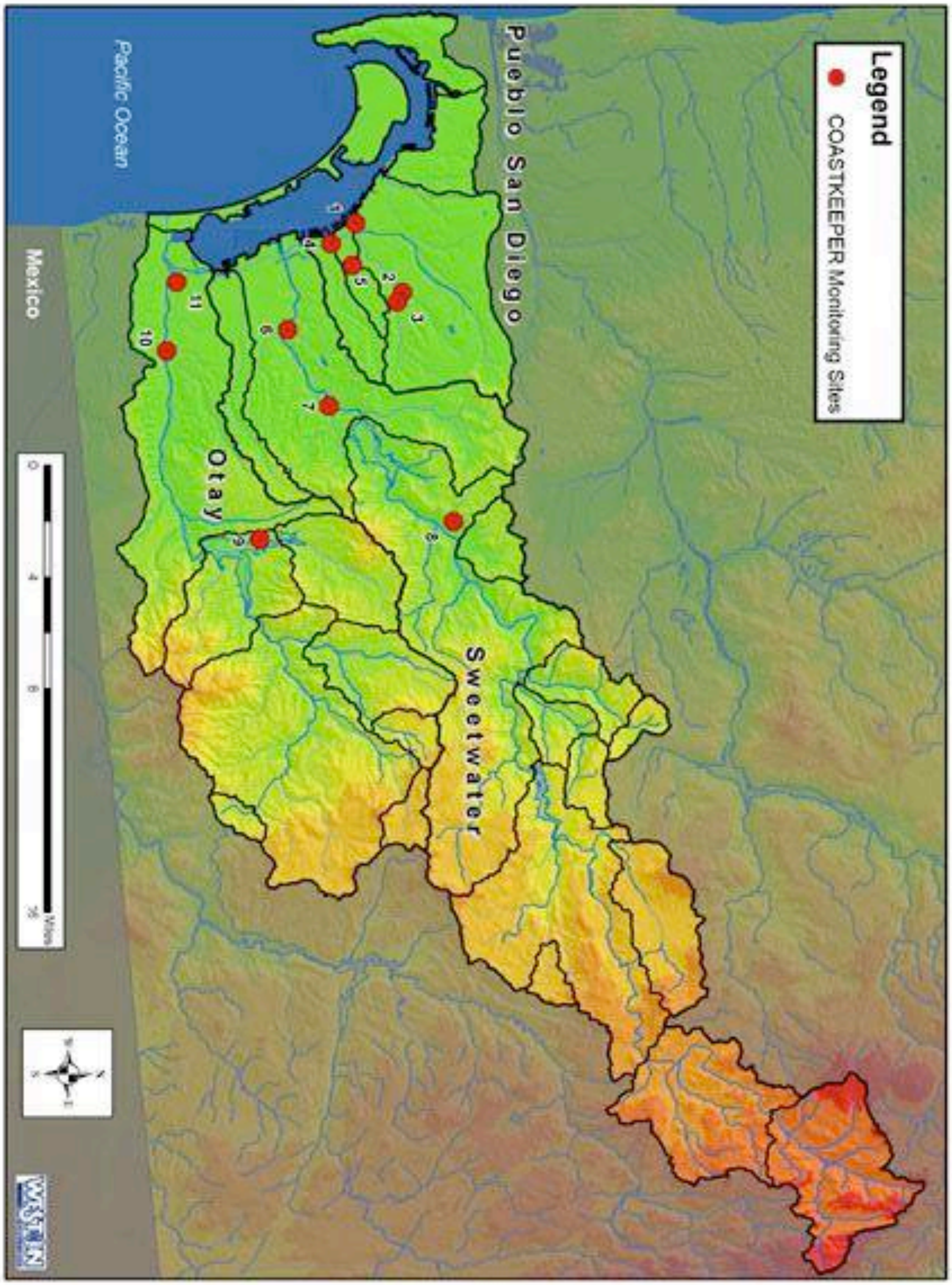
- access is safe,
- permission to cross private property is granted,
- sample can be taken in main river current or where homogeneous mixing of water occurs,
- sample is representative of the part of the water body of interest,
- location complements or supplements historical data,
- location represents an area that possesses unique value for fish and wildlife or recreational use.

Any reference sites are chosen upstream of any potential impact. A site chosen to reflect the impact of a particular discharge, tributary or land use is located downstream of the impact where the impact is completely integrated with the water, but upstream of any secondary discharge or disturbance.

Prior to final site selection, permission to access the stream was obtained from all property owners. If access to the site becomes a problem, the citizen monitoring leader will select a new site. Safety issues are included in the Standard operating Procedure.

Sample sites will be reviewed by the leader before sending volunteers out to the site. The monitoring leader will document permission and terms obtained from landowners, and will complete and file a Stream/Shore Walk form for the site, which will include a map and photographs. On February 11th, 2006, Karen Franz and Lillian Luong conducted a field reconnaissance, to verify sampling locations and adust these sites and identify alternate locations if necessary to avoid barriers such as road construction. In addition, sites may be altered based on a study of the current San Diego City dry weather monitoring stations.

Map 10.1 – Sample Site Locations within the San Diego Bay Watersheds


Legend
COASTKEEPER Monitoring Sites
Pueblo San Diego
Pacific Ocean
Mexico
Otay
Sweetwater
Miles

10.2. Sample Design Logistics

Volunteers are instructed to work in teams of at least two people. If a scheduled team cannot conduct the sampling together, the team captain is instructed to contact the citizen monitoring leader so that arrangements can be made for a substitute trained volunteer.

Prior to final site selection, permission to access the stream is obtained from all property owners. If access to the site is a problem, the citizen monitoring leader will select a new site following the site selection criteria identified in Section 10.1.

Safety measures will be discussed with all volunteers. No instream sampling will be conducted if there are small creek flood warnings or advisories. It is the responsibility of the citizen monitoring organization to ensure the safety of their volunteer monitors. Safety issues are included in the Standard operating Procedure.

11. Sampling Method Requirements

The manual Measuring the Health of California Streams and Rivers: A methods manual for resource professionals, citizen monitors and natural resources students (Harrington and Born, 2000, 2nd Ed.), describes the appropriate sampling procedure for collecting samples for water chemistry. Water chemistry sampling for a given field sampling location will be conducted in the same sampling area within the given field sampling location and during the same sampling period.

In those cases where glass bottles are required in Table 11.1, plastic samplers are allowed as long as the hold time in the sampling device is minimal before transfer to the glass sample bottle. Sampling devices and sample bottles (that are not pre-sterilized and do not contain preservatives/fixing agents) will be rinsed three times with sample water prior to collecting each sample. For sterile bottles, whirl-paks, and sample bottles which do contain preservatives/fixing agents (e.g., acids, etc.) never rinse with sample water prior to collecting the sample. Also, never use a sample bottle containing preservatives/fixing agents for sampling; in these cases always use a sampling device to collect the sample prior to transferring the sample into the bottle.

Whenever possible, the collector will sample from a bridge so that the water body is not disturbed from wading. All samples are taken approximately in mid-stream, at least one inch below the surface. If it is necessary to wade into the water, the sample collector stands downstream of the sample, taking a sample upstream. If the collector disturbs sediment when wading, the collector will wait until the effect of disturbance is no longer present before taking the sample.

The following table describes the sampling equipment, sample holding container, sample preservation method and maximum holding time for each parameter.

Table 11.1 Sampling Method Requirements

Parameter	Containers	Preferred / Maximum Holding Times
	Conventional Parameters	
Temperature	Sample directly	Immediately
Dissolved oxygen	500 mL plastic or Sample directly	Immediately / for wet chemistry fix per protocol instructions, continue analysis within 8 hr.
pH	500 ml plastic or Sample directly	Immediately
Conductivity	500 ml plastic or Sample directly	Immediately / refrigerate up to 24 hours
	Nutrient	
Phosphate	500 ml plastic	Immediately / refrigerate at 4º C in dark for up to 8 hours.
	Biological Samples	
Bacteria	500 ml plastic or Whirl-Pak	Refrigerate to 4 º C in the dark; deliverd to the lab within 4 hours, start analysis within 6 hours

12. Sample Handling and Custody Procedures

12.1. Sample Handling

Identification information for each sample will be recorded on the field data sheets when the sample is collected. Samples that are not processed immediately in the field will be labeled with the waterbody name, sample location, sample number, date and time of collection, sampler's name, and method used to preserve sample (if any).

12.2. Custody Procedures

The conventional water quality monitoring tests do not require specific custody procedures since they will, in most cases, be conducted immediately by the same person who performs the sampling. In certain circumstances (such as driving rain or extreme cold), samples will be taken to a nearby residence for analysis. Samples requiring chemical preservation will be fixed prior to transport.

When samples are transferred from one volunteer to another member of the same organization for analysis, or from the citizen monitoring group to an outside professional laboratory, then a Chain of Custody form should be used. This form identifies the waterbody name, sample location, sample number, date and time of collection, sampler's name, and method used to preserve sample (if any). It also indicates the date and time of transfer, and the name and signature of the sampler and the sample recipient. In cases where the sample remains in the custody of the monitoring organization, then the field data sheet may be allowed to double as the chain of custody form. It is recommended that when a sample leaves the custody of the monitoring group, then the Chain of Custody form used be the one provided by the outside professional laboratory. Similarly, when quality control checks are performed by a professional lab, their samples will be processed under their chain of custody procedures with their labels and documentation procedures.

The record documents the transferring of samples from one volunteer to another member of the same organization, or from the citizen monitoring group to an outside professional laboratory. Each transfer of custody must be noted and signed. The individual responsible for custody is to maintain direct control (e.g., possession or line of site) of the sample(s), or must maintain the sample(s) in a secured location, such as in a locked car. The Chain of Custody record shall include (at a minimum) the following:

- Name of the water body,
- Sample location,
- Sample number,
- Sample date,
- Sampler's name and signature, and
- Preservative used (if any)

It also documents the date(s) and time(s) of transfer(s), and the name and signature of the sample recipient. When a professional lab performs quality control checks, their chain of custody forms and procedures are to be used.

12.3. Disposal

All analyzed samples or spent chemicals (except for waste from the nitrate/cadmium reduction test and the Nessler ammonia test) including used reagents, buffers or standards will be collected in a plastic bottle clearly marked "Waste" or "Poison". This waste material will be disposed of according to appropriate state and local regulations. This will usually mean disposal into a drain connected to a sewage treatment plant.

Liquid waste from the cadmium reduction nitrate test will be kept separate and disposed of at a facility that is permitted to handle, transport, or dispose Cd waste. Liquid waste from the Nessler ammonia test (which contains mercury) will likewise be kept separate and disposed of at a facility that is permitted to handle, transport, or dispose Hg waste. Waste from the zinc reduction nitrate test and the salicylate ammonia test can be held in the regular waste container and disposed of as described in the previous paragraph.

Whenever possible, if waste includes reagents from the detergent test, these wastes will be poured down a drain underneath a flume hood.

13. Analytical Methods Requirements

Water chemistry is monitored using protocols outlined in the manual "Measuring the Health of California Streams and Rivers: A methods manual for resource professionals, citizen monitors and natural resources students second edition" (Harrington and Born, 2000). The methods were chosen based on the following criteria:

- capability of volunteers to use methods,
- provide data of known quality,
- ease of use,
- methods can be compared to professional methods in *Standard Methods*.

If modifications of methods are needed, comparability will be determined by side-by-side comparisons with a US EPA or APHA Standard Method on no less than 50 samples. If the results meet the same precision and accuracy requirements as the approved method, the new method will be accepted.

Table 13.1 outlines the methods to be used, any modifications to those methods, and the appropriate reference to a standard method.

Table 13.1 Analytical Methods for Water Quality Parameters

Parameter	Method	Modification	Reference (a)
Field Methods			
Temperature	Thermometric	Alcohol-filled thermometer marked in 0.5°C increments	2550 B.
Dissolved Oxygen	Membrane Electrode	None	4500-O G.
Dissolved Oxygen	Colorimetric indigo carmine	Vacuum ampoules	ASTM D 888-87
pH	Electrometric	None	4500-H B.
pH	Litmus indicator strips	Non-bleeding	Whatman Co.
Conductivity	Electrometric	None	2520 B.
Phosphate	Ascorbic acid	Color Comparator	4500 – P E.
Phosphate	Ascorbic acid	prepackaged reagents, colorimeter or spectrophotometer	4500 – P E.
Laboratory Methods			
Total Coliform Bacteria	IDEXX Colisure	None	IDEXX Corp.
E. coli Bacteria	IDEXX Colisure	None	IDEXX Corp.
Enterococcus Bacteria	Enterolert 24 hour	None	IDEXX Corp.

(a) All of the above methods, with the exception of dissolved oxygen via indigo carmine, pH via non-bleeding indicator strips, turbidity via dual tube (JTUs), and rococcus bacteria are described in Standard Methods for the Examination of Water and Wastewater 20th Edition. American Public Health Association et al, 1998.

14. Quality Control

Quality control samples will be taken to ensure valid data are collected. Depending on the parameter, quality control samples will consist of blanks, replicate samples, and split samples. In addition, quality control sessions (a.k.a. intercalibration exercises) will be held twice a year to verify the proper working order of equipment, refresh volunteers in monitoring techniques and determine whether the data quality objectives are being met.

14.1. Cautions Regarding Test Procedures

14.1.1. Nutrients

The nitrate test measures nitrite as well as nitrate. Therefore the results for the nitrate test are actually mg/l Nitrite + Nitrate Nitrogen. When mixing nitrate reagents take care not to agitate aggressively. The LaMotte phosphate reagents have been shown to degrade well within their listed shelf life once opened.

14.2. Blanks, Replicates, Split Samples, and Standardization

Field/Laboratory Blanks: For all conventional water quality analyses, except temperature, dissolved oxygen and pH, field blanks will be analyzed once daily. For nutrients using comparators, a field blank will be analyzed every sampling trip. Color can sometimes appear in these nutrient blanks, suggesting that the real samples may be overestimating the true nutrient concentration. When colorimeters or spectrophotometers are used at the group's facility for nutrient analysis, a laboratory reagent blank will be analyzed and recorded for each day of analysis. For urban pollutants field blanks will be run daily. For bacterial analysis performed at a group's facility, a laboratory blank will be performed for each sampling/analysis event.

Instructions for Field and Lab Blanks: Distilled water is taken into the field or used in the laboratory and handled just like a sample. It will be poured into the sample container and then analyzed. When reagents are used in a test method, then the reagents are added to the distilled water and these types of blanks are referred to as reagent blanks. Field blanks are recorded on the field data sheet. For nutrients measured with comparators, results from the field reagent blanks should be "not detected". If nutrients are detected, corrective action will be taken to eliminate the problem. For nutrients measured with colorimeters, the lab reagent blanks should be less than 0.05 ppm and the specific value should be recorded and subtracted from the field sample result. For bacterial analysis, the reagents are added to distilled water (in the same manner as for a field sample) and that blank is then sealed in a quantitray and incubated along with the field samples. The blank should be below detection limits (i.e., no positive wells) at the end of the incubation period.

Field Confirmations: When a second method for measuring temperature, dissolved oxygen, and pH is available in the field, then the monitors are encouraged to perform both measurements on a split sample at least once daily. Examples of this sort of redundant measurement would be:

- for temperature, the use of an electronic thermometer (such as those that are built into dissolved oxygen meters) and an armored thermometer;
- for dissolved oxygen, the use of an oxygen meter and an indigo carmine colorimetric kit;
- for pH, a meter and a non-bleeding indicator strip.

This will serve to provide backup capability if the more sensitive electronic meters fail, and will provide additional confidence as to the quality of the data. The results of both measurements will be recorded along with the procedure used on the field data sheet. If both results are comparable then the result produced using the method of greater sensitivity will be the one entered in the final data set by the data manager in consultation with the monitoring leader. If the two results are inconsistent, then the monitoring leader will note on the data sheet which of the results will be entered on the final data set by the data manager.

Replicate Samples: Replicate samples are two or more samples collected at the same time and place. When there are only two replicates then these are referred to as duplicates. For conventional water quality, nutrients, and urban pollutant analyses duplicate field samples will be taken once every 20 samples, or quarterly whichever comes first. Duplicate samples will be collected as soon as possible after the initial sample has been collected, and will be subjected to identical handling and analysis. For bacterial analysis lab duplicates will be run at least once per sampling day, and when there are more than 20 samples run per day then there will be a minimum 5% of the samples analyzed in duplicate.

Split Samples: Twice a Year, split spiked samples (standards) will be analyzed as part of the Quality Control Session. The split standard is one sample, containing a known concentration of an analyte, that is divided equally into two or more sample containers. Split standards will be analyzed by the volunteers, and sent to a professional laboratory (except for dissolved oxygen, temperature, and pH), before the maximum sample handling time is exceeded. Volunteers will analyze the split standard normally and will perform at least three analyses on that same sample. From these results accuracy and precision will be determined. The professional laboratory will analyze the sample using the method referenced in Table 13.1

For bacteria, split field samples or split positive controls will be analyzed by the citizen monitoring group and an outside professional laboratory twice annually. In addition, at the quality control session different analysts from the citizen monitoring group(s) will each read a minimum of the three quantitrays and compare their results. These results should be within ± one well for concentrations of less than 1000 MPN/100 ml, and within ± two wells for concentrations of greater than 1000 MPN/100ml.

Standardization of Instruments and Procedures: At the Quality Assurance Sessions the temperature measurements will be standardized by comparing our thermometers to a NIST-certified or calibrated thermometer in ice water and ambient temperature water. All meters (pH, conductivity, oxygen) will be evaluated at the Quality Assurance Session using standards provided with the assistance of a professional laboratory and/or the technical advisors. For oxygen meters the standard will be distilled water saturated with oxygen. The Winkler kits for dissolved oxygen will be checked by standardizing the sodium thiosulfate solution in the test kit, and/or by comparing the entire kit to a saturated oxygen standard. Instructions for checking the sodium thiosulfate are included in the test kit. (Additional reagents and glassware must be purchased separately however.) If the result is unsatisfactory, as indicated in the instructions, the sodium thiosulfate and/or other reagent will be discarded and replaced with new reagents.

Table 14.1 summarizes the quality control regimen.

Table 14.1 Summary of Quality Control Requirements

Parameter	Blank	Duplicate Sample	Split Sample to lab	QC session
Water quality				
Temperature	none	5% or a minimum of once a year	none	twice a year
Dissolved oxygen	none	5% or a minimum of once a year	none	twice a year
pH	none	5% or a minimum of once a year	none	twice a year
Conductivity	daily	5% or a minimum of once a year	twice a year	twice a year
Nutrients (comparators)				
Phosphate	daily	5% or a minimum of once a year	twice a year	twice a year
Nutrients (colorimeters or spectrophotometers)				
Phosphate	daily	5% or a minimum of once a year	twice a year	twice a year
Biological Parameters				
Total Coliform and *E. coli* Bacteria	daily	5% or a minimum of once per day	twice a year	twice a year
Enterococcus Bacteria	daily	5% or a minimum of once per day	twice a year	twice a year

15. Instrument/Equipment Testing, Inspection and Maintenance

A maintenance log is kept by the monitoring group leader. This log details the dates of instrument and sampling gear inspection, calibrations performed in the laboratory, battery replacement, the dates reagents and standards are replaced, and any problems noted with instruments, samplers, or reagents.

15.1. Temperature

Before each use, thermometers are checked for breaks in the column. If a break is observed, the alcohol thermometer will be placed in nearly boiling water so that the alcohol expands into the expansion chamber, and the alcohol forms a continuous column. verify accuracy by comparing with a calibrated or certified thermometer.

15.2. Dissolved oxygen

Dissolved Oxygen Meters: Membranes and solutions should be replaced according to manufacturer's specifications, but no less frequently than quarterly. Membranes should be checked for bubbles after replacement. Before each use, D.O. meters are checked to see if they are clean and in good working order.

15.3. Conductivity and pH

Before each use, conductivity and pH meters are checked to see if they are clean and in good working order. Conductivity and pH meters are calibrated before each use. Conductivity standards and pH buffers are replaced at least annually. Conductivity standards are stored with the cap firmly in place and in a dry place kept away from extreme heat. Do not re-use pH or conductivity standards.

15.4. Nutrients and Urban Pollutants

Before each use, test kits are checked to ensure that droppers, sample containers, and color comparators are clean and in working condition. Colorimeter tubes should be checked to make sure they are clean and are not scratched. Reagents are replaced annually according to manufacturer's instructions.

16. Instrument Calibration / Standardization and Frequency

Instruments will be calibrated and reagents checked against standards accordingly to the following schedule. Standards will be purchased from a chemical supply company or prepared by (or with the assistance of) a professional laboratory. Calibration records will be kept in the maintenance log at the headquarters location (described in Section 5.2.) where it can be easily accessed before and after equipment use. Calibrations that are performed by monitors in the field are recorded on the field data sheets, also archived at the headquarters. The frequency of calibration is described in Table 16.1.

Table 16.1 Instrument Calibration and Frequency

Conventional Water Quality Parameters		
Equipment Type	**Calibration Frequency**	**Standard or Calibration Instrument Used**
Temperature	Every 6 months	NIST calibrated or certified thermometer
Dissolved Oxygen meter	Every sampling day	At a minimum, water saturated air, according to manufacturer's instructions.
pH	Every sampling day	pH 7.0 buffer and one other standard (4 or 10)
conductivity	Every sampling day	Conductivity standard and distilled water

Nutrient (using comparators)		
Equipment type	**Checked against Standard**	**Standard Used**
Phosphate	every 6 months or when reagents replaced	phosphorous standard

Nutrient (using colorimeters or spectrophotometers)		
Equipment type	**Checked against Standard**	**Standard Used**
Phosphate	Every day of analysis	ortho-phosphate standard

17. Inspection/Acceptance Requirements

Upon receipt, buffer solutions, standards, and reagents used in the field kits will be inspected by Karen Franz, the Coastkeeper QA Officer, for leaks or broken seals, and to compare the age of each reagent to the manufacturer's recommended shelf-life. All other sampling equipment will be inspected for broken or missing parts, and will be tested to ensure proper operation.

Before usage, thermometers are inspected by Karen Franz, the Coastkeeper QA Officer, for breaks. Breaks can be eliminated by heating (see Section 15.1). If not, they will be returned to the manufacturer.

Reagents are replaced before they exceed manufacturer's recommended shelf life. These shelf lives are typically one to two years. However, specific replacement dates can determined by providing the reagent lot number to the manufacturer. Reagent replacement dates are noted in the maintenance log.

18. Data Acquisition Requirements

18.1. Professional Analytical Data

Only certified analytical laboratories or academic laboratories (with approval of State and/or Regional Board staff) will be used for quality assurance checks and analysis of field samples. The Technical advisory Committee (TAC) or technical advisors will review these laboratories' data as well as the volunteers. They may also review the lab's own quality control data to ensure data validity.

18.2. Geographical Information/ Mapping

USGS maps will be used to verify watershed boundaries and river courses. NOAA navigation charts can be used for mapping marine sampling sites. Additional information on distribution of natural resources will be obtained from the National Park Service. Land use information will be obtained from local planning offices. When information is requested, the agency will be asked to provide appropriate megadata and any information on data limitations. This information will be maintained with the data files.

19. Data Management

Field data sheets are checked and signed in the field by the citizen monitoring leader. The citizen monitoring leader will identify any results where holding times have been exceeded, sample identification information is incorrect, samples were inappropriately handled, or calibration information is missing or inadequate. Such data will be marked as unacceptable by the monitoring leader and will not be entered into the electronic data base.

Independent laboratories will report their results to the citizen monitoring leader. The leader will verify sample identification information, review the chain-of-custody forms, and identify the data appropriately in the database. These data are also reviewed by the technical advisors quarterly.

The data management coordinator will review the field sheets and enter the data deemed acceptable by the citizen monitoring leader and the technical advisors. Upon entering the data the data management coordinator will sign and archive the field data sheets. Data will be entered into a spreadsheet (MS Excel) or a database (MS Access) in a way that will be compatible with EPA's STORET and the Regional WQCB's database guidelines. Following initial data entry the data coordinator will review electronic data, compare to the original data sheets and correct entry errors. After performing data checks, and ensuring that data quality objectives have been met, data analysis will be performed.

Raw data will be provided to the State WQCB and Regional WQCB in electronic form at least once every two years so that it can be included in the 305(b) report. Appropriate quality assurance information may be provided upon request. Electronic data will be included on the Common Ground website in coordination with SDSU's Department of Geography.

20. Assessment and Response Actions

Review of all field and data activities is the responsibility of the citizen monitoring leader, with the assistance of the technical advisory committee. Volunteers will be accompanied by the citizen monitoring leader, or a technical advisor on at least one of their first 5 sampling trips. If possible, volunteers in need of performance improvement will be retrained on-site. All volunteers must attend a refresher course offered by the citizen monitoring group. If errors in sampling technique are consistently identified, retraining may be scheduled more frequently.

Within the first three months of the monitoring project, the State Water Board or Regional Board staff, or its designee, will evaluate field and laboratory performance and provide a report to the citizen monitoring group. All field and laboratory activities, and records may be reviewed by State and EPA quality assurance officers as requested.

21. Reports

The technical advisors will review draft reports to ensure the accuracy of data analysis and data interpretation. Raw data will be made available to data users per their request. The citizen monitoring organization(s) will report their data to its (their) constituents after quality assurance has been reviewed and approved by their technical advisors. Every effort will be made to submit data and/or a report to the State and/or Regional Board staff in a fashion timely for their data uses, e.g. 305(b) reports.

Report	Date	Responsible party
QAPP Finalization	Pending SWRCB approval	Karen Franz
Training	March 2006	Karen Franz
Monitoring	April 2006	Karen Franz
Data Inclusion	May 2006	Karen Franz

22. Data Review, Validation and Verification

Data sheets or data files are reviewed quarterly by the technical advisors to determine if the data meet the Quality Assurance Project Plan objectives. They will identify outliers, spurious results or omissions to the citizen monitoring leader. They will also evaluate compliance with the data quality objectives. They will suggest corrective action that will be implemented by the citizen monitoring leader. Problems with data quality and corrective action will be reported in final reports, and Lillian Luong, the Data Manager, will be responsible for doing this.

23. Validation and Verification Methods

As part of standard field protocols, any sample readings out of the expected range will be reported to the citizen monitoring leader. A second sample will be taken as soon as possible to verify the condition. If the data is invalid, then the data will be noted (flagged) on the data sheet. We will take further actions to trace the sources of error, and to correct those problems. If the error is a result of improper monitoring procedures, then we may re-train monitors until their performance is acceptable. It is the responsibility of the citizen monitoring leader to re-train volunteers until performance is acceptable.

Lillian Luong, the Data Manager, will be responsible for collecting all data and converting into SWAMP-compliant data to ensure that the data is in acceptable format for inclusion into the Common Ground website.

24. Reconciliation with DQOs

The Technical Advisory Committee working with the monitoring leader(s) will review data quarterly to determine if the data quality objectives (DQOs) have been met. A quorum of 1/2+1of the technical advisory committee will be required for committee decisions. If a quorum is not met at the meeting, work will still proceed. The work product (e.g., review and comments on data or reports) will then be sent out to the whole technical advisory committee for approval with a 30-day review period.

If data do not meet the project's specifications, the following actions will be taken. First, the technical advisors working with the monitoring leader(s) will review the errors and determine if the problem is equipment failure, calibration/maintenance techniques, or monitoring/sampling techniques. They will suggest corrective action. If the problem cannot be corrected by training, revision of techniques, or replacement of supplies/equipment, then the technical advisors and the TAC will review the DQOs and determine if the DQOs are feasible. If the specific DQOs are not achievable, they will determine whether the specific DQO can be relaxed, or if the parameter should be eliminated from the monitoring program. Any revisions to DQOs will be appended to this QA plan with the revision date and the reason for modification. The appended QAPP will be sent to the quality assurance panel that approved and signed this plan. When the appended QAPP is approved, the citizen monitoring leader will work with the data coordinator to ensure that all data meeting the new DQOs are entered into the database. In addition, the citizen monitoring leader will ensure that all laboratory reporting limits were equal to or below the WQOs. Archived data can also be entered.

Lillian Luong, the Data Manager, will be responsible for collecting all data and converting into SWAMP-compliant data to ensure that the data is in acceptable format for inclusion into the Common Ground website.

APPENDIX 1. Data Quality Forms

Data Quality Form: Accuracy

Quality Control Session

Monitoring Group Name	Type of Session (field or lab)
Your Name	Quality Assurance Leader
Date	

Parameter/ units	Sensitivity	Accuracy Objective	Standard Conc.	Analytical Result	Estimated Bias	Meet Objective? Yes or No	Corrective action planned	Date Corrective Action taken
Temperature ^{o}C								
Dissolved Oxygen (mg/l)								
pH standard units								
Conductivity (umhos/cm)								

Comments:

Data Quality Form: Completeness

Quality Control Session

Monitoring Group Name	Type of Session (field or lab)
Your Name	Quality Assurance Leader
Date	

Parameter	**Collection Period**	**No. of Samples Anticipated**	**No. Valid Samples Collected and Analyzed**	**Percent Complete**
Temperature ^{o}C				
Dissolved Oxygen (mg/l)				
pH standard units				
Conductivity (umhos/cm)				

Comments:

Data Quality Form: Precision — Quality Control Session

Monitoring Group Name	Type of Session (field or lab)
Your Name	Quality Assurance Leader
Date	

Parameter/ units	Mean (x)	Standard Deviation (s.d.)	s.d./x	Precision Objective	Meet Objective? Yes or No	Corrective action planned	Date Corrective Action taken
Temperature ^{o}C							
Dissolved Oxygen mg/l							
pH standard units							
Conductivity (umhos/cm)							

Comments:

San Diego Coastkeeper Watershed Monitoring Program

Field Data Sheet
February 2006

San Diego State University | San Diego Coastkeeper | The Future of Our Water Resources is in Your Hands | San Diego Citizen Watershed Monitoring Consortium

DOC_ID# :

GPS Coordinates:	
Datum	
W:	
N:	
GPS_ID:	

Field Data Sheet DATE_______________ TIME __________________

Please **Use one sheet for each Station**. Use back for comments.

Watershed:

Hydrologic Unit ID:

Station (Site) ID:

Watershed Group Name:

Waterbody:

Site map is attached to this data sheet, please update if necessary.

Sampling Station Type:

Volunteer Monitors

TEAM LEADER (list full name & phone #):

Phone: ( ) ______-____________

2)

3)

4)

5)

(list additional names on back)

Additional Comments

INSTRUMENT ID	PARAMETER	RESULT 1	RESULT 2	RESULT 3	UNITS
	Air Temperature				°C °F
	Water Temperature				°C °F
	Dissolved Oxygen				pH units
	pH				uS mS
	Conductivity				mg/L
	Phosphate				mg/L
					UNIT ________
					UNIT ________
					UNIT ________

Water Clarity (circle one):

clear cloudy murky

Additional observations (color, foam, smell, etc.):

How was sample collected (circle one)?

Sampling Pole Hand Bucket

Other:

Weather Conditions (circle):

Has it rained within the last 72 hours? Y / N

-- SKY--	-- PRECIPITATION--	-- WIND--
no clouds	none	none
partly cloudy	foggy	breezy
heavy clouds	misty	windy
overcast	rain	blustery

Notes and Observations :

(please include any observations such as amount of trash and composition, equipment problems, wildlife encountered, etc...)

Flow Information (average of 3 measurements):

Width (ft/in):(1)__________ (2)__________ (3)__________Avg__________

Depth (ft/in):(1)__________ (2)__________ (3)__________Avg__________

Speed (ft/sec or in/sec):(1)__________ (2)__________ (3)__________Avg__________

CAMERA_ID | **PICTURE_#**

Sample Collection:

Sample ID:	Time Collected:	Collected by:	Sample Type:	Containter type:	Quantity	Vol (mL) / Container	Preservative
	:						
	:						
	:						
	:						
	:						

***Container Types:* WP = Whirl Pack Bag PL = Plastic Container GL = Glass Container

Sample Custody:

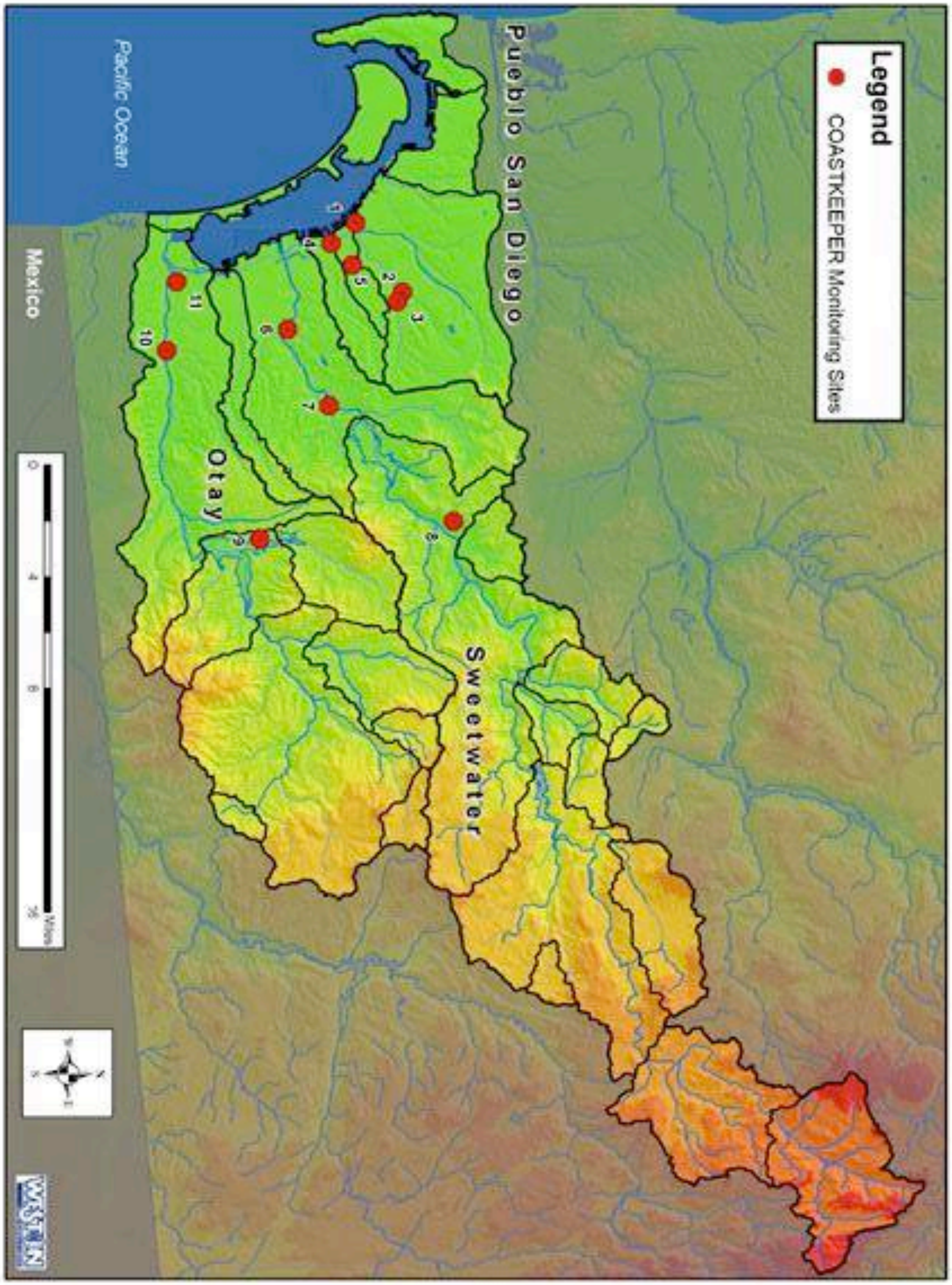
Relinquished By:	Received By:
Date /Time: / / :	Date /Time: / / :

This datasheet was modified from an original version prepared for the 2003 Coastal Snapshot Day event

Do not jeopardize your personal safety to complete this datasheet.

APPENDIX 2. Maps of Sampling Sites

San Diego City Watersheds: Pueblo, Sweetwater and Otay


Legend
COASTKEEPER Monitoring Sites
Pueblo San Diego
Pacific Ocean
Mexico
Otay
Sweetwater
1
2
3
4
5
6
7
8
9
10
11
0
4
8
16
Miles

Appendix 3. Enviromatrix, Inc. State Laboratory Certification

State of California—Health and Human Services Agency

Department of Health Services

SANDRA SHEWRY
Director

ARNOLD SCHWARZENEGGER
Governor

September 30, 2004

Certificate No.: 2564

DAN VERDON
ENVIROMATRIX ANALYTICAL, INC.
4340 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123

Dear DAN VERDON:

This is to advise you that the laboratory named above has been certified as an environmental testing laboratory pursuant to the provisions of the California Environmental Laboratory Improvement Act (Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.).

The Fields of Testing for which this laboratory has been certified under this Act are indicated on the enclosed "Accredited Fields of Testing." Certification shall remain in effect until **September 30, 2006** unless revoked. This certificate is subject to an annual fee as prescribed by Section 100860(a), HSC, due on September 30, 2005.

Your application for renewal must be received 90 days before the expiration of your certificate to remain in force according to the California Code of Regulations, Title 22, Division 4, Chapter 19, Section 64801 through 64827.

Any changes in laboratory location or structural alterations, which may affect adversely the quality of analysis in the fields of testing for which the laboratory has been granted certification, require prior notification. Notification is also required for changes in ownership or laboratory director within 30 days after the change (HSC, Section 100845(b) and (d)).

Your continued cooperation is essential to maintain high quality of the data produced by environmental laboratories certified by the State of California.

If you have any questions, please contact Bill Walker at (213) 580-5731.

Sincerely,

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

Enclosure

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

ENVIRONMENTAL LABORATORY CERTIFICATION

Is hereby granted to

ENVIROMATRIX ANALYTICAL, INC.

4340 VIEWRIDGE AVENUE., SUITE A

SAN DIEGO, CA 92123

Scope of certification is limited to the
"Accredited Fields of Testing"
which accompanies this Certificate.

Continued certification status depends on successful completion of site visit, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No:	**2564**
Expiration Date:	**09/30/2006**
Effective Date:	**09/30/2004**

Berkeley, California
subject to forfeiture or revocation.

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

ENVIROMATRIX ANALYTICAL, INC. **Lab Phone** (858) 560-7717

4340 VIEWRIDGE AVENUE., SUITE A
SAN DIEGO, CA 92123

Certificate No: 2564 **Renew Date: 09/30/2006**

Field of Testing: 101 - Microbiology of Drinking Water

101.010	001	Heterotrophic Bacteria	SM9215B
101.020	001	Total Coliform	SM9221A,B
101.021	001	Fecal Coliform	SM9221E (MTF/EC)
101.060	002	Total Coliform	SM9223
101.060	003	E. coli	SM9223
101.120	001	Total Coliform (Enumeration)	SM9221A,B,C
101.130	001	Fecal Coliform (Enumeration)	SM9221E (MTF/EC)

Field of Testing: 102 - Inorganic Chemistry of Drinking Water

102.090	001	Total Organic Carbon	EPA 415.1
102.100	001	Alkalinity	SM2320B
102.120	001	Hardness	SM2340B
102.130	001	Conductivity	SM2510B
102.140	001	Total Dissolved Solids	SM2540C
102.163	001	Free & Total Chlorine	SM4500-Cl G
102.171	001	Chloride	SM4500-Cl- D
102.190	001	Cyanide, Total	SM4500-CN E
102.192	001	Cyanide, amenable	SM4500-CN G
102.200	001	Fluoride	SM4500-F C
102.220	001	Nitrite	SM4500-NO2 B
102.231	001	Nitrate calc.	SM4500-NO3 E
102.240	001	Phosphate, Ortho	SM4500-P E
102.251	001	Sulfate	SM4500-SO4 E
102.260	001	Total Organic Carbon	SM5310B
102.261	001	DOC	SM5310B
102.270	001	Surfactants	SM5540C
102.520	001	Calcium	EPA 200.7
102.520	002	Magnesium	EPA 200.7
102.520	003	Potassium	EPA 200.7
102.520	004	Silica	EPA 200.7
102.520	005	Sodium	EPA 200.7
102.520	006	Hardness (calc.)	EPA 200.7

Field of Testing: 103 - Toxic Chemical Elements of Drinking Water

103.130	001	Aluminum	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	004	Beryllium	EPA 200.7
103.130	005	Cadmium	EPA 200.7
103.130	007	Chromium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	012	Nickel	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.130	018	Boron	EPA 200.7
103.140	001	Aluminum	EPA 200.8

As of 09/30/2004 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

ENVIROMATRIX ANALYTICAL, INC.

Certificate No: 2564
Renew Date: 09/30/2006

103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	EPA 200.8
103.140	018	Vanadium	EPA 200.8
103.160	001	Mercury	EPA 245.1

Field of Testing: 107 - Microbiology of Wastewater

107.010	001	Heterotrophic Bacteria	SM9215B
107.020	001	Total Coliform	SM9221B
107.040	001	Fecal Coliform	SM9221C,E (MTF/EC)
107.041	001	Fecal Coliform	SM9221C,E (A-1)
107.100	001	Fecal Streptococci	SM9230B
107.100	002	Enterococci	SM9230B

Field of Testing: 108 - Inorganic Chemistry of Wastewater

108.050	001	pH	EPA 150.1
108.112	001	Boron	EPA 200.7
108.112	002	Calcium	EPA 200.7
108.112	003	Hardness (calc.)	EPA 200.7
108.112	004	Magnesium	EPA 200.7
108.112	005	Potassium	EPA 200.7
108.112	006	Silica	EPA 200.7
108.112	007	Sodium	EPA 200.7
108.282	001	Sulfate	EPA 375.4
108.310	001	Biochemical Oxygen Demand	EPA 405.1
108.323	001	Chemical Oxygen Demand	EPA 410.4
108.330	001	Oil and Grease	EPA 413.1
108.340	001	Total Organic Carbon	EPA 415.1
108.350	001	Total Recoverable Petroleum Hydrocarbons	EPA 418.1
108.360	001	Phenols, Total	EPA 420.1
108.380	001	Oil and Grease	EPA 1664
108.390	001	Turbidity	SM2130B
108.400	001	Acidity	SM2310B
108.410	001	Alkalinity	SM2320B
108.430	001	Conductivity	SM2510B
108.440	001	Residue, Total	SM2540B
108.441	001	Residue, Filterable	SM2540C
108.442	001	Residue, Non-filterable	SM2540D
108.443	001	Residue, Settleable	SM2540F
108.451	001	Chloride	SM4500-Cl- C
108.465	001	Chlorine	SM4500-Cl G
108.470	001	Cyanide, Manual Distillation	SM4500-CN C
108.472	001	Cyanide, Total	SM4500-CN E

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108.480	001	Fluoride	SM4500-F C
108.500	001	Ammonia	SM4500-NH3 C
108.501	001	Kjeldahl Nitrogen	SM4500-NH3 C
108.510	001	Nitrite	SM4500-NO2 B
108.520	001	Nitrate-nitrite, Total	SM4500-NO3 E
108.521	001	Nitrate calc.	SM4500-NO3 E
108.531	001	Dissolved Oxygen	SM4500-O G
108.540	001	Phosphate, Ortho	SM4500-P E
108.541	001	Phosphorus, Total	SM4500-P E
108.590	001	Biochemical Oxygen Demand	SM5210B
108.591	001	Carbonaceous BOD	SM5210B
108.640	001	Surfactants	SM5540C

Field of Testing: 109 - Toxic Chemical Elements of Wastewater

109.010	001	Aluminum	EPA 200.7
109.010	002	Antimony	EPA 200.7
109.010	004	Barium	EPA 200.7
109.010	005	Beryllium	EPA 200.7
109.010	007	Cadmium	EPA 200.7
109.010	009	Chromium	EPA 200.7
109.010	010	Cobalt	EPA 200.7
109.010	011	Copper	EPA 200.7
109.010	012	Iron	EPA 200.7
109.010	013	Lead	EPA 200.7
109.010	015	Manganese	EPA 200.7
109.010	016	Molybdenum	EPA 200.7
109.010	017	Nickel	EPA 200.7
109.010	021	Silver	EPA 200.7
109.010	023	Thallium	EPA 200.7
109.010	024	Tin	EPA 200.7
109.010	026	Vanadium	EPA 200.7
109.010	027	Zinc	EPA 200.7
109.020	001	Aluminum	EPA 200.8
109.020	002	Antimony	EPA 200.8
109.020	003	Arsenic	EPA 200.8
109.020	004	Barium	EPA 200.8
109.020	005	Beryllium	EPA 200.8
109.020	006	Cadmium	EPA 200.8
109.020	007	Chromium	EPA 200.8
109.020	008	Cobalt	EPA 200.8
109.020	009	Copper	EPA 200.8
109.020	010	Lead	EPA 200.8
109.020	011	Manganese	EPA 200.8
109.020	012	Molybdenum	EPA 200.8
109.020	013	Nickel	EPA 200.8
109.020	014	Selenium	EPA 200.8
109.020	015	Silver	EPA 200.8
109.020	016	Thallium	EPA 200.8
109.020	017	Vanadium	EPA 200.8
109.020	018	Zinc	EPA 200.8
109.190	001	Mercury	EPA 245.1
109.811	001	Chromium (VI)	SM3500-Cr D

Field of Testing: 110 - Volatile Organic Chemistry of Wastewater

110.010	000	Halogenated Volatiles	EPA 601

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110.020	000	Aromatic Volatiles	EPA 602
110.040	040	Halogenated Hydrocarbons	EPA 624
110.040	041	Aromatic Compounds	EPA 624
110.040	042	Oxygenates	EPA 624
110.040	043	Other Volatile Organics	EPA 624

Field of Testing: 111 - Semi-volatile Organic Chemistry of Wastewater

111.101	032	Polynuclear Aromatic Hydrocarbons	EPA 625
111.101	034	Phthalates	EPA 625
111.101	036	Other Extractables	EPA 625
111.170	030	Organochlorine Pesticides	EPA 608
111.170	031	PCBs	EPA 608

Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste

114.010	001	Antimony	EPA 6010B
114.010	003	Barium	EPA 6010B
114.010	004	Beryllium	EPA 6010B
114.010	005	Cadmium	EPA 6010B
114.010	006	Chromium	EPA 6010B
114.010	007	Cobalt	EPA 6010B
114.010	008	Copper	EPA 6010B
114.010	009	Lead	EPA 6010B
114.010	010	Molybdenum	EPA 6010B
114.010	011	Nickel	EPA 6010B
114.010	012	Selenium	EPA 6010B
114.010	013	Silver	EPA 6010B
114.010	014	Thallium	EPA 6010B
114.010	015	Vanadium	EPA 6010B
114.010	016	Zinc	EPA 6010B
114.020	001	Antimony	EPA 6020
114.020	002	Arsenic	EPA 6020
114.020	003	Barium	EPA 6020
114.020	004	Beryllium	EPA 6020
114.020	005	Cadmium	EPA 6020
114.020	006	Chromium	EPA 6020
114.020	007	Cobalt	EPA 6020
114.020	008	Copper	EPA 6020
114.020	009	Lead	EPA 6020
114.020	010	Molybdenum	EPA 6020
114.020	011	Nickel	EPA 6020
114.020	012	Selenium	EPA 6020
114.020	013	Silver	EPA 6020
114.020	014	Thallium	EPA 6020
114.020	015	Vanadium	EPA 6020
114.020	016	Zinc	EPA 6020
114.140	001	Mercury	EPA 7470A
114.141	001	Mercury	EPA 7471A
114.222	001	Cyanide	EPA 9014
114.230	001	Sulfides, Total	EPA 9034
114.241	001	pH	EPA 9045
114.270	001	Fluoride	EPA 9214

Field of Testing: 115 - Extraction Test of Hazardous Waste

115.020	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
115.030	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
115.040	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312

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Field of Testing: 116 - Volatile Organic Chemistry of Hazardous Waste

116.030	001	Gasoline-range Organics	EPA 8015B
116.040	041	Methyl tert-butyl Ether (MTBE)	EPA 8021B
116.040	060	Halogenated Volatiles	EPA 8021B
116.040	061	Aromatic Volatiles	EPA 8021B
116.040	062	BTEX	EPA 8021B
116.080	000	Volatile Organic Compounds	EPA 8260B
116.080	120	Oxygenates	EPA 8260B

Field of Testing: 117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	Diesel-range Total Petroleum Hydrocarbons	EPA 8015B
117.017	001	TRPH Screening	EPA 418.1
117.110	000	Extractable Organics	EPA 8270C
117.210	000	Organochlorine Pesticides	EPA 8081A
117.220	000	PCBs	EPA 8082
117.240	000	Organophosphorus Pesticides	EPA 8141A
117.250	000	Chlorinated Herbicides	EPA 8151A

Field of Testing: 120 - Physical Properties of Hazardous Waste

120.010	001	Ignitability	EPA 1010
120.022	001	Ignitability	EPA 1030
120.040	001	Reactive Cyanide	Section 7.3 SW-846
120.050	001	Reactive Sulfide	Section 7.3 SW-846
120.080	001	Corrosivity - pH Determination	EPA 9045C

Field of Testing: 126 - Microbiology of Recreational Water

126.010	001	Total Coliform (Enumeration)	SM9221A,B,C
126.030	001	Fecal Coliform (Enumeration)	SM9221E
126.050	001	Total Coliform and E. coli	SM9223
126.060	001	Enterococci	SM9230C
126.080	001	Enterococci	IDEXX

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Appendix 4.

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2. Faber et al., 1989. ***The Ecology of Riparian Habitats of the Southern California Coastal Region: a community profile***. U.S. Department of the Interior, Fish & Wildlife Services. V. 85 (7.27).

3. Harrington and Born. ***Measuring the Health of California Streams and Rivers: a methods manual for resource professionals, citizen monitors and natural resources students.*** Sustainable Land Stewardship International Institute (2000, 2nd Ed.)

4. Surface Water Ambient Monitoring Program (SWAMP). ***Appendix D: SWAMP Quality Assurance Management Plan.*** CA State Water Resources Control Board (12/22/02)

5. EPA analytical method publication can be obtained athttp://www.epa.gov/cincl/

6. IDEXX Quantitray Tables. A copy can be obtained at: http://www.idexx.com/water/products/refs/096323501.pdf

7. Standard Methods for Examionation of Water and Wastewaters, APHA, AWWA, and WEF, 20th edition, 1999.