Quality Assurance Project Plan

Malibu Creek Watershed Monitoring Program

Version 3

City of Calabasas

November 16, 2004

SUBMITTED BY JIM MEDLEN, WATER MONITORING CONSULTANT
FOR THE CITY OF CALABASAS

Adapted from the template prepared by
George Nichol and Emilie Reyes, DWQ,
in collaboration with
WILLIAM RAY, SWRCB QUALITY ASSURANCE PROGRAM MANAGER

PROJECT MANAGEMENT

1. TITLE AND APPROVAL SHEETS

Quality Assurance Project Plan
For

PROJECT NAME: Malibu Creek Watershed Monitoring Program

Date: 11/16/04

NAME OF RESPONSIBLE ORGANIZATION: City of Calabasas

APPROVAL SIGNATURES
(Add or delete signature lines as needed)

GRANT ORGANIZATION:

Title:	Name:	Signature:	Date*:
Project Director	Charles S. Mink		
Project Administrator	Robin Hull		
Project Manager	Jim Medlen		
QA Officer	Jim Medlen		

PROFESSIONAL LABORATORY CRG Laboratories Inc.:

		Signature:	Date*:
QA Officer	Richard Gossett		
Lab Director	Richard Gossett		

REGIONAL BOARD:

Title:	Name:	Signature:	Date*:
Contract Manager	Rod Collins		
QA Officer	Jau Ren Chen		

* This is a contractual document. The signature dates indicate the earliest date when the project can start.

** If the QAPP is being prepared under the jurisdiction of the State Water Resources Control Board (SWRCB) rather than a Regional Board, substitute the appropriate SWRCB information for the RWQCB information.

PROFESSIONAL LABORATORY Aquatic Bioassay and Consulting Laboratories Inc.:

	Print name below:	Signature:	Date*:
QA Officer			
Lab Director			

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Group D: Data Validation and Usability

Appendix

3. Distribution List

(If the QAPP is being prepared under the jurisdiction of the State Water Resources Control Board (SWRCB) rather than a Regional Board (RWQCB), substitute the SWRCB information for the RWQCB information.)

Title:	Name (Affiliation):	Tel. No.:	QAPP No*:
Contractor Project Manager	Jim Medlen	818-871-0760	1,2,3
Los Angeles Regional Water Quality Control Board Contract Manager	Rod Collins	213-576-6691	3
Los Angeles Regional Water Quality Control Board Regional Board QA Officer	Jau Ren Chen	213-576-6656	3
City of Calabasas Project Administrator	Robin Hull	818-878-4225 ext 306	1,2,3
Ventura County Watershed Protection District	Darla Wise	805-654-3942	2
City of Thousand Oaks	Arne Anselm	805-449-2386	2
Los Angeles County Department of Public Works	Arfan Haidary	626-458-4329	2
Los Angeles County Department of Public Works	Frank Wu	626-458-4358	2
Clean Lakes, Incorporated	Thomas Moorhouse	818-889-8691	2
Ventura County Watershed Protection District	Mark Davis	805-654-6758	2
Heal the Bay	Mark Abramson	310-453-0395	2
Surfrider Foundation	Hersh Farberon	310-451-1010	2
Surfrider Foundation	Mollie Cull	310-451-1010	2
Laboratory QA Officer	Richard Gossett	310-533-5191	2
Laboratory Director	Richard Gossett	310-533-5191	2
QA Officer	Michael Machuzak	805-643-5621	2
Laboratory Director	Tim Mikel	805-643-5621	2
Project intern	John Hess	559-679-9315	3
Project intern	Geri Silverberg	818-723-1428	3
Project intern	Sung Won Lee	818-597-8012	3
Project intern	Greg Lyon	310-770-3640	3
Project intern	Chris Hardenbrook	818-388-4600	3

4. PROJECT/TASK ORGANIZATION

4.1 Involved parties and roles.

The cities of Calabasas, Agoura, Westlake Village, and Malibu, along with Los Angeles County (collectively called the Watershed Management Committee "WMC") and the Las Virgenes Municipal Water District (LVMWD) applied for and were awarded Proposition 13 grant funds to implement the 1999 Malibu Creek Watershed Monitoring Program (Monitoring Program). The Monitoring Program was assembled by members of the Malibu Creek Watershed Advisory Council's Monitoring and Modeling Subcommittee including the Los Angeles Regional Water Quality Control Board (Regional Board), State Department of Parks and Recreation, City of Calabasas, LVMWD, Heal the Bay, City of Malibu, and USC California Sea Grant. As the lead agency, the City of Calabasas contracted with Jim Medlen, a water quality monitoring consultant, to serve as the Watershed Monitoring Coordinator to coordinate and organize the sample collection, field and in-house analysis of samples, the initiation and maintenance of contracts with laboratories, and the submittal of data to the Regional Board.

CRG Laboratories, Inc. will be the main contracted laboratory for this project, and will analyze the majority of parameters. CRG subcontracted the analysis of the remaining parameters to Aquatic Bioassay and Consulting Laboratories, Inc., Calscience Environmental Laboratories, Inc., Frontier GeoSciences, Inc., Asbestos TEM Laboratories, Inc., and Alta Analytical Laboratory, Inc. CRG and subcontractors mentioned above will be the contract laboratories for all analyses not conducted in the field or at an in-house laboratory. The Laboratories will analyze submitted samples in accordance with all method and quality assurance requirements found in this QAPP. The Laboratories will also act as a technical resource to the Watershed Monitoring Coordinator and City of Calabasas' staff and management.

4.2 Quality Assurance Officer role

Jim Medlen is the Malibu Creek Watershed Monitoring Program's (MCWMP) Quality Assurance Officer. Jim's role is to establish the quality assurance and quality control procedures found in this QAPP as part of the sampling, field analysis, and in-house analysis procedures. He will communicate all quality assurance and quality control issues contained in this QAPP to the CRG Laboratory Director and Quality Assurance Officer Richard Gossett.

Jim Medlen will also review and assess all procedures during the life of the contract against QAPP requirements. He will report all findings to Robin Hull, the Project Administrator for the Proposition 13 grant contract, and the TAC, where necessary, including all requests for corrective action. Jim may stop all actions, including those conducted by professional labs, if there are significant deviations from required practices, or if there is evidence of a systematic failure.

4.3 Persons responsible for QAPP update and maintenance.

Changes and updates to this QAPP may be made after a review of the evidence for change by Robin Hull and/or the TAC with the concurrence of both the State Board's Contract Manager and Quality Assurance Officer. MCWMP's Quality Assurance Officer Jim Medlen will be responsible for making the changes, submitting drafts for review, preparing a final copy, and submitting the final for signature.

4.4 Involved Parties

PROJECT DIRECTOR (one name only)	Mr.	Charles S. Mink, Public Works Director	September 20, 2004

LEAD APPLICANT OR ORGANIZATION: City of Calabasas

TYPE OF AGENCY:

Municipality	X	Local Agency		*Nonprofit (non-landowner)	
Nonprofit (landowner)		Local Public Agency			

STREET ADDRESS:	26135 Mureau Rd.		
CITY:	Calabasas	Zip Code:	91302
P.O. BOX:		Zip Code:	
COUNTY	Los Angeles		
STATE:	California		

RWQCB or SWRCB STAFF CONTACTED REGARDING THIS PROPOSAL:

RWQCB Contact:	Shirley Birosik	RWQCB Contact:	Rod Collins
Phone No.:	213-576-6679	Phone No.:	213-576-6691
Dates contacted:	Frequent	Dates contacted:	Frequent

COOPERATING ENTITIES:

Entity Name:	Las Virgenes Municipal Water District		
Role/Contribution to Project:	Co-sponsor		
Contact Person:	Randal Orton	Phone No.:	818-251-2145
E-mail address:	Rorton@lvmwd.dst.ca.us		

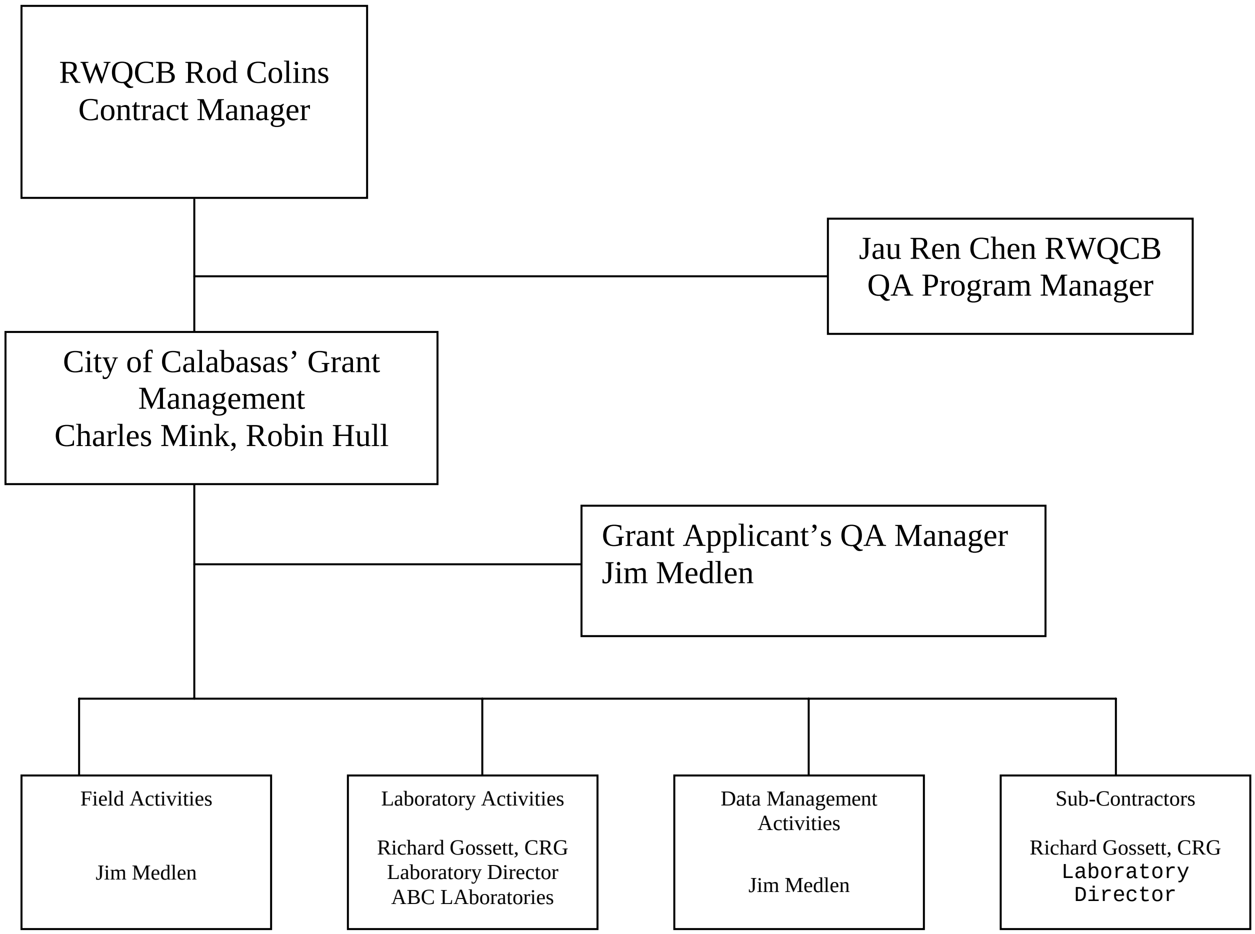
Entity Name:	City of Agoura Hills		
Role/Contribution to Project:	Co-sponsor		
Contact Person:	Jed Ireland	Phone No.:	818-597-7327
E-mail address:	jireland@ci.agoura-hills.ca.us		

Entity Name:	City of Westlake Village		
Role/Contribution to Project:	Co-sponsor		
Contact Person:	Roxanne Hughes	Phone No.:	805-653-6597
E-mail address:	rhughes@willdan.com		

Entity Name:	City of Malibu		
Role/Contribution to Project:	Co-sponsor		
Contact Person:	Melanie Irwin	Phone No.:	310-456-2489 ext 275
E-mail address:	mirwin@ci.malibu.ca.us		

Entity Name:	County of Los Angeles		
Role/Contribution to Project:	Co-sponsor		
Contact Person:	Fred Gonzalez	Phone No.:	626-458-5948
E-mail address:	gonzal@ladpw.org		

4.5 Organizational Chart



5 PROBLEM DEFINITION/BACKGROUND

5.1 Problem statement

The Malibu Creek Watershed is unique in the State of California for the diversity of its beneficial uses and wildlife habitat. Within a relatively modest area of just over 100 square miles, the watershed's riparian corridors support over 450 vertebrate species, including 50 species of mammals, 384 bird species, and 36 species of reptiles and amphibians. There are over 650 species of plants, including two endangered species and four species of special concern. It is home to one of the southern-most population of endangered steelhead trout, anadromous *Oncorhynchus mykiss*, the endangered tidewater goby, *Eucyclogobius newberryii*, and a thriving population of Arroyo Chub, *Gila orcutti*, a state fish of special concern. Its downstream terminus is one of the best-known and most popular surfing beaches in the world. (*Taken from the 1999 Malibu Creek Watershed Monitoring Plan Draft).*

Currently, the Malibu Creek Watershed is listed for over twenty impairments on the 303 (d) list including: high coliform, nutrients, low dissolved oxygen, unnatural scum and foam, trash, sediment/siltation, ammonia, lead, mercury, selenium, eutrophication, organic enrichment, algae, and fish barriers.

These impairments are affecting beneficial use resources used by animals and humans throughout the watershed, creating poor and unhealthy habitat for wildlife, and a reduction of the areas full potential as a recreational and educational resource for humans.

Water quality data in the Malibu Creek Watershed, especially upper watershed, is incomplete and uncoordinated. There are many groups in the watershed monitoring water quality, and working to locate sources of urban run-off, but as of yet, there has not been any coordinated effort.

5.2 Decisions or outcomes

This project seeks to take a critical first step in reducing pollution due to urban run-off – tracking pollution sources throughout the watershed.

Data in the Malibu Creek Watershed, especially upper watershed, is incomplete and uncoordinated. The Monitoring Program will provide conclusive data while collaborating with other monitoring agencies and stakeholders to incorporate recommendations and previously gathered data. Such a broad approach will eliminate redundancies and the creation of more isolated monitoring programs, making the best use of limited funds.

The Watershed Monitoring Coordinator, under the guidance of the Advisory Council's (MCWAC) Monitoring and Modeling Subcommittee (serving as the program's Technical Advisory Committee), will locate areas in the watershed that have not been monitored previously, or need supplemental monitoring in order to fill in data gaps that will determine baseline water quality for the watershed. Parameters analyzed will be based on 303d listed impairments including: Total and fecal coliform, chloride, ammonia, orthophosphate, TKN (nitrate+nitrite), chlorophyll a, algae, odor, PCB and DDT congeners, dissolved oxygen, fish muscle tissue (selenium, mercury, aluminum, lead, copper and organochlorie pesticides including DDT and PCB congeners.

In addition to the 303(d) list of parameters, the following tests have been included to complete the baseline assessment: benthic community bioassessment, acute and chronic toxicity, fish muscle tissue (priority pollutants- silver, beryllium, antimony, nickel, arsenic, chromium, thallium, zinc, cadmium), enterococcus, E. coli, temperature, hardness, pH, and visual observations including trash, scum, foam, color, and flow measurements.

"Hot Spot" advanced monitoring will be conducted once first year baseline monitoring determines where intensified monitoring would be most useful. For example, high levels of nutrients in residential areas may give cause to monitor for a range of pesticides. Also, positive hits in fish tissue for specific metals will allow effective monitoring of metals in the water column to trace potential sources. This two-tier setup will ensure that the most expensive tests are not used frivolously.

“Hot Spot” testing will include the following Priority Pollutants : Cyanide, Asbestos, metals in the water column (Silver, Beryllium, Antimony, Nickel, Arsenic, Chromium, Thallium, Zinc, Cadmium, Copper, Selenium, Lead, Mercury), EPA method 624 series- volatile organic compounds (25 priority pollutants), EPA method 625 series- organochlorine pesticides including DDT and PCB congeners (50 priority pollutants), and EPA method 608 series- semi-volatile organic compounds base/neutral and acid extractables including poly aromatic hydrocarbons (PAHs).

Once the first year’s worth of baseline data is assessed, a “Hot Spot” monitoring addendum to this QAPP will be prepared, distributed to the TAC for review, and submitted for signature by the authorizing entities. After approval is obtained, “hot spot” testing will begin.

5.3 Water quality or regulatory criteria

Water quality standards are identified in the Los Angeles Regional Water Quality Control Board’s Basin Plan. The Basin Plan sets standards based on the EPA’s guidelines for water quality. However, the EPA leaves the final say up to individual regional water quality control boards as all areas have different natural backgrounds and beneficial uses to take into consideration.

Where possible, new water quality standards will be used when new regulations are adopted or are near adoption.

6. PROJECT/TASK DESCRIPTION

6.1 Work statement and produced products

Year one sites will be tested bi-monthly until February 2005 in order to address findings for baseline data. Ten to twelve sites will be monitored for total coliform, e.coli, enterococcus, fecal coliform, pH, conductivity, dissolved oxygen, temperature, total suspended solids, total nitrogen, nitrite-N, nitrate-N, orthophosphate, ammonia-N, and chlorophyll a. In addition, metals in fish muscle tissue, and DDT and PCBs tests will be performed once for all sites during the first year in order to locate "Hot Spot" sites, or areas that show a particularly high and unhealthy level of pollutants. In addition, "Hot Spot" testing will include acute and chronic toxicity tests, which will be conducted two times in wet and two times in dry weather seasons during the first year.

Bioassessments will be performed at all sites using the California Department of Fish and Games' benthic macro-invertebrate bioassessment protocol (revised in December 2003) in spring 2005, and fall 2005.

An estimated five "Hot Spot" sites will be selected from the original sites to be tested at least twice during year two for EPA priority pollutants including: cyanide, mercury, (Ag, As, Be, Cd, Cr, Cu, Pb, Ni, Sb, Se, Tl, Zn), asbestos TEM, semi-volatile organic compounds, volatile organic compounds, organochlorine pesticides including DDT and PCB congeners. In addition, a water hardness test will be conducted during "Hot Spot Testing."

Data summaries will be presented to the projects' Technical Advisory Committee on a quarterly basis. An annual report will be completed in March 2005, which will report findings and give recommendations for year two "Hot Spot" testing. A second year report will be produced after findings from the "Hot Spot" testing is completed, and then a final report incorporating all the data will be prepared, which will be due at the end of the project.

6.2 Constituents to be monitored and measurement techniques

This project will analyze for a number of water quality parameters (listed above) many of which were taken from the draft 1999 Malibu Creek Watershed Monitoring Plan.

Conductivity, pH, dissolved oxygen, flow, photo documentation and physical observations will be tested/assessed in the field with hand held probes and visual observations. Sampling forms will be created based on SWAMP sampling forms provided in the SWAMP management plan.

Total coliform, *e.coli*, enterococcus, and fecal coliform will be analyzed by CRG Laboratories, Inc.

Total suspended solids, Total Kjeldahl Nitrogen, Nitrate-N, Nitrite-N, Orthophosphate, Ammonia, and Chlorophyll a samples will be collected in the field and then sent to CRG Laboratories Inc. EPA priority pollutants will be collected in the appropriate method and time constraints, and will also be analyzed by CRG Laboratories. Benthic community assessment and acute and chronic toxicity tests will be performed by ABC laboratories. The collection of fish for analyzing metals in fish tissue will be collected and analyzed according to approved methods by CRG and ABC laboratories.

Table 6.3 Project Schedule

Activity	Date
Technical Advisory Committee	May 2004
QAPP approval	January 2005
Permits, Landowner Access Agreements	November 2004
Project Assessment and Evaluation Plan	January 2005
Quarterly Reports	Every Quarter 2004-2006
Obtain and check operation of instruments	November 2004
Final Monitoring Program	January 2005
Train monitors	January 2005
Initiate monitoring	January 2005
Initiate data entry	February 2005
Calibration and quality control sessions	Once per quarter
Review data with technical advisors	Once per quarter
First Year Annual Report (Baseline)	March 2005
Second Year Annual Report (Hot Spots)	January 30, 2006
Draft and Final Project Report	February 2006, March 2006

6.4 Geographical setting

The Malibu Creek Watershed is the focus of this water quality project, and no areas outside of the watershed will be tested. The Malibu Creek Watershed is located about 35 miles west of Los Angeles and comprises of Los Angeles and Ventura counties, which consist of the cities of Agoura Hills, Calabasas, Malibu, Westlake Village and unincorporated county areas. The 109-square mile watershed extends from the Santa Monica Mountains and adjacent Simi Hills to the Pacific Coast at Santa Monica Bay. Several creeks and lakes are located in the upper portions of the watershed, and these ultimately drain into Malibu Creek at the downstream end of the watershed. Historically there is little flow in the summer months; much of the natural flow that does occur in the summer in the upper tributaries comes from springs and seepage areas. During rainstorms the runoff from the watershed may increase flows in the creeks dramatically. The natural hydrology of the watershed has been modified by the creation of several dams and man-made lakes, the importation of water to the system for human use which provides most of the base flow to the system, and the presence of the Tapia Wastewater Reclamation Facility (WRF), which provides significant dry-weather flow to the system in the winter months. Flows from the watershed drain into Malibu Lagoon and ultimately into Santa Monica Bay when the Lagoon is breached.

6.5 Constraints (resources and time)

Since contract negotiations to enter into agreement between the lead agency and SWRCB were delayed, the project started significantly behind schedule. In order to adjust to the loss of time on the grant schedule, the “first year of monitoring” will to have to occur during a period of six months. Monitoring frequency during this six-month period will be doubled to twice per month in order to collect more data for time that was lost, giving a better indication of baseline conditions. Baseline monitoring will continue into a second year, which will provide for a total of one and a half years of baseline data.

7 Data Quality Objectives

Data quality objectives for this project will consist of the following:

Field Measurements – Target Reporting Limits, Accuracy, Precision, Completeness
Bacterial Analyses – Target Reporting Limits, Precision, Presence/Absence, Completeness
Metals Analyses – Target reporting Limits, Accuracy, Precision, Recovery, Completeness
Chemical Analyses – Target Reporting Limits, Accuracy, Precision, Recovery, Completeness

Data collected from previous studies will be assessed against the same data quality objectives listed in section 7. Only those data meeting data quality objectives will be used in this project.

7.1 Accuracy

Accuracy will be determined by measuring one or more selected performance testing samples or standard solutions from sources other than those used for calibration. Field monitoring equipment will be checked for accuracy in a quality control session held quarterly. Accuracy criteria for parameters tested at CRG laboratories will follow their quality assurance, quality control plan, and will be documented.

7.2 Precision

Precision measurements will be determined on both field and laboratory replicates. The number of replicates for field measurements will be three, laboratory replicates will be done by professional contracted laboratory.

7.3 Recovery

Recovery measurements will be determined by laboratory spiking of a replicate sample with a known concentration of the analyte. The target level of addition is at least twice the original sample concentration.

7.4 Completeness

Completeness is the number of analyses generating useable data for each analysis divided by the number of samples collected for that analysis. Completeness for field monitoring activities will be a minimum of 90%.   Completeness for biological analysis in-house or professional laboratory testing of parameters for baseline conditions will also be a minimum of 90%. For priority pollutants and "hot spot" testing, acceptable completeness goals will be set at 100% because these parameters will be monitored less frequently (i.e. two times). Completeness goals must be met in order to collect sufficient data, which will create baseline data for the project.

7.5 Target Reporting Limits

Method sensitivity is dealt with by the inclusion of the required SWAMP Target Reporting Limits, where such values exist. Target Reporting Limits exist for all bacterial parameters and chemical parameters. Target Reporting Limits were set for some field analyses as well.   All Target Reporting Limits are suggested recommendations by SWAMP, and not yet required.

7.6 Representativeness

The Malibu Creek Watershed Monitoring Program for which this QAPP addresses is an effort to create baseline data throughout the watershed. This program is important in that it will assess existing monitoring data and seek to fill in the data gaps. Parameters tested for in this project will be based on impairments in the watershed; further testing in the second half of the project will focus on EPA priority pollutants. These parameters are representative of impairments that are of concern to the Regional Board, the EPA, and stakeholders in the watershed.

7.7 Data Quality Objectives Table for Water and Fish Tissue Analysis including Accuracy, Precision, and Recovery for Laboratory Analytical Parameters

Group	Parameter (Water/Air)	Accuracy	Precision	Target Reporting Limit	Recovery	Completeness
Field Analyses	*Dissolved Oxygen* *Water*	*+0.5 mg/L*	*+ 0.5 or 10%*	*0.2 mg/L*	*NA*	*90%.*
"	*pH* *Water*	*+ .2 units*	*+ .2 units*	*.1 pH*	*NA*	*90%*
"	*Conductivity* *Water*	*+ 5%*	*+5%*	*20 µS/cm*	*NA*	*90%*
"	*Temperature* *Air, Water*	*+ .5 °C*	*+ .5 °C*	*± .5°C*	*NA*	*90%*
"	*Total Suspended Solids* *Water*	*NA*	*+ 10%*	*+ 10%*	*.1mg/l*	*NA*
Professional Lab Bacteria Analyses	*Total Coliform* *E.Coli* *Enterococcus* *Fecal Coliform* *Water*	*Laboratory positive and negative cultures – proper positive or negative response. Bacterial PT sample -within the stated acceptance criteria.*	R_{log} *within 3.27*mean* R_{log} *(reference is section 9020B of 18th, 19th, or 20th editions of* Standard Methods	*2 MPN/100ml* *2MPN/100ml* *1 CFU/100ml* *2MPN/100ml*	*NA*	*90%*
Professional Lab	*Bioassessment* *Water*	*≤ 5% difference*	*≤ 5% difference*	*Level III Genus*	*NA*	*90%*
"	*Acute and Chronic Toxicity* *Water*	*5 dilutions*	*NA*	*NA*	*NA*	*100%*

Group	Parameter Water	Accuracy	Precision	Target Reporting Limit	Recovery	Completeness
Laboratory Analyses Conventional Constituents in Water	*See Below*	Standard Reference Materials (SRM, CRM, PT) within 95% CI stated by provider of material. If not available then with 80% to 120% of true value. (For all parameters in group)	Laboratory duplicate, Blind Field duplicate, or MS/MSD 25% RPD Laboratory duplicate minimum. (For all parameters in group)	*See Below*	*Matrix spike 80% - 120% or control limits at ± 3 standard deviations based on actual lab data. (For all parameters in group)*	*See below per parameter*
"	*Orthophosphate as P Water*	"	"	*.01mg/l*	"	*90%*
"	*Ammonia-N Water*	"	"	*.01 mg/L*	"	*90%*
"	*TKN Water*	"	"	*.5 mg/l*	"	*90%*
"	*Nitrate-N Water*	"	"	*.01 mg/L*	"	*90%*
"	*Nitrite-N Water*	"	"	*.01 mg/L*	"	*90%*
"	*Chlorophyll-a Water*	"	"	*2.0 (500ml filtration)*	"	*90%*
"	*Chloride Water*	"	"	*.25 mg/L*	"	*90%*
"	*Hardness Water*	"	"	*1 mg/l*	"	*90%*

Group	**Parameter Water/Tissue**	**Accuracy**	**Precision**	**Target Reporting Limit**	**Recovery**	**Completeness**
Laboratory Analyses of Trace metals in water, including mercury	*See below*	Standard Reference Materials (SRM, CRM, PT) 75% to 125%.	Field replicate, laboratory duplicate, or MS/MSD ± 25% RPD. Laboratory duplicate minimum.	*See below*	*Matrix spike 75% - 125%.*	*See below*
"	*Mercury Water/Tissue*	"	"	*.2 ng/L ppt* *.03 mg/kg*	"	*100%*
"	*Cyanide Water/Tissue*	"	"	*.05 mg/L*	"	*100%*
"	*Silver Water/Tissue*	"	"	*.02 ug/L ppb* *.025 mg/kg*	"	*100%*
"	*Arsenic Water/Tissue*	"	"	*1 ug/L* *.05mg/kg*	"	*100%*
"	*Beryllium Water/Tissue*	"	"	*.1 ug/L ppb* *.025 mg/kg*	"	*100%*
"	*Cadmium Water/Tissue*	"	"	*.01 ug/L ppb* *.025 mg/kg*	"	*100%*
"	*Chromium Water*	"	"	*.1 ug/L*	"	*100%*
"	*Copper Water/Tissue*	"	"	*.01 ug/L* *.01 mg/kg*	"	*100%*
"	*Lead Water/Tissue*	"	"	*.01 ug/L* *.01 mg/kg*	"	*100%*
"	*Nickel Water/Tissue*	"	"	*.02 ug/L* *.02 mg/kg*	"	*100%*
"	*Antimony Water/Tissue*	"	"	*.1 ug/L* *.05 mg/kg*	"	*100%*

“	*Selenium Water/Tissue*	“	“	*.30 ug/L* *.3 mg/kg*	“	*100%*
“	*Thallium Water/Tissue*	“	“	*.5 ug/L* *.1 mg/kg*		*100%*
“	*Zinc Water/Tissue*	“	“	*.5 ug/L* *.05 mg/kg*	“	*100%*

Group	**Parameter Water**	**Accuracy**	**Precision**	**Target Reporting Limit**	**Recovery**	**Completeness**
Laboratory Analyses	Volatile Organic Analytes (including VOCs, MTBE, BTEX) in Water	Standard Reference Materials (SRM, CRM, PT) within 95% CI stated by provider of material. If not available then with 50% to 150% of true value	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	.5 – 10 ug/L	*Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.*	*100%*
“	Semi-volatile Organic Compounds Water	Standard Reference Materials (SRM, CRM, PT)within 95% CI stated by provider of material. LCS, or LCM may also be used. If not available then with 50% to 150% of true value.	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	2 – 100ng/L	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	*100%*

Group	Parameter Water	Accuracy	Precision	Target Reporting Limit	Recovery	Group
"	Organochlorine Pesticides and PCBs Water	Standard Reference Materials (SRM, CRM, PT)within 95% CI stated by provider of material. LCS, or LCM may also be used. If not available then with 50% to 150% of true value.	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	2 ng/L	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	*100%*

8. Special Training Needs/Certification

8.1 Specialized Training or Certification

The Malibu Creek Watershed Monitoring Program's Monitoring Coordinator, Jim Medlen, will be responsible for the training of all field staff, volunteer monitors, and data managers, for the project. Jim has been trained by the Orange County Coastkeeper and has helped train over 150 citizen monitors and a dozen interns on properly taking and analyzing water samples and collecting macroinvertebrates using EPA and the California Department of Fish and Game California Streamside Bioassessment procedures.

8.2 Training and Certification Documentation

A training field book will be developed and brought to all sampling sites. Records of hours spent by staff and volunteers during their initial training will be kept, and the Monitoring Coordinator will initially accompany new personnel and volunteers to all sampling sites until correct field procedures are met. All training records for staff members satisfactorily completing the training course given by the Watershed Monitoring Coordinator, Jim Medlen, will be kept on file at his office at the following address during the life of the program:
Las Virgrenes Municipal Water District
4232 Las Virgenes Road
Calabasas, CA 91302

Once the program is completed, all records will be stored at the City of Calabasas' City Hall:
26135 Mureau Road
Calabasas, CA 91302

Any staff member that does not complete the training course successfully will not be allowed to take samples in the field.

8.3 Training Personnel

Monitoring Coordinator, Jim Medlen, will provide all training to personnel including conducting sample collection, visual observations, and bio-assessments. Correct field procedures will be clearly stated in a monitoring handbook created by the Monitoring Coordinator, which will specifically cite SWAMP procedures.

9. Documents and Records

The Monitoring Coordinator will collect records for sample collection, field analyses, and bacterial testing. Samples sent to the professional laboratory for analysis will include a Chain of Custody form. The professional laboratory, CRG, will generate records for sample receipt and storage, analyses, and reporting which will be submitted to the Monitoring Coordinator.

The database will be either developed by a database consultant, or adapted from an existing database utilized by the Ventura County Watershed Protection District and the Calleguas Creek Monitoring Program, study originally created by the consulting firm, Larry Walker and Associates. The Data Manager, Jim Medlen, or database consultant will maintain the database, and utilize interns or train staff to enter data. Mr. Medlen will also maintain the database of information collected during the course of this project. Copies of the database will be backed up electronically on two computers and a CD-ROM weekly, along with any other electronic copies pertinent to the project.

All records generated by this project will be stored in Mr. Medlen's office at the Las Virgenes Municipal Water District (LVMWD) during the course of the project. After the project is complete, the files will be transferred to the City of Calabasas for storage. The professional laboratory's records pertinent to this project will be maintained at their main office, and will also be maintained at the LVMWD office of Jim Medlen. Copies of all records held by the professional laboratory will be provided to Mr. Medlen and stored in the project file at his office. Again, records generated by the professional laboratory will be transferred from Mr. Medlen's office to the City of Calabasas after project completion.

All manuals relevant to the proper calibration, care, and use of water testing equipment will be on file at the office of Mr. Medlen at the LVMWD. All manuals relevant to the operation of computer equipment will also be on file at the office. Material Safety Data Sheets will also be on file, and posted where relevant to the safe handling and usage of laboratory chemicals and calibration standards. Copies of invoices for ordered equipment, supplies, and expenses will be kept at the City of Calabasas' City Hall, and will be submitted to the Los Angeles Regional Water Quality Control Board (LA RWQCB) and State Water Resources Control Board.

Copies of this QAPP will be distributed to all parties involved with the project, including field collectors, the in-house laboratory analyst, TAC members, and any interested parties via e-mail, or hard copy at TAC meetings. Copies will be sent to the professional laboratory manager for distribution to pertinent staff. Any amendments to the QAPP will be held and distributed in the same fashion. All originals of the first approved version and subsequent amended versions of the QAPP will be held at Mr. Medlen's office at the LVMWD. Upon completion of this project, the approved QAPP and amendments will be transferred to the City of Calabasas for records storage.

Persons responsible for maintaining records for this project are as follows until additional staff is hired: Jim Medlen, also serving as field supervisor, will maintain all sample collection, chain of custody, and field analyses forms. CRG Laboratories, Inc. will be responsible for the transport and analysis of parameters in the project not conducted in the field, or in the in-house laboratory. Jim, also serving as the MCWMP laboratory analyst, will maintain all records associated with the receipt and analysis of samples analyzed for bacterial parameters, and all records submitted by professional laboratories. Richard Gossett, Laboratory Director and Quality Assurance Officer of CRG Laboratories, Inc., will maintain an archive (for 7 years after completion of the project) of all records associated with analysis conducted at CRG or their subcontractors for the project. Jim with the aid of his assistant will maintain the database. The contracted lab will maintain their records, and keep them on file for the life of the project. MCWMP Project Manager Jim and City of Calabasas staff will have the final say on issues concerning records retention and decisions to discard records by the professional laboratory.

All records will be submitted to the LA RWQCB Contract Manager, Rod Collins, as requested and at project completion. Copies of the records will be maintained at the City of Calabasas for at least 8 years (as indicated by SWAMP) after project completion then discarded, except for the database, which will be retained.

10. SAMPLING PROCESS DESIGN

Design
In 1999, members of the Malibu Creek Watershed Advisory Council's Monitoring and Modeling Subcommittee developed the draft Malibu Creek Watershed Monitoring Plan. Recommended parameters, sites, and levels of testing from the draft monitoring plan are used to guide the design of this project.

Experimental Design

Sampling sites for the project will be selected by stakeholders in the Malibu Creek Watershed, primarily the TAC and co-sponsoring agencies of the Prop 13 grant (the cities of Calabasas, Agoura Hills, Malibu, Westlake Village, and the County of Los Angeles and the Las Virgenes Municipal Water District). These stakeholders within the watershed will select their sites based on the following criteria, and will use a judgmental design approach:

1. Sites downstream of particular land-use types.
2. Creek segments or water bodies that have not or are not currently or sufficiently monitored.
3. Creeks or water bodies listed on the 303(d) list of impaired water bodies.
4. Sites that are known for being used recreationally.
5. Creek or water body locations that provide spatial representation of the entire watershed.

Stakeholders will select monitoring sites based on judgmental design strategy. The experimental design will be further discussed in the monitoring plan. Natural variability should be taken into account by monitoring pristine undeveloped areas for characteristics representative of natural, undisturbed, sites. Characteristics may include: substrate, faunal coverage, and contributing sources of surface water.

Inaccessible Sampling Sites
In some cases sites may not be accessible due to flooding, construction, or other unpredictable events that may make sampling at a site impossible. In these cases, sampling will either be conducted upstream/downstream from the site within 50 feet, or aborted if conditions are hazardous to the samplers' well being.

Recording Location of Sample Sites
All sites will be marked by GPS waypoints, which will enable easy mapping and location of sites in the future. Along with GPS waypoints for sites, all sites will be photo documented and a physical description of landmarks will be noted.

Sample Delivery
All samples will be taken to a location that is agreed upon by CRG laboratories in order for pick up and delivery to their lab. Ideally, pick-up times will be in mid-morning in order to avoid traffic in the afternoon and early morning on the 405 Freeway. CRG laboratories will receive approximately 6-10 samples during scheduled sampling events twice a month for the first six months and once to twice a month during the following year.

Sampling events will be planned on a bi-monthly basis the first six months, and then monthly for the following year. Sampling will begin once the monitoring plan and QAPP are approved.

In addition, bioassessment collections, which will be conducted three times during the life of the program, will be delivered to ABC laboratories in Ventura by the watershed monitoring coordinator or interns.

Critical Information
All parameters analyzed and all observations are critical for achieving program success and are therefore critical to the project. Each parameter and observation will help create an overall picture of water quality at sites.

11. SAMPLING METHODS

11.1 Sampling Method

Water sampling apparatuses for field measurements and collection will include YSI Model 55 Dissolved Oxygen and Temperature Meter, Oakton pH testr3 hand held probe, Oakton Conductivity High and Low hand held probes, IDEXX 100ml sterile bacterial containers, extension pole type sampling devices, and hand held plastic containers. All bottles needed for the analysis of chemical parameters will be received by the Monitoring Coordinator, Jim Medlen, from the contracted professional laboratory.

Benthic macro-invertebrate collection will follow the California Fish and Game's Stream Bioassessment Protocol (CSBP), which has been attached in the appendix in section A2. Fish collection for tissue contaminant analysis will also be included in the appendix A1.

All fish collected for toxicity tissue testing will be caught by ABC laboratories in Ventura, and will use their sampling methods.

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 or analyzing of each sample. Sterile bottles, whirl-paks, and sample bottles, which do contain preservatives / fixing agents (e.g. acids, etc.) will never be rinsed with sample water prior to collecting the sample. A separate sterile sampling bottle to transfer the sample from the water body to a bottle containing a preservative/fixing agent will always be used. This is done so the preservative/fixing agent does not escape from the sample bottle while sampling.

All samples are taken approximately in mid-stream with the grab method of sampling 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.

In most streams, near-surface water is representative of the water mass. Sites accessed by bridge can be sampled with a sample container-suspending device. Extreme care must be taken to avoid contaminating the sample with debris from the rope and bridge. Care must also be taken to rinse the device between stations. If the centroid of the stream cannot be sampled by wading, sampling devices can be attached to an extendable sampling pole.

In some cases, depth-integrated sampling is required, as requested by Regional Boards. This is useful when lakes or rivers are stratified and a sample is wanted that represents the entire water column. The protocol for depth integrated sampling can be found in the SWAMP Management Plan if needed.
A summary of sample container, volume, initial preservation, and holding time recommendations for water samples can be found in the next section 12, table 12.2.

An in-house calibration/equipment cleaning area will be on hand at the Las Virgenes Municipal Water District's Rancho Composting Facility, where sink space is available.

Standard operating procedures for the cleaning of handheld probes used in the field can be found in the equipment's manual. Material safety data sheets will be kept on file at the in-house calibration station, along with proper disposal techniques of waste generated from the calibration of the equipment. The professional laboratory, CRG, will follow their own SOPs for the maintenance of their equipment, and the disposal of waste created from their analysis of samples. Waste material will be disposed of according to appropriate state and local regulations.

All problems occurring during the life of the project's sampling methods will be documented in the database for the sampling event involved, and discussed with the TAC team and the Regional Water Quality Control Board. The QA Officer and Contract Manager at the Regional Water Quality Control Board decide upon whether the data can be used after the problem has been identified.

Sampling methods will follow the above methodology depending on the nature of the sites selected for the project. Further sampling methodology can be found in the project's field manual that will be created by Jim Medlen, before the start of field sampling.

12. Sample Handling and Custody

12.1 SWAMP REQUIREMENTS

In the field, all samples will be packed in wet ice or frozen ice packs during shipment, so that they will be kept at approximately 4˚C. Samples will be shipped in insulated containers. All caps and lids will be checked for tightness prior to shipping.

All samples will be handled, prepared, transported and stored in a manner so as to minimize bulk loss, analyte loss, contamination, or biological degradation. Sample containers will be clearly labeled with an indelible marker. Where appropriate, samples may be frozen to prevent biological degradation. Water samples will be kept in Teflon™, glass, or polyethylene bottles and kept cool at a temperature of 4˚C until analyzed. Maximum holding times for specific analyses are listed in section 12.1.

Ice chests are sealed with tape before shipping. Samples are placed in the ice chest with enough ice, or frozen ice packs to completely fill the ice chest. Laboratory forms are placed in an envelope and taped to the top of the ice chest or they may be placed in a plastic bag and taped to the inside of the ice chest lid. It is assumed that samples in tape-sealed ice chests are secure whether being transported by staff vehicle, by common carrier, or by commercial package delivery. The receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation, and holding times.

CRG Laboratories, Inc., will follow sample custody procedures outlined in their QA plans as well as this QAPP. All QA plans of laboratories involved in the project will be kept on file with the respective laboratory, and will be submitted to the city when requested.

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals. Any in-house testing will dispose of all reagents and bi-products of tests as permissible by local regulations.

Chain-of-custody procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. A complete chain-of-custody form is to accompany the transfer of samples to the analyzing laboratory.

A sample is considered under custody if:

- it is in actual possession;
- it is in view after in physical possession;
- it is placed in a secure area (accessible by or under the scrutiny of authorized personnel only after in possession)

Field crews shall be required to keep a field log for each sampling event. The following items should be recorded in the field log for each sampling event:

- time of sample collection;
- sample ID numbers, including etched bottle ID numbers for Teflon™ mercury sample containers and unique IDs for any replicate or blank samples;
- the results of any field measurements (temperature, D.O., pH, conductivity, turbidity) and the time that measurements were made;

- qualitative descriptions of relevant water conditions (e.g. color, flow level, clarity) or weather (e.g. wind, rain) at the time of sample collection;
- a description of any unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality.

The field crews shall have custody of samples during field sampling. Chain of custody forms will accompany all samples during shipment to contract laboratories. All water quality samples will be transported to the analytical laboratory directly by the field crew or by courier.

Laboratory Custody Log**:** Laboratories shall maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times.

12.2 Summary of Sample Container, Volume, Initial Preservation, and Holding Time Recommendations for Water Samples

Parameters for Analysis in WATER Samples	Recommended Containers (all containers pre-cleaned)	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
Conventional Constituents in Water				
Ortho-phosphate (OPO_4)	"	150 ml	"	48 hours at 4°C, dark
Nitrate-N + Nitrite-N (NO_3 + NO_2)	"	150 ml	"	48 hours at 4°C, dark
Total Keldjahl Nitrogen (TKN)	"	600 ml	"	Recommend: 7 days Maximum: 28 days Either one at 4°C, dark
Total Suspended Solids (TSS)	Polyethylene Container	1000 ml	Cool to 4°C, dark	7 days at 4°C, dark

Parameters for Analysis in WATER Samples	Recommended Containers (all containers pre-cleaned)	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
Non-Routine Compounds in Water Samples				
CYANIDE	1-L cubitainer	1000 ml (one cubitainer)	Add 2 ml 1:1 NaOH to make pH > 12; Add 0.6 g ascorbic acid if residual Cl present. Cool to 4°C, dark.	14 days at 4°C, dark
Trace Metals in Water Samples				
DISSOLVED METALS (except Dissolved Mercury)	60 ml polyethylene bottle, pre-cleaned in lab using HNO_3	60 ml (one bottle) if salinity <0.5 ppt 180 ml (three bottles) if salinity >0.5 ppt	Filter at sample site using 0.45 micron in-line filter, or syringe filter. Cool to 4°C, dark. Acidify in lab, within 48 hrs, using pre-acidified container (ultra-pure HNO_3) for pH<2.	Once sample is filtered and acidified, can store up to 6 months at room temperature
TOTAL METALS (except Total Mercury)	60 ml polyethylene bottle, pre-cleaned in lab using HNO_3	60 ml (one bottle) if salinity <0.5 ppt 180 ml (three bottles) if salinity >0.5 ppt	Cool to 4°C, dark. Acidify in lab within 48 hrs, with pre-acidified container (ultra-pure HNO_3), for pH<2.	Once sample is acidified, can store up to 6 months at room temperature

Parameters for Analysis in WATER Samples	Recommended Containers (all containers pre-cleaned)	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
TOTAL MERCURY	250 ml glass or Teflon bottle, pre-cleaned in lab using HNO_3	250 ml (one bottle)	Cool to 4°C, dark. Acidify in lab within 48 hrs, with pre-tested HCL to 0.5%.	Once sample is acidified, can store up to 6 months at room temperature.
HARDNESS	200 ml polyethylene or glass bottle	200 ml (one bottle)	Cool to 4°C, dark OR Filter and add 2 ml conc. H_2SO_4 or HNO_3 to pH < 2; Cool to 4°C, dark.	48 hours at 4°C, dark 6 months at 4°C, dark
Synthetic Organic Compounds in Water Samples				
VOLATILE ORGANIC ANALYTES (VOA's) including VOC, MTBE and BTEX	40 ml VOA vials	120 ml (three VOA vials)	All vials are pre-acidified (50% HCl or H_2SO_4) at lab before sampling. Cool to 4°C, dark	14 days at 4°C, dark
Toxicity Testing Water Samples				
TOXICITY IN WATER	Four 2.25 L amber glass bottles	9000 ml	Cool to 4°C, dark	14 days at 4°C, dark

Parameters for Analysis in WATER Samples	Recommended Containers (all containers pre-cleaned)	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
Bacteria and Pathogens in Water Samples				
E. Coli	Factory-sealed, pre-sterilized, disposable Whirl-pak® bags or 125 ml sterile plastic (high density polyethylene or polypropylene) container	100 ml volume sufficient for both E. coli and Enterococcus analyses	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 4°C; dark.	STAT: 6 hours at 4°C, dark; lab must be notified well in advance
Enterococcus	Factory-sealed, pre-sterilized, disposable Whirl-pak® bags or 125 ml sterile plastic (high density polyethylene or polypropylene) container	100 ml volume sufficient for both E. coli and Enterococcus analyses	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 4°C; dark.	STAT: 6 hours at 4°C, dark; lab must be notified well in advance
TOTAL AND FECAL COLIFORM	Factory-sealed, pre-sterilized, disposable Whirl-pak® bags or 125 ml sterile plastic (high density polyethylene or polypropylene) container	100 ml volume sufficient for both fecal and total coliform analyses	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 4°C; dark.	STAT: 6 hours at 4°C, dark; lab must be notified well in advance

Summary of Sample Container, Volume, Preservation, and Storage Requirements for SWAMP Biota, and Tissue Samples (for contaminant analysis)

Parameters for Analysis	Recommended Containers	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time
Tissue Sample Collection				
Fish, crab, and shellfish tissue (for contaminant analysis)	Polyethylene bags (Teflon sheets in zip lock bags); or glass (with Teflon lid); or polyethylene jar for trace metals sample only	200g	Freeze until processing	12 months (-20°C)
Biota				
Benthic Macroinvertebrates				
FRESHWATER	plastic or glass	variable	70% ethyl alcohol OR 70% isopropyl alcohol OR Add formalin to produce a 5-10% formalin solution Store in dark and away from extremes of hot and cold	5 years

13. ANALYTICAL METHODS AND FIELD MEASUREMENTS

13.1 Analytical Methods

Analytical Methods are methods that will be used in the project in order to analyze water samples in the field and in the contracted laboratories for the project. All Analytical Methods used in the project must meet SWAMP method criteria. Below are tables for Field Analytical Methods and Laboratory Analytical Methods (Table 13.2 and 13.3 respectively) that will be used for the project.

13.2 Field analytical methods.

Analyte	Lab/ Organization	Analytical Method/ SOP	MDLs	Target Reporting Limit	Constituent
pH	Field monitoring by Calabasas staff/ Monitoring Coordinator	Oakton pH testr3 manual	NA	.1 pH	Water
Conductivity high	Field monitoring by Calabasas staff/ Monitoring Coordinator	Oakton EC High manual	N/A	20µS	Water
Conductivity low	Field monitoring by Calabasas field staff/ Monitoring Coordinator	Oakton EC Low manual	N/A	.20mS	Water
Dissolved Oxygen	Field monitoring by Calabasas field staff/ Monitoring Coordinator	YSI incorporated manual Model 55	N/A	.2mg/L	Water
Temperature	Field monitoring by Calabasas field staff/ Monitoring Coordinator	YSI incorporated manual Model 55	N/A	.5ºC	Water
Visual Observations	Field Monitoirng by Calabasas Field Staff	SWAMP	NA	NA	Banks, water body.

13.3 Laboratory Analytical Methods

Analyte	Lab/ Organization	Analytical Method/ SOP	MDLs	Target Reporting Limit	Constituent
Total Coliform	CRG Laboratories, Inc.	SM 9211B, SM 9222B (25 tube dilution) IDEXX Colilert	2 MPN/100ml	2 MPN/100ml	Water
E. Coli	CRG Laboratories, Inc.	SM 92111B/E mod. MUG, SM 9223B, IDEXX Colilert	2 MPN/100ml	2 MPN/100ml	Water
Fecal Coliform	CRG Laboratories, Inc.	SM 9221E, SM 9222D (25 tube dilution)	2MPN/100ml	2 MPN/100ml	Water
Enterococcus	CRG Laboratories, Inc.	SM 9230 C, ASTM D6503, IDEXX Enterolert	1 CFU/100ml	1 CFU/100ml	Water
Ammonia	CRG Laboratories	SM 4500-NH3 F	.1 mg/L	.5 mg/L	Water
Total Kjeldahl Nitrogen	CRG subcontract to Calscience Environmental Laboratories	SM 4500-N/EPA 351.3	.45546 mg/L	.5 mg/L	Water

Nitrate-N	CRG Laboratories	SM 4500-NO3 E	.01 mg/L	.05 mg/L	Water
Nitrite-N	CRG Laboratories	.SM 4500-NO3 B	.01 mg/L	.05 mg/L	Constituent
Chlorophyll-a	CRG Laboratories	SM 10200 H	.005 mg/m3	.01 mg/m3	Water
Chloride	CRG Laboratories	SM 4500-CL E	.1 mg/L	.1 mg/L	Water
Mercury	CRG Laboratories	EPA 1631 modified	.05 ng/L	.15 ng/L	Water
Total Cyanide	CRG Laboratories subcontracted out to Calscience Environmental	EPA 335.2	.04727 mg/L	.05 mg/L	Water
Silver	CRG Laboratories	EPA 1640	.005 µg/L	.01 µg/L	Water
Arsenic	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Beryllium	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Antimony	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Cadmium	CRG Laboratories	EPA 1640 EPA 6020	.1 µg/L .01 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Chromium	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Copper	CRG Laboratories	EPA 1640 EPA 6020	.005 µg/L .01 mg/kg	.01 µg/L .05 mg/kg	Water Tissue
Lead	CRG Laboratories	EPA 1640 EPA 6020	.005 µg/L .01 mg/kg	.01 µg/L .05 mg/kg	Water Tissue
Nickel	CRG Laboratories	EPA 1640 EPA 6020	.005 µg/L .02 mg/kg	.01 µg/L .05 mg/kg	Water Tissue
Selenium	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Thallium	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Zinc	CRG Laboratories	EPA 200.8 EPA 6020	.1 µg/L .025 mg/kg	.5 µg/L .05 mg/kg	Water Tissue
Hardness	CRG Laboratories	SM 2340 B	1 mg/L	1 mg/L	Water
Asbestos TEM	CRG subcontracted to Asbestos Tem Labs, Inc.	EPA 100.2	.2 MFL	N/A	Water
Volatile Organic Compounds	CRG subcontracted to Calscience Environmental, Inc.	EPA 624	.1 - .366 µg/L	.5 – 10µg/L	Water
Semi-Volatile Organic Compounds	CRG Laboratories	EPA 625	1-100 ng/L	2-100 ng/L	Water
Organochlorine Pesticides (incl. DDT) and PCB Congeners	CRG Laboratories	EPA608	1 ng/L	2 ng/L	Water

CRG Laboratories, Inc. uses all analytical methods suggested by SWAMP. CRG's Laboratory turn around time of 2 weeks meets the project's needs.

14. Quality Control

14.1 Quality Control for Field Measurements

*All field measurements involving hand held instruments will be conducted 3 times in order to insure accuracy. Quality Control for Field Measurement instruments will follow suggestions given by the SWAMP Management Plan.

Dissolved Oxygen

SWAMP calls for the dissolved oxygen meter to have an accuracy of ± .5 mg/L, and a precision of ± .5 or 10% of the true value. Completeness for samples must be 90% for all sampling events. The dissolved oxygen meter will be tested in one quality control session or inter-calibration session per quarter. All field measurements will be taken three times in order to insure precision.

pH Meter

SWAMP calls for the pH meter to have an accuracy of ± .5, and a precision of ± .5 or 5% of the true value. The pH meter will be tested in one in-house quality control session or inter-calibration session per quarter. All field measurements will be taken three times in order to insure precision.

Conductivity

SWAMP calls for the conductivity meter to have an accuracy of ±5%, and a precision of ±5% for both the high and low conductivity meters. The conductivity meters will be tested in one in-house quality control session or inter-calibration session per quarter. All field measurements will be taken three times in order to insure precision.

Temperature

At quarterly quality control sessions or inter-calibration sessions, the thermometer will be tested against a NIST certified thermometer at a professional laboratory. The thermometer will meet SWAMP accuracy of ± .5 degrees Celsius, and a precision of ± .5 degrees Celsius. The thermometer includes the hand held air temperature thermometer, and the water temperature thermometer found on the dissolved oxygen meter.

14.2 Analytical Laboratory Quality Control

<u>Professional Laboratory</u>

Group	Parameter	Quality Control
Laboratory analyses	Conventional Constituents in water	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and blanks at 1 in 20 (5%) with at least one in every batch. *MDL study – prior to first use and annually thereafter. Procedure according to 40CFR Part 136.3 Appendix B.* All quality assurance and quality control procedures and criteria specified by selected method.
"	Volatile organics (including VOCs, MTBE, and BTEX) in water	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and blanks at 1 in 20 (5%) with at least one in every batch. *MDL study – prior to first use and annually thereafter. Procedure according to 40CFR Part 136.3 appendix B.* *Surrogate spike (similar structure or isotopically labeled) – determined by project manager.* All quality assurance and quality control procedures and criteria specified by selected method.
"	Synthetic organic compounds (non-volatiles, PCBs, PAHs, pesticides) in water	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and blanks at 1 in 20 (5%) with at least one in every batch. *MDL study – prior to first use and annually thereafter. Procedure according to 40CFR Part 136.3 appendix B.* *Surrogate spike (similar structure or isotopically labeled) – determined by project manager.* All quality assurance and quality control procedures and criteria specified by selected method.
"	Trace metals, including mercury in water	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and blanks at 1 in 20 (5%) with at least one in every batch. *MDL study – prior to first use and annually thereafter. Procedure according to 40CFR Part 136.3 appendix B.* All quality assurance and quality control procedures and criteria specified by selected method.

Group	Parameter	Quality Control
Laboratory analyses	Trace metals, including mercury in tissue and sediment	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and laboratory blanks at 1 in 20 (5%) with at least one in every batch. Field blanks – initial demonstration. No further blanks collected if no detectable amount. Otherwise blanks collected at 5% of samples. *MDL study – prior to first use and annually thereafter. Procedure according to 40CFR Part 136.3 appendix B.* All quality assurance and quality control procedures and criteria specified by selected method.
"	Bacteria – pathogen indicators	Field and sterility checks (laboratory blanks) no detectable amounts or less than 1/5 of sample amounts for field blanks. Frequency – accuracy at 1 per culture medium or reagent lot. Precision at 1 in 10 (10%) with at least one per batch. All quality assurance and quality control procedures found in *Standard Methods* (18^{th}, 19^{th}, or 20^{th} editions) section 9020 and in the selected analytical method including confirmation practices.
"	Benthic invertebrates	Frequency – accuracy and precision at 1 per 10 benthic samples.
"	Toxicity testing	Field duplicates at 5% of samples collected per event with a minimum of 1. Positive and negative controls with each test. General water quality measurements – dissolved oxygen, pH, conductivity, and ammonia. All performance criteria outlined in method SOP.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field measurement equipment will be checked for operation in accordance with the manufacturer's specifications. This includes battery checks, routine replacement of membranes, and cleaning of conductivity electrodes. All equipment will be inspected when first handed out and when returned from use for damage. All replacement reagents, or parts required for maintenance will be recorded in an inspection log created by the Water Monitoring Coordinator, Jim Medlen, and recorded by field monitoring staff. Catalogs for replacement parts will be on-hand in the office for ease of ordering.

Equipment associated with bacterial analyses for total coliform, e.coli, fecal coliform and enterococcus will be checked in accordance with the specifications of the professional laboratory's SOPs. SOPs have been reviewed by the CRG QA officer and have been found to be in compliance with SWAMP criteria. SOPs are listed in appendix A3.

Jim Medlen will train staff to maintain field equipment in accordance with the manufacturer's SOPs and will create a manual with detailed instructions and descriptions for proper maintenance of all field equipment.

15.1 Field equipment: Testing, inspection, maintenance of sampling equipment and analytical instruments.

Equipment / Instrument	**Maintenance Activity, Testing Activity or Inspection Activity**	**Responsible Person**	**Frequency**	**SOP Reference**
Oakton pH testr 3	Cleaning, maintenance: check batteries, and tip for damage.	Water Monitoring Coordinator, Field Crew	Once per sampling date.	Manufacturer's specifications
Oakton EC high and EC low conductivity meter	Cleaning, maintenance: check batteries, and tip for damage.	Water Monitoring Coordinator, Field Crew	Once per sampling date.	Manufacturer's specifications.
YSI 55 Handheld Dissolved Oxygen and temperature system meter	Cleaning, maintenance: check batteries, probe and membrane for leakage, Change membrane and fluid as scheduled.	Water Monitoring Coordinator, Field Crew	Once per sampling date.	Manufacturer's Specifications.
Bioassessment	Equipment cleaning	Water Monitoring Coordinator, Field Crew	Before every sampling event.	Department of Fish and Game Protocal.
CRG Laboratory Equipment- Testing, Inspection and Maintenance. *See Appendix A3*				
Professional Laboratory Analyses- CRG Laboratories, Inc. See Appendix	Per CRG Laboratories' SOPs	Richard Gossett, Laboratory Director and Quality Assurance Specialist CRG Laboratories, Inc.	Per CRG Laboratories' SOPs	CRG Laboratories' SOPs. In compliance with SWAMP criteria.

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

16.1 Field Instrument Calibration

In order to keep proper calibration records, all equipment will be assigned equipment numbers. A calibration log for pH and conductivity field equipment will be maintained and filled out for every calibration event. Conductivity (high and low) and pH equipment will be calibrated once before every sampling date. The calibration log will include the following: date, start time, end time, name of person conducting calibration, temperature of standard, standard lot #, initial reading, and final reading. The YSI model 55 Dissolved Oxygen Meter will be calibrated at every site in order to take into account environmental conditions including altitude and temperature.

Deficiencies will be trouble shot by the Water Monitoring Coordinator using the manufacturer's equipment manual, technical support through the appropriate company, or the Technical Advisory Committee. Any deficiencies in calibration procedures will be extensively detailed and addressed to insure quality data.

Table 16.2 Field Equipment and Calibration

Equipment / Instrument	SOP reference	Calibration Description and Criteria	Frequency of Calibration	Responsible Person
Oakton pH testr3	Manufacturer's SOP	Three point calibration in standards (4.01, 7,10)	Before every sampling date	Water Monitoring Coordinator
Oakton conductivity EC high and low	Manufacturer's SOP	Calibration in mid-range standard	Before every sampling date	Water Monitoring Coordinator
YSI Model 55 Dissolved Oxygen Meter	Manufacturer's SOP	100% relative humidity in instrument calibration chamber, altitude input necessary (GPS)	Before every Sampling date	Water Monitoring Coordinator
YSI Model 55 Dissolved Oxygen Meter Temperature gauge	Manufacturer's SOP	Calibrate and check to a NIST approved thermometer	Monthly	Water Monitoring Coordinator

16.3 Professional Laboratory Calibration

CRG Laboratories, Inc. and any subcontracted laboratories must meet the guidelines from SWAMP in the Table 16.4.

16.4 Laboratory Equipment- Instrument Calibration and Frequency

Group	Parameter	Element 16 Instrument Calibration/Frequency
Laboratory analyses	Conventional Constituents in water	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 > 0.995$. Calibration verification every 20 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 80% - 120%.
	Volatile organics (including VOCs, MTBE, and BTEX) in water	External calibration with minimum 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. %RSD for CCCs <30%, RF for SPCCs >0.1, except 1,1,2,2-tetrachloroethane, which is 0.3 Calibration verification every 12 hours. Standard source different that that used for initial calibration. RF for SPCCs same as initial calibration. RF of CCCs must be <20% difference from initial calibration.
	Synthetic organic compounds (non-volatiles, PCBs, PAHs, pesticides) in water	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$ or RSD < 10%. Calibration verification every 10 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 85% - 115%.
	Trace metals, including mercury in water	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$ Calibration verification every 20 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 90% - 110%, except for mercury 80% - 120%.
	Organic chemicals (PCBs, PAHs, pesticides) in tissue and sediment & semi-volatiles & volatiles in sediment only	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$ Calibration verification every 10 samples after initial calibration. Standard source different than that used for initial calibration. Recovery 90% - 110%, except for mercury 85% - 115%.
	Trace metals, including mercury in tissue and sediment	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$ Calibration verification every 10 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 90% - 110%, except for mercury 80% - 120%.
	Bacteria – pathogen indicators	No SWAMP requirements. Suggest follow the requirements of *Standard Methods* (18^{th}, 19^{th}, or 20^{th} editions) section 9020.

Group	Parameter	Element 16 Instrument Calibration/Frequency
	Benthic invertebrates	No SWAMP requirements. Department of Fish and Game Guidelines.

17. Inspection/Acceptance of supplies and Consumables

Supplies for the project that may directly, or indirectly, affect the quality of results are as follows:

Conductivity standards
pH standards
De-ionized water
Sample Containers
Batteries
DO Solution and Membranes

Jim Medlen and field staff will inspect all supplies upon receipt. All supplies should appear free of damage, properly sealed, and have lot numbers for lot identification.

New conductivity and pH standards will be checked by comparing readings with those generated by the current lot of standards. Standards must agree exactly. Standards will also be checked for expiration, proper storage temperatures, and proper method of storage.

All lot-numbers, start date of usage, end date of usage, and name of supply will be recorded in a standards/ reagent log.

Water Monitoring Coordinator, Jim Medlen, will be responsible for all supplies used for the project.

Richard Gossett, Laboratory Director and Quality Assurance Specialist of CRG Laboratories, Inc., will be responsible for inspection/ acceptance of supplies and consumables in CRG Laboratories, Inc.

18. Non-Direct Measurements (Existing Data*)*

Data from monitoring efforts in the watershed will be used in order to help determine baseline conditions. Groups, organizations, and companies currently collecting water quality data in the watershed, or have been involved with collecting water quality data in the past include: Las Virgenes Municipal Water District, Heal the Bay's Stream Team, Los Angeles County Department of Public Works, Clean Lakes Incorporated (in Westlake Village), Southern California Coastal Water Research Project, Ventura County Watershed Protection District, and the Santa Monica Mountains Resource Conservation District. Data collected by these groups can be used to establish baseline data, identify data gaps, and help determine where "hot spot" testing will occur.

Only Data meeting all of the data quality objectives stated in Section 7 of this QAPP will be used in the project.

19. Data Management

Data collected in the field will be recorded on monitoring forms created for field measurements and observations. Contracted laboratories will submit data to the Water Monitoring Coordinator, Jim Medlen, according to their method of transmittal (e-mail, fax, mail).

All data will be input into a Microsoft Access database, which will be either created, or adapted from an existing database. Data will be stored in the office of the Water Monitoring Coordinator and then transferred to the City of Calabasas' City Hall as mentioned above in section 9. Data will also be made available via a website.

Data from the field will be input into the database before the next sampling event. Jim will train an assistant for data input. Only Jim Medlen and his assistant shall enter data into the database. Limiting the amount of people working on the database will reduce the chance of variance and error in data entry. All data entered will be checked at the end of the day in order to insure correct entry.

The Water Monitoring Coordinator, Jim Medlen, will prepare all reports and queries generated from the data.

Backups of the database will be made everyday on the main computer's hard drive and a back-up copy via disk or portable storage device.

No SWAMP database has been made available by the State at this time. The project seeks to use an existing database that can directly upload data from CRG Laboratories.

20. Assessments and Response Actions

All reviews will be made by the QA Officer for the project, and may include the QA Officer and the Contract Manager at the Regional Board. Water Monitoring Coordinator, Jim Medlen, will conduct reviews of sampling procedures on a bi-monthly schedule. Reviews will consist of observing practices and comparing those against the project's sampling SOPs. The QA officer for the project will audit the contracted laboratory quarterly. The review will also consist of observing method practices against the contracted lab's SOPs and an audit of data from their quality assurance and quality control program.

If an audit discovers any discrepancies, the QA Officer will discuss the observed discrepancy with the appropriate person responsible for the activity. The discussion will begin with whether the information collected is accurate, what were the cause(s) leading to the deviation, how the deviation might impact data quality, and what corrective actions might be considered.

The QA Officer has the power to halt all sampling and analytical work in the field, or in the professional laboratory if the deviation(s) noted are considered detrimental to data quality.

The project's Technical Advisory Committee will be utilized in order to help solve any problems related to Quality Assurance and Quality Control objectives.

Calibration of field equipment will be recorded in a calibration log; problems related to the calibration of, or use of instruments will be assessed by the Water Monitoring Coordinator, whom will provide the proper action in order to remediate the problem.

All corrective actions will be documented and discussed in reports generated by the project.

21. Reports to Management

The Water Monitoring Coordinator, Jim Medlen, will issue all data reports. All data and quarterly progress reports will be submitted to the Los Angeles Regional Water Quality Control Board (Regional Board).

21.1 QA management reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Dates(s)	Person(s) Responsible for Report Preparation	Report Recipients
Progress Reports	Quarterly	10th day after the quarter	Water Monitoring Coordinator and City of Calabasas staff	Regional Board
First Year Annual Report	First Year	March 2005	Water Monitoring Coordinator and City of Calabasas staff	Regional Board, Stakeholders, Public
Second Year Annual Report (Hot Spots)	Second Year	January 2006	Water Monitoring Coordinator and City of Calabasas staff	Regional Board, Stakeholders, Public
Draft and Final Project Reports	End of the project	February, March 2006	Water Monitoring Coordinator and City of Calabasas staff	Regional Board, Stakeholders, Public

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

Data generated by project activities will be reviewed against the data quality objectives cited in Element 7 and the quality assurance/quality control practices cited in Elements 14, 15, 16, and 17. Data will be separated into three categories: data meeting all data quality objectives, data failing to meet precision or recovery criteria, and data failing to meet accuracy criteria. Data meeting all data quality objectives, but with failures of quality assurance/quality control practices will be set aside until the impact of the failure on data quality is determined. Once determined, the data will be moved into either the first category or the last category.

Data falling in the first category is considered usable by the project. Data falling in the last category is considered not usable. Data falling in the second category will have all aspects assessed. If sufficient evidence is found supporting data quality for use in this project, the data will be moved to the first category, but will be flagged with a "J" as per EPA specifications.

23. VERIFICATION AND VALIDATION METHODS

Prior to any data entry, all interns will be thoroughly trained and tested for accuracy by the monitoring coordinator, Jim Medlen.

Procedures for data entry verification and validation:

1. On a daily basis, persons responsible for data entry will log in on a database log sheet. The log sheet will include the date, time, and initials of person responsible for entering data into the project's database.

2. When finished, the data enterer will enter a log out time, and initial. At this time, monitoring coordinator Jim Medlen will check 10% off all data entered for errors, and then sign database log if no errors are found.

3. If errors are found in data entry, Jim will retrain the person responsible and then retest them for accuracy by giving them 10 more database forms to enter. If errors are found in any of the forms entered after retesting, then the person responsible will not be allowed to enter data in the future, and all data entered by the individual will be checked again for errors. If errors are found to be caused by the database program itself, then all data entry efforts will stop, the database will be checked, and the problem will be resolved by a hired database consultant or by Jim through the guidance of the Technical Advisory Committee.

4. On a quarterly basis, 10% of all data entered into the database will be checked at the end of the quarter by Jim Medlen, and then checked again by an intern.

Jim will use a random number table in order to select which data entry events to check. For quarterly data checks, daily data entry events will be numbered on the database log sheet in order to select by the random number table. For daily data checks, each data entry form will be numbered in order to select by the random number table.

24. RECONCILATION WITH USER REQUIREMENTS

The project seeks to create baseline data through the collection of data at 10 to 12 sites. After baseline data is collected in the first year, data will be looked at in order to confirm whether, or not, individual sites meet water quality standards set by the Regional Board. An annual report of the findings will be created, which will indicate exceedances of water quality standards per site per parameter. Graphs showing trends in the data collected will be included within the report. The second year report and the final report will follow the same design. All data quality objectives, or quality control efforts not met will be included in these reports.

Several EPA priority pollutants will also be tested at every site, and will aid in locating "hot spots." The collection of all data will indicate which sites are in need of "hot-spot," or further, testing in the second year of the project. The final analyses of data collected should conclusively show areas that are in need of further study, and give indication of programs and projects that would restore beneficial uses of creeks and other water bodies.

Limitations in collected data will be submitted to data users upon request. Reports generated for the project will include a summary of any limitations.

APPENDIX

A1. Fish Tissue Collection Procedures for Contaminant Analysis

A2. California Department of Fish and Game Benthic Macroinvertebrate Bioassessment Protocol

A3. CRG Laboratories Incorporated SOPs.

A1. *Fish Tissue Collection Procedures for Contaminant Analysis*

Collection of fish for analysis of contaminants in tissue may be accomplished by a variety of methods, including hook and line, seines, gill nets, and electro-shocking. Species collected will, in most cases, be non-migratory species that are most representative of a given location. Efforts will be made to collect fish of a similar (medium) size for each composite. Fish will be wrapped in trace metal- and organic-free Teflon™ sheets and frozen for transportation to the laboratory. The tissue samples are prepared in the laboratory using non-contaminating techniques in a clean room environment.

Collection, handling, and storage of tissue samples will be performed in a manner consistent with other large scale tissue contaminant monitoring programs, such as the Regional Monitoring Program (RMP) protocols (SFEI 1999, SFRWQCB 1995), CALFED DFG protocols, and toxic substances monitoring protocols, to assure the collection of representative, uncontaminated tissue chemistry samples. Field crews must rigorously follow sampling procedures and complete all necessary documentation according to the SOPs.
As a general rule, five fish of medium size or three fish of larger size are collected as composites for analysis. The smallest fish length cannot be any smaller than 75% of the largest fish length.

Five fish provide sufficient quantities of tissue for the dissection of 100 grams of fish flesh for organic and inorganic analysis. The medium size is more desirable to enable similar samples to be collected in succeeding collections. When only small fish are available, sufficient numbers are collected to provide 100 grams of fish flesh for analysis. If the fish are too small to excise flesh, the whole fish, minus the head, tail, and guts are analyzed as composites.

Fish collected that are too large to fit in our clean bags (>500 mm) are initially dissected in the field. At the dock, the fish are laid out on a clean plastic bag and a large cross section from behind the pectoral fins to the gut is cut with a cleaned bone saw. The bone saw is cleaned (Micro™, DI, methanol) between fish and a new plastic bag is used. The internal organs are not cut into, to prevent contamination. During lab dissection, a subsection of the cross section is removed, discarding any tissue exposed by field dissection.

Field data recorded include, but are not limited to site name, sample identification number, site location (GPS), date of collection, time of collection, names of collectors, method of collection, type of sample, water depth, water and atmospheric conditions, fish total lengths (fork lengths where appropriate), photo number and a note of other fish caught.

The fish are then wrapped in cleaned Teflon™ sheets. The wrapped fish are then double-bagged in Ziploc™ bags with the inner bag labeled. The fish are put on dry ice and transported to the laboratory where they are kept frozen until they are processed for chemical analysis.
All samples, once returned to the laboratory for processing, are prepared in a clean room to avoid airborne contamination.

The professional laboratory will use methods for testing fish tissue that are compliant to SWAMP recommendations, which will be cited upon hire.

A2. *Benthic Macro-invertebrate Bio-assessment Protocol*

The protocol for the Department of Fish and Game's Benthic Macro-invertebrate Bio-assessment, which will be used for the purposes of this project, can be viewed at: www.dfg.ca.gov/cabw/csbp_2003.pdf.

A3. ***CRG LABORATORY EQUIPMENT - TESTING, INSPECTION, MAINTENANCE***

Service contracts may be maintained for the major instrumentation and equipment that are no longer under warranty. The Gas Chromatograph and Inductively Coupled Plasma Mass Spectrometer instrumentation and balances are typical examples of equipment that might be covered by a maintenance contract. Records of maintenance are kept by the person responsible for the equipment as designated by the Laboratory Director, Richard Gossett. Specific examples of routine preventive maintenance are further discussed in the following sections:

A. Hewlett Packard 5972 Gas Chromatograph/Mass Spectrometer System

1. Every six months, replace the MSD foreline pump oil and foreline trap pellets. During the fluid exchange, replace the outlet mist filter

2. Every year, check and if necessary replace the diffusion pump fluid

3. As needed, clean the ion source of the MSD (typically every six months)

4. As needed, the glass injector sleeve and injector septum for the split-splitless injector is replaced (typically once per month)

5. As needed, the gas purifiers and filters for the carrier gas are replaced

B. Hewlett Packard 4500 Inductively Coupled Plasma Mass Spectrometer System

1. Every six months, replace the oil and foreline trap pellets for the rough pumps. During the fluid exchange, replace the outlet mist filter

2. Every year check and replace the turbo molecular pump fluid

3. Once per month, clean the sample and skimmer cones

4. Once per week, replace the peripump tubing

5. As needed, clean the ion source of the mass spectrometer

6. Every three months, clean the nebulizer

C. Mettler AE 160 and the Sartorius Micro analytical balances

1. All analytical balances should be serviced by an authorized service center once per year.