MARCH 2010

Quality Assurance Project Plan (QAPP)

Sacramento Valley Water Quality Coalition Monitoring and Reporting Program Plan—Sacramento River Basin

Prepared by:

LARRY WALKER ASSOCIATES

LARRY WALKER ASSOCIATES

This page intentionally blank

March 2010

Quality Assurance Project Plan (QAPP)

Sacramento Valley Water Quality Coalition

Monitoring and Reporting Program Plan — Sacramento River Basin

Prepared by

Larry Walker Associates

This page intentionally blank

A PROJECT MANAGEMENT

A.1 TITLE AND APPROVAL SHEET

Quality Assurance Project Plan
Sacramento Valley Water Quality Coalition
Monitoring and Reporting Program Plan —
Sacramento River Basin
Revision V.5.1

Coalition Project Lead	Bruce Houdesheldt, Northern California Water Association	June 29, 2010 Date
Coalition Monitoring Manager	Claus Suverkropp, Larry Walker Associates	June 28, 2010 Date
Project QA Manager	Brian Laurenson, Larry Walker Associates	7/6/2010 Date
NECWA Monitoring Coordinator	~~Ted DeBrega~~, Northeast California Water Association	7/1/2010 Date
PCWG Monitoring Manager	Jonathan Koehler, Napa County Putah Creek Watershed Group	6/29/10 Date
UFRWG Monitoring Coordinator	Carol Dobbas, Upper Feather River Watershed Group	6-29-2010 Date
Board QA Officer	Leticia Valadez, CVRWQCB	Date
Regional Board Coalition Lead	Mark Cady, CVRWQCB, Irrigated Lands Regulatory Program, Monitoring and Implementation Unit	Date

A.2 TABLE OF CONTENTS

List of Tables

List of Figures

Appendices

A.3 DISTRIBUTION LIST

Table 1. Distribution list for this QAPP

Name	Agency	Phone	E-mail Address
Joe Karkoski	Central Valley Regional Water Quality Control Board	(530) 464-4668	Jkarkoski@waterboards.ca.gov
Mark Cady	Central Valley Regional Water Quality Control Board	(916)-464-4654	Klarsen@waterboards.ca.gov
Susan Fregien	Central Valley Regional Water Quality Control Board	(916) 464-4813	Sfregien@waterboards.ca.gov
Leticia Valadez	Central Valley Regional Water Quality Control Board	(530) 464-4634	Lvaladez@waterboards.ca.gov
Bruce Houdesheldt	Northern California Water Association	(916) 442-8333	Bruceh@norcalwater.org
Stephen Clark	Pacific EcoRisk	(925) 313-8080	Slclark@pacificecorisk.com
Todd Albertson	Caltest Laboratory	(707) 258-4000	Todd_albertson@caltestlabs.com
Karen Tuttle	CRG Marine Labs	(310) 533-5191	KTuttle@crglabs.com
Cynthia Clark	APPL, Inc.	(559) 275-2175	Cclark@applinc.com
Laura Miller	North Coast Labs	(707) 822-4649	LLMiller@northcoastlabs.com
Michael Machuzak	ABC Laboratory	(805) 643-5621	aquabio@pacbell.net
Melissa Hawley	Basic Laboratory	(530) 243-7234	mhawley@basiclab.com
Joe Nava	Sierra Environmental Monitoring Laboratory	(775) 857-2400	jnava@sem-analytical.com
Jonathan Koehler	Napa County Resource Conservation District	(707) 252-4188	Jonathan@naparcd.org
Ted Debraga	Northeastern California Water Association	(530) 949-1984	Tdebraga@aol.com
Carol Dobbas	Upper Feather River Watershed Group	(775) 722-2610	Cdobbas@peoplepc.com

A.4 PROJECT ORGANIZATION

This Quality Assurance Project Plan (QAPP) describes the quality assurance requirements for the Monitoring and Reporting Program (Order No. R5-2009-0875, CVRWQCB 2009b) plan for the Irrigated Lands Regulatory Program (ILRP) for the Sacramento Valley Water Quality Coalition (Coalition). The Coalition project lead is Bruce Houdesheldt, Northern California Water Association. The Coalition monitoring program is managed by Larry Walker Associates (LWA). The monitoring program manager is Claus Suverkropp of LWA, and is responsible for maintaining the approved QAPP. The project quality assurance (QA) manager for the project is Brian Laurenson of LWA.

Sample collection and analysis will be performed by the following agencies and subcontractors:

- Pacific EcoRisk, Martinez, California
- Caltest Analytical Laboratory, Napa, California
- CRG Marine Laboratories, Torrance, California
- Agriculture and Priority Pollutants Laboratory, Inc (APPL), Fresno, California
- Applied Marine Sciences, Inc., League City, Texas
- North Coast Laboratory, Ltd., Arcata, California
- Basic Laboratory, Redding, California
- Sierra Environmental Monitoring, Reno, Nevada
- ABC Laboratory, Ventura, California
- BC Laboratories, Bakersfield, California

Additional contractors will be selected as required to successfully implement the monitoring program described in the MRP and this QAPP. The contractors selected to perform sampling and laboratory analyses provide the precision, accuracy, detection and reporting limits, and meet the quality control criteria necessary to satisfy the data quality objectives described in this document. Primary project position and responsibilities are listed in Table 2.

Table 2. Project Positions and Responsibilities

Position	Person	Responsibilities
Coalition Project Manager	Bruce Houdesheldt, NCWA, 916-442-8333	Project management and oversight, advisory role.
Monitoring Management	Claus Suverkropp, Larry Walker Associates, 530-753-6400	Project coordination and oversight, data management, and reporting. Maintenance of QAPP.
Project QA Manager	Brian Laurenson, Larry Walker Associates, 530-753-6400	Ensure that the laboratory quality assurance plan and quality assurance project plan criteria are met through routine monitoring and auditing of the systems.
Regional Board QA Officer	Leticia Valadez, CVRWQCB, 530-464-4634	
Sampling Contractor	Stephen Clark, Pacific EcoRisk, 925-313-8080	Sampling coordination, operations, and implementing field-sampling procedures.
Analytical Contractors	Stephen Clark, Pacific EcoRisk, 925-313-8080	Oversight of toxicity testing & TIEs
	Todd Albertson, CalTest Laboratory, 707-258-4000	Chemical Analysis of Water and Sediment
	Karen Tuttle, CRG Marine Labs, 310-533-5190	
	Cynthia Clark, APPL, Inc, 559-275-2176	
	Mike Seymour, Applied Marine Sciences, 281-554-7272	
	Laura Miller, North Coast Labs, 707-822-4649	
	Michael Machuzak, ABC Laboratories, 805-643-5621	
	Melissa Hawley, Basic Laboratory, 530-243-7234	
	Joe Nava, SEM Laboratory, 775-857-2400	
	Sara Guron, BC Labs, 661-327-4911	

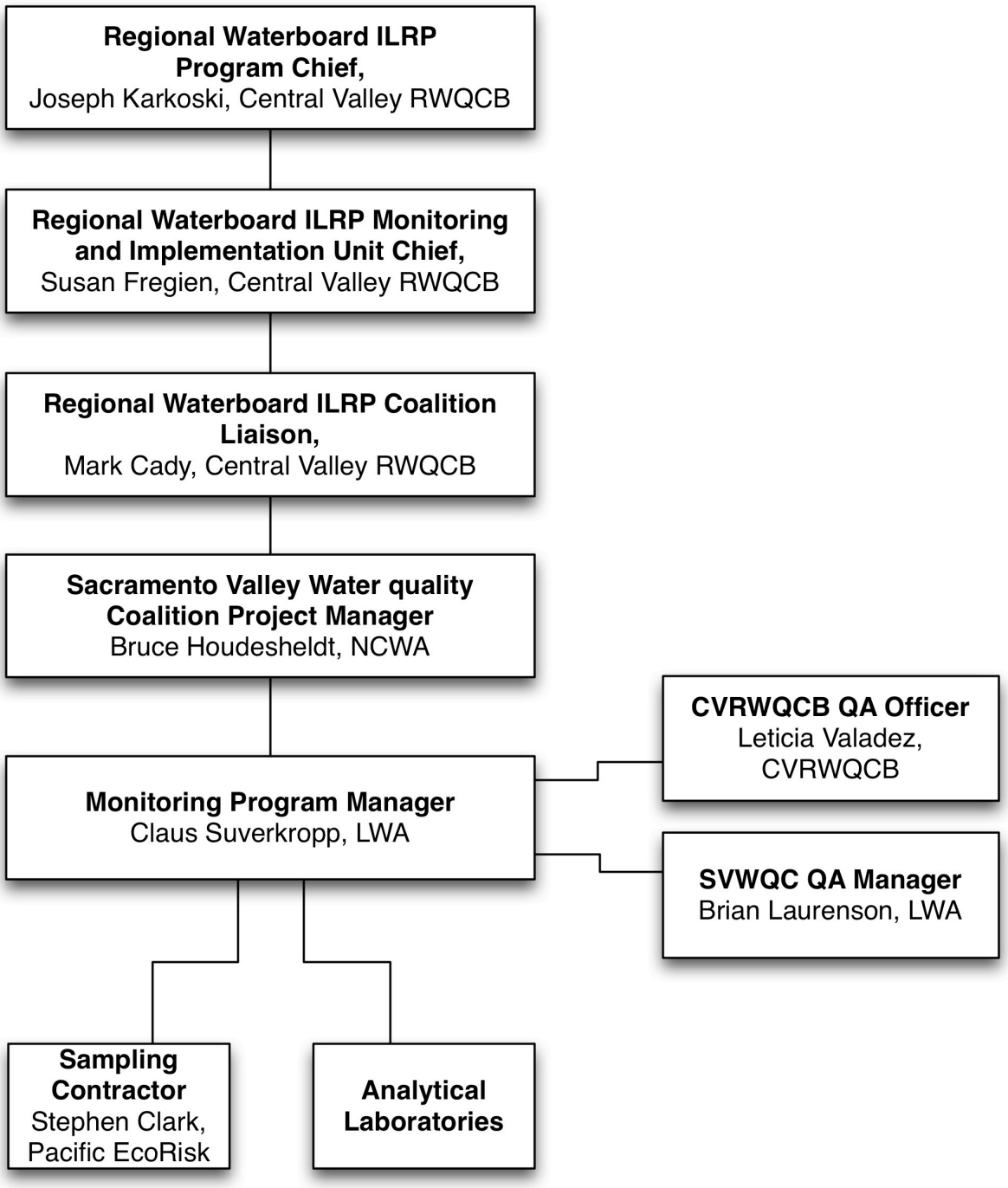

Figure 1. Coalition Monitoring Program Management Structure

A.5 PROBLEM DEFINITION/BACKGROUND

The rationale for monitoring is described in the Coalition Monitoring and Reporting Program (MRP) (Order No. R5-2009-0875, CVRWQCB 2009b). The MRP discusses requirements for compliance with the Conditional Waiver for Irrigated Lands (R5-2008-0005, CVRWQCB 2008) as well as the decisions to be made based on the results of the monitoring. The overall objective of the MRP is to provide a monitoring framework that will address the following questions:

1. Are conditions in waters of the State that receive discharges of wastes from irrigated lands within Coalition Group boundaries, as a result of activities within those boundaries, protective of beneficial uses?
2. What is the magnitude and extent of water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition Group boundaries, as determined using monitoring information?
3. What are the contributing source(s) from irrigated agriculture to the water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition Group boundaries?
4. What are the management practices that are being implemented to reduce the impacts of irrigated agriculture on waters of the State within the Coalition Group boundaries and where are they being applied?
5. Are water quality conditions in waters of the State within Coalition Group boundaries getting better or worse through implementation of management practices?

The science-based program described in the Coalition MRPP uses significant toxicity and exceedances of numeric and narrative water quality objectives as triggers for further investigation. Determining the degree of management practice implementation in place in each subwatershed (Objective 4) is addressed in the Coalition Management Plan (SVWQC 2008b). Appendix B of the Coalition Management Plan describes the specific steps and activities that are planned for each management plan parameter. The WER also includes information on the characteristics of the Sacramento River watershed critical for developing the MRPP.

The "Action Limits" for this project are the numeric and narrative water quality objectives in the Central Valley Basin Plan (CVRWQCB 2009a), the California Toxics Rule (USEPA 2000), and the Interim "Trigger Limits" for the *ILRP*. These "Action Limits" include any numeric limits associated with applicable Total Maximum Daily Load (TMDL) requirements adopted in the Basin Plan. Numeric limits and numeric interpretations of narrative objectives for physical, chemical, and microbiological parameters are listed in **APPENDIX A** and **APPENDIX B**. The "Action Limits" used to assess water column and sediment toxicity are (1) statistically significant toxicity as defined by the USEPA analytical methods cited in this document.

A.6 PROJECT DESCRIPTION

A.6.1 Work Summary

The work to be performed for the Coalition MRP includes sampling and analysis for ILRP monitoring parameters. Parameters to be monitored for the Coalition MRPP are determined as specified in the Sacramento Valley Water Quality Coalition Monitoring and Reporting Program (MRP) (Order No. R5-2009-0875, CVRWQCB 2009b). The following environmental monitoring elements are included:

- Water column and sediment toxicity

- Physical and conventional parameters in water and sediment
- Organic carbon
- Pathogen indicator organisms in water
- Trace metals in water
- Pesticides in water and sediment
- Nitrogen and phosphorus compounds in water

The MRP requires the Coalition to identify the pesticide (current use) and metals monitoring parameters for each subwatershed area by 15 November of the year prior to the Assessment Monitoring year.

The MRP also requires testing for 303(d)-listed constituents identified in waterbodies downstream from Coalition sites and discharged within the watershed if agriculture is identified as a contributing source. Specific individual parameters to be measured for the Coalition monitoring effort are provided in **APPENDIX D**. If parameters to be measured are not currently listed in Appendix D, due to additions at a later date, then the QAPP will be amended accordingly.

A.6.2 Project Schedule

The Coalition monitoring program will be implemented beginning in January 2010 and is expected to continue through 2014. Sites will be monitored according to a three year Assessment and Core monitoring cycle, as shown in the schedule presented in Table 3. Assessment monitoring shall occur for one year at all Assessment monitoring sites, followed by Core Monitoring for the next two years. This cycle will be repeated in subsequent years. A description of additional Special Project monitoring studies was provided in the Sacramento Valley Coalition's approved 2009 Management Plan, which reflects the management plans required through December 2008.

Monitoring will generally be conducted monthly. Storm season monitoring will attempt to include monitoring during two storm events each year. The identification of a specific storm event will be based on the potential for runoff to occur during the event. This decision will be made by the Monitoring Manager after consultation with agricultural commissioners and other subwatershed representatives knowledgeable of local soil saturation conditions and potential for runoff. At least two storm season sample events will be planned to sample sites during substantially elevated storm runoff flows. However, it is recognized that limited resources and logistical considerations (i.e., the large size of the watershed and distance between stations, and the unpredictable nature of precipitation) may prevent achieving this for all sites. Monitoring is generally conducted monthly during the irrigation season when there is sufficient surface flow for sample collection. No more than one complete sample event per month is required.

Sediment toxicity testing will be conducted once at the end of the storm season, between March 1 and April 30, depending on weather patterns and site conditions, and once again later in the irrigation season (between August 15 – October 15).

Assessments of exceedances of numeric and narrative water quality objectives are conducted for each monitoring event.

Monitoring data are submitted quarterly and Annual Monitoring Reports are prepared and submitted by March 1 after completion of monitoring for the previous water year, according to the requirements of the ILRP MRP (Order No. R5-2009-0875, CVRWQCB 2009b).

Table 3. Core and Assessment Monitoring Schedule

Site Identification	Site Code	2010	2011	2012	2013	2014
Butte-Yuba-Sutter Subwatershed Monitoring Sites						
Lower Honcut Creek at Hwy 70	LHNCT	Core	Core	Assmt	Core	Core
Lower Snake River at Nuestro Road	LSNKR	Core	Assmt	Core	Core	Assmt
Pine Creek at Nord Gianella Road	PNCGR	Core	Assmt	Core	Core	Assmt
Sacramento Slough Bridge near Karnak	SSKNK	Core	Assmt	Core	Core	Assmt
Colusa-Glenn Subwatershed Monitoring Sites						
Colusa Basin Drain above Knights Landing	COLDR	Core	Assmt	Core	Core	Assmt
Freshwater Creek at Gibson Road	FRSHC	Core	Assmt	Core	Core	Assmt
Walker Creek near 99W and CR33	WLKCH	Core	Core	Assmt	Core	Core
El Dorado Subwatershed Monitoring Sites						
North Canyon Creek	NRTCN	Core	Assmt	Core	Core	Assmt
Lake-Napa Subwatershed Monitoring Sites						
Middle Creek upstream from Highway 20	MDLCR	Core	Assmt	Core	Core	Assmt
Pope Creek upstream from Lake Berryessa	PCULB	Core	Assmt	Core	Core	Assmt
Pit River Subwatershed Monitoring Sites						
Pit River at Pittville	PRPIT	Core	Assmt	Core	Core	Assmt
Placer-Nevada-South Sutter-North Sacramento Subwatershed Monitoring Sites						
Coon Creek at Brewer Road	CCBRW	Core	Assmt	Core	Core	Assmt
Sacramento-Amador Subwatershed Monitoring Sites						
Cosumnes River at Twin Cities Road	CRTWN	Core	Assmt	Core	Core	Assmt
Grand Island Drain near Leary Road	GIDLR	Core	Assmt	Core	Core	Assmt
Shasta-Tehama Subwatershed Monitoring Sites						
Anderson Creek at Ash Creek Road	ACACR	Core	Assmt	Core	Core	Assmt
Solano-Yolo Subwatershed Monitoring Sites						
Shag Slough at Liberty Island Bridge	SSLIB	Core	Assmt	Core	Core	Assmt
Ulatis Creek at Brown Road	UCBRD	Core	Assmt	Core	Core	Assmt
Willow Slough Bypass at Pole Line	WLSPL	Core	Assmt	Core	Core	Assmt
Upper Feather River Subwatershed Monitoring Sites						
Middle Fk Feather River above Grizzly Creek	MFFGR	Core	Assmt	Core	Core	Assmt
Spanish Creek below Greenhorn Creek	SPGRN	Core	Assmt	Core	Core	Assmt
Indian Creek below Arlington Bridge	INDAB	Core	Assmt	Core	Core	Assmt

Table 4. Constituents to be Monitored

Category	Parameters	Matrix	Assessment	Core
Field Parameters	Photo documentation	Site	X	X
	Flow	Water	X	X
	pH	Water	X	X
	Conductivity	Water	X	X
	Dissolved Oxygen	Water	X	X
	Temperature	Water	X	X
General Physical Parameters	Hardness, total as $CaCO_3$	Water	X	
	Turbidity	Water	X	X
	Total Suspended Solids	Water	X	X
	Total Organic Carbon	Water	X	X
Pathogen Indicators	*E. Coli* bacteria	Water	X	X
Nutrients	Total Kjeldahl Nitrogen	Water	X	
	Phosphorus, total	Water	X	X
	Soluble Orthophosphate	Water	X	
	Nitrate + Nitrite as N	Water	X	X
	Ammonia as N	Water	X	
Trace Elements (as determined by evaluation of agricultural use, monitoring results, and other factors (Section A.7.3)	Arsenic	Water	TBD	(no metals)[2]
	Boron	Water	TBD	
	Cadmium	Water	TBD	
	Copper	Water	TBD	
	Lead	Water	TBD	
	Molybdenum	Water	TBD	
	Nickel	Water	TBD	
	Selenium	Water	TBD	
	Zinc	Water	TBD	
Pesticides	Current use pesticides as determined by evaluation of PUR data and monitoring results, and other factors (Section A.7.3)	Water	TBD	
Group-A organochlorine pesticides[1]	Aldrin	Water	TBD	(no pesticides)[2]
	a-BHC	Water	TBD	
	b-BHC	Water	TBD	
	d-BHC	Water	TBD	
	g-BHC (Lindane)	Water	TBD	
	a-chlordane	Water	TBD	
	g-chlordane	Water	TBD	
	Endosulfan I	Water	TBD	
	Endosulfan II	Water	TBD	
	Endosulfan Sulfate	Water	TBD	
	Heptachlor	Water	TBD	
	Heptachlor epoxide	Water	TBD	
	Toxaphene	Water	TBD	
Organochlorine pesticides	Dicofol	Water	X	(no pesticides)[2]
	DDD(p,p')	Water	X	
	DDE(p,p')	Water	X	
	DDT(p,p')	Water	X	
	Dieldrin	Water	X	
	Endrin	Water	X	
	Methoxychlor	Water	X	

Category	Parameters	Matrix	Assessment	Core
Toxicity	*Ceriodaphnia*, 96-h acute	Water	X	
	Pimephales, 96-h acute	Water	X	
	Selenastrum, 96-h short-term chronic	Water	X	
	Toxicity Identification Evaluation	Water	As needed, see Section B.4.1.4	
	Hyalella, 10-day short-term chronic	Sediment	X	
Pesticides and Sediment Parameters[3]	Bifenthrin	Sediment	As needed for significantly toxic sediments[3]	
	Cyfluthrin	Sediment		
	Cypermethrin	Sediment		
	Esfenvalerate/Fenvalerate	Sediment		
	Fenpropathrin	Sediment		
	Lambda cyhalothrin	Sediment		
	Permethrin	Sediment		
	Chlorpyrifos	Sediment		
	Total Organic Carbon	Sediment		
	Grain Size	Sediment	X	

1 Group A pesticides will only be analyzed for water bodies that are 303(d) listed for Group A Pesticides, or that are directly tributary to stream segments that are 303(d) listed for Group A

2 Pesticide and metals monitoring is not required during Core Monitoring unless identified as a Parameter of Concern per Section III.B of the Coalition MRP (Order No. R5-2009-0875, CVRWQCB 2009b).

3 For sediment samples measuring significant toxicity and ≥20% reduction in survival from Control, analysis of sediment pesticides and organic carbon will be performed.

A.6.3 Geographical Information (Monitoring Locations)

A detailed geographic description of the watershed and the ten subwatersheds is included in the Coalition's 2009 MRP (Order No. R5-2009-0875, CVRWQCB 2009b). All sampling sites are located in the Sacramento River watershed and Cosumnes River watershed. Coalition monitoring locations are listed in **APPENDIX C**.

A.6.4 Photo reconnaissance

Photo reconnaissance of all monitoring sites must be submitted to Central Valley Water Board once a year along with the target GPS coordinates. At a minimum four pictures should be taken and included in the Project report. These pictures should include:

- A general site overview
- Upstream view
- Downstream view
- Entrance to location where the samples will be collected

A.6.5 Resource and Time Constraints

Monitoring addressed in this QAPP is expected to continue through 2014.

A.7 QUALITY OBJECTIVES

A.7.1 Data Quality Objectives

The objective of data collection for this monitoring program is to produce data that represents, as closely as possible, *in-situ* conditions of agricultural discharges and water bodies in the Central Valley. This objective will be achieved by using standard accepted methods to collect and analyze surface water and sediment samples. Assessing the monitoring program's ability to meet this objective will be accomplished by evaluating the resulting laboratory measurements in terms of detection limits, precision, accuracy, representativeness, comparability, and completeness, as presented in Section B.5 and **APPENDIX K** of this document.

A.7.2 Performance Criteria Goals

Performance criteria goals for this project are derived from numeric and narrative water quality objectives intended to protect beneficial uses of surface waters of the state. Appendices A and B of this document list the performance criteria goals.

A.7.3 Parameters Monitored

The parameters to be monitored are established by the Coalition's MRP (Order No. R5-2009-0875, CVRWQCB 2009b) and listed in Table 4.

The specific pesticides to be monitored at sites within each subwatershed will be determined (in part) based on three consecutive years of the most recent available pesticide use information from the California Department of Pesticide Regulation Pesticide Use Reporting (PUR) database and the Coalition's previous monitoring results. Pesticides (current use) that have been applied and/or detected in a subwatershed area during all or part of three consecutive years of PUR data will be monitored, unless exclusion from monitoring is justified through an evaluation of additional factors. Additional factors that may be considered to determine if monitoring of a pesticide is warranted include: pesticide use trends; the proportion of acres treated out of total

irrigated acres; total pounds or pounds per acre of pesticide applied; application rates; LC50 or EC50 toxicity thresholds; prior monitoring results; availability of reliable analytical methods; chemical characteristics of the parameter, such as mobility or half-life.

Trace metals to be monitored within each subwatershed shall be determined through an evaluation of several factors. These evaluation factors shall include, but not be limited to: documented use of the metal applied to agricultural lands; prior monitoring results; geological or hydrological conditions; and mobilization or concentration through agricultural operations. Other factors may also be considered, including acute and chronic toxicity thresholds and chemical characteristics of the metals. The Coalition shall evaluate the metals parameters listed in Table 4 to determine which metals warrant monitoring for each subwatershed.

Complete documentation of the evaluations to determine pesticides and metals to be monitored must be provided.

A.7.3.1 Quantitation Limits

Project quantitation limits (QLs) for parameters monitored or potentially monitored for this project are listed in **APPENDIX D**. Note that not all parameters will be monitored at each location, and some parameters listed in **APPENDIX D** may not require monitoring at all. Additional parameters may be added to this list based on the evaluations discussed in Section A.7.3, or as required and approved by the Central Valley Regional Water Quality Control Board's Executive Officer.

Each laboratory performing analyses for the ILRP program must routinely conduct MDL studies to establish the maximum sensitivity (lowest reliably detectable concentration) for each chemical constituent and to document that the MDLs are less than the PQLs. The MDL studies must be thoroughly documented and conducted in accordance with Revision 1.1, Code of Federal Regulations (CFR), Title 40, Part 136, Appendix B (1984), "Definition and Procedure for the Determination of the Method Detection Limit." New MDL studies should be conducted whenever there is a significant change in methods, reagent type or procedures, or within two years of the date the most recent study was conducted. Project samples will not be analyzed and reported until an MDL study has been completed according to the CFR requirements.

QLs and MDLs are further discussed in section B.4.4 Method Performance Criteria.

A.7.3.2 Quality Control Measures

The collection of samples and evaluation of data shall provide data that are representative, comparable, complete, precise, and accurate.

Representativeness

Representativeness can be defined as the degree to which the environmental data generated by the monitoring program accurately and precisely represent actual environmental conditions of interest. For this project, this objective is addressed by the overall design of the monitoring program. Specifically, assuring the representativeness of the data is addressed primarily by selecting appropriate locations, methods, times, and frequencies of sampling for each environmental parameter, and by maintaining the integrity of the sample after collection. Each of these elements of the quality assurance program is addressed elsewhere in this document. Representativeness is also assured by avoiding the introduction of bias in sampling and analytical methods where possible, by recognizing potential sources of bias inherent in the sampling design or methodology, and by controlling these sources of bias where possible.

Comparability

Comparability of the data can be defined as the similarity of data generated by different monitoring programs. For the purpose of the Coalition Monitoring Program, this objective is addressed primarily by using standard sampling and analytical procedures where possible. Additionally, comparability of analytical data is addressed by analysis of standard reference materials (discussed subsequently in this document).

Completeness

Completeness is a measure of the amount of successfully collected and validated data relative to the amount of data planned to be collected for the project, and is usually expressed as a percentage value. Project completeness is assessed for two areas: Sampling completeness and laboratory completeness. Sampling completeness refers to the complete event process of successful planned site visit, conditions documentation, collection of in-field measurements, sample collection technique and volume, in-field quality assurance and control sample preparation, chain-of-custody documentation, preservation, and successful transport of samples to the analyzing laboratories. Note that if a site is inaccessible or dry, the adequate documentation of these conditions through field sheets, photos, and other means meets the completeness goal for that site and event. Meeting this sampling completeness requirement does not supersede other requirements outlined in the MRP order that would determine site re-visitation or site location changes. Laboratory completeness refers to the complete event process of sample reception, chain-of-custody documentation, storage and in-house preservation, extraction, analysis, and laboratory quality assurance and control samples and measures.

A project objective for percent completeness is typically based on the percentage of the data needed for the program or study to reach valid conclusions. Because monitoring conducted by the Coalition is intended to be a long term program, data that are not successfully collected for a specific sample event or site can typically be recollected at a later sampling event. For this reason, any specific data planned for collection can not be considered absolutely critical, and it is difficult to set any meaningful objective for data completeness. However, some reasonable objectives for data completeness are desirable, if only to measure the effectiveness of the Monitoring Program. The program goals for data completeness are based on the planned sampling frequency and a subjective determination of the relative importance of the monitoring element within the Monitoring Program. Both sampling and laboratory completeness goals for the Coalition program are set at 90% for all chemistry, toxicity, and microbiology results.

Sampling completeness is expressed and assessed as the percent of successfully completed and documented site visits, successfully collected field measurements, and successfully collected and transported samples relative to the number planned for the project.

Percent sampling completeness is calculated as:

$$\%C_{sampling} = \frac{N_{valid} \times 100\%}{N_{planned}}$$

where $\%C_{sampling}$ = percent sampling completeness,

N_{valid} = the number of successfully completed and documented site visits, successfully collected field measurements, and successfully collected and transported samples, and

$N_{planned}$ = the number planned for the project.

Laboratory completeness is expressed and assessed as the percent of valid results generated by the laboratory relative to the number of samples received by the laboratory.

Percent laboratory completeness is calculated as:

$$\%C_{lab} = \frac{N_{valid} \times 100\%}{N_{planned}}$$

where $\%C_{lab}$ = percent laboratory completeness,

N_{valid} = the number of successfully analyzed and validated results, and

$N_{planned}$ = the number of planned results for successfully received samples.

Precision and Accuracy

The precision of data is a measure of the reproducibility of the measurement. Precision is assessed by evaluation of the results for duplicate samples and analyses, including field replicate samples and laboratory replicate analyses of environmental and QA samples.

Precision is expressed and assessed as the relative percent difference between two measured results. Generally, relative percent difference (RPD) is calculated as:

$$RPD = \frac{|R_1 - R_2| \times 100\%}{[R_1 + R_2] \div 2}$$

Where: RPD = the Relative Percent Difference

R_1 = first replicate result,

R_2 = second replicate result.

The accuracy of an analysis is a measure of how close a measurement is to the true or accepted value. Accuracy is assessed by evaluation of field and method blanks, laboratory control spikes, matrix spikes. For trace organic analyses, recovery of surrogate analytes are also assessed. Analytical bias (i.e., a systematic lack of accuracy) is assessed and controlled through routine analytical calibration procedures.

Generally, accuracy is expressed and assessed as percent recovery of a known quantity of analyte. Generally, percent recovery (REC) is calculated as:

$$REC = \frac{V_m \times 100\%}{V_k}$$

where REC = percent recovery,

V_m = the measured value, and

V_k = the expected or "true" value.

In the specific case of matrix spikes, percent recovery (REC) is calculated as:

$$REC = \frac{[MS_m - M_m] \times 100\%}{V_k}$$

where MS_m = the measured value in the spiked matrix,

M_m = the measured value in the matrix, and

V_k = the expected or "true" concentration of the spike added to the matrix.

A.8 SPECIAL TRAINING NEEDS AND CERTIFICATION

Organizations and individuals involved in monitoring for the Coalition MRP are expected to have familiarity with the quality documents described in this quality assurance program plan. All staff performing field or laboratory procedures shall receive training to ensure that the work is conducted correctly and safely. Each contractor's QA officer is responsible for oversight of training. Specific responsibilities for providing and overseeing training are provided in the QA Manuals for each laboratory Contractor (provided in **APPENDIX F**).

The Coalition may have several entities responsible for sampling. The Coalition will collect and submit one set of Field QC samples per sampling event for all sampling entities trained by a single designated sampling entity. Otherwise, each sampling entity is required to collect and submit a set of Field QC samples for each sampling event.

Field personnel from all entities that conduct field sampling for the Coalition must receive annual training from the designated Training Officer to ensure consistency of field methodologies and data quality. At a minimum, all staff conducting sampling shall be familiar with the field guidelines and sample collection procedures, and all laboratory staff shall be familiar with the specific laboratory standard operating procedures (SOP) included in this QAPP. All contractors and staff conducting fieldwork must receive field safety training. All work shall be performed under the supervision of experienced staff or a field coordinator. A copy of the staff training records must be maintained in the specific project file by each contractor performing work for this project.

Pacific EcoRisk (the primary sampling contractor for the project) does not maintain SOPs for training field teams for sampling because requirements are project-specific. Members of Pacific EcoRisk field crews for this project are required to read the field sampling SOPs and are then given a dry run in the laboratory. This is followed by a field demonstration of sampling methods, plus oversight and in-field training by senior staff during sample events.

The Putah Creek Watershed Group the conducts ILRP sampling for Napa County sites in the Lake-Napa subwatershed and has the following training requirements. As part of the required annual training for this project, training of field staff includes review of the SOPs prior to each year's sampling season, and review of sampling and handling procedures with the lab manager. Resource Conservation District senior staff will also demonstrate field collection techniques for each parameter with field staff prior to sampling. If new field staff is added, at least one sample event is conducted with supervision of senior staff.

The Northeastern California Water Association (NECWA) conducts ILRP sampling for the Coalition in its subwatershed and has the following training requirements. As part of the required annual training for this project, new sampling personnel are required to review the Quality Assurance Protection Plan SOPs for sampling. The review includes field data sheets, equipment operation, water quality parameters and lab requirements for sample handling procedures. New personnel are trained in collecting, handling, and transporting required samples by experienced sampling personnel. Sampling personnel are also trained in the calibration, operation, and maintenance of the multi-parameter field meters used to collect field-measured water quality data. Training includes a streamside hands-on training and review session conducted in the field with experienced personnel prior to collecting any samples.

The Upper Feather River Watershed Group conducts ILRP sampling for the Coalition in its subwatershed and has the following training requirements. As part of the required annual training for this project, a field staff meeting is held to review the sampling SOP prior to each sampling

season. The review includes field data sheets, equipment operation, water quality parameters and lab requirements for sample handling procedures. A streamside hands-on training and review session is conducted in the field prior to the first sampling event each season. Equipment calibration, operation and collection techniques for each parameter are reviewed with the county's UC Cooperative Extension Livestock & Resource Specialist, UC Davis Hydrologist and Resource Conservation District Watershed Coordinator. New field staff members are trained and work under the supervision of a senior field staff member for the first two sample events. A second staff meeting is held mid--season to review field procedures and equipment operation to ensure standardization of procedures by all field staff.

A.9 DOCUMENTS AND RECORDS

Documents and reports associated with this project include the Coalition MRP (Order No. R5-2009-0875, CVRWQCB 2009b), Management Plan (SVWQC 2008b), this QAPP, Annual Monitoring Reports, Management Plan reports, quarterly data submittals, and reports of exceedances of ILRP "trigger limits".

A.9.1 Reporting Format

An Annual Monitoring Report (AMR) will be completed after all testing and analysis is completed for each calendar year of monitoring. The specific components of the Annual Monitoring Reports are specified in the ILRP MRP (CVRWQCB 2008). Each quarter the Coalition will submit the previous quarter monitoring results in electronic and hard copy formats. Specific components and formats of these submittals are specified in the ILRP MRP (CVRWQCB 2008).

As part of the AMR, the field team or monitoring agency shall provide the Coalition Monitoring Manager with copies of the field data sheets, relevant pages of field logs, toxicity laboratory sheets (replicate and in house water quality data) including failed tests, and copies of the chain-of-custody (COC) forms for all samples submitted for analysis. The Monitoring Manager is responsible for maintaining and providing this documentation to the Project Lead. At a minimum, the following sample-specific information will be provided to the Regional Board staff as part of the quarterly data submittals:

a) Site name
b) Site code
c) GPS coordinates taken with each sampling event
d) Sample type, e.g., grab or composite type (Cross-sectional, flow-proportional, etc)
e) QC sample type and frequency
f) Date and time of sample collection (first sample taken)
g) Results of field measurements
h) Sample preservation
i) Requested analyses (specific parameters or method references)
j) Results of samples collected and all laboratory QC samples (calibrations, blanks, surrogates, laboratory spikes, matrix spikes, reference materials, etc) and the identification of each analytical sample batch

k) Results of measurements for tests run prior to toxicity analyses, such as dissolved oxygen, temperature, electrical conductivity, hardness, and ammonia

l) A description of any unusual occurrences, noted by the field personnel, associated with the sampling event - particularly those that may affect sample or data quality

m) Any anomalies regarding sample condition noted by the laboratory

n) Report of any adjustments made to samples prior to running analyses, such as adjustments to dissolved oxygen, alkalinity, de-chlorination, or other

o) Records of exceedance reports or exception reports when results exceed trigger limits or do not meet QC criteria

A.9.2 Other Project Documents

A.9.2.1 Field Documentation

All field activities must be adequately and consistently documented to ensure defensibility of any data used for decision-making and to support data interpretation. Pertinent field information, including (as applicable), the width, depth, flow rate of the stream, and the surface water condition must be recorded on the field sheets.

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

- Name(s) of field personnel
- Sampling location identification, including decimal latitude and longitude coordinates using the NAD 1983 State Plane California datum.
- Sample type (e.g. grab or composite type)
- Whether field measurement calibration was performed
- Results of all required field measurements (flow, temperature, D.O., pH, conductivity) and the time that measurements were made
- Date and time of sample collection
- Sample ID numbers, including unique IDs for any replicate or blank samples
- Observations of weather or other conditions that may influence sample results (*e.g.*, wind, rain)
- Problems or unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality.

All samples taken at a site for one sample event should be assigned one designated sampling time. This time designation is the time assigned to the first field sample collected, and must be consistent with the time assigned in the chain of custody, field data sheet, and laboratory report forms.

Copies of all field logs and Chain-of-Custody (COC) forms for each sample event will be provided to the Monitoring Manager within 48 hours of the conclusion of each sampling event. Sampling status reports will be provided to the Monitoring Manager within one week of the completion of each sampling event, and will consist of a brief (one to two page) narrative summary of samples successfully collected, a summary of any deviations from the Sample Plan or QAPP, and a discussion of any problems encountered during the sample event.

A.9.2.2 Analytical Laboratory Documentation

Analytical data reports will consist of a hardcopy or equivalent electronic report in each laboratory's standard format, and in an electronic format compatible with the Surface Water Ambient Monitoring Program database and approved by the Monitoring Manager. All final data reports will include the results of Quality Assurance analyses and a narrative summary of Quality Assurance data for the environmental results reported. Results of chemical analyses, toxicity testing, and any Toxicity Identification Evaluations (TIEs) performed will be provided to the Monitoring Manager in the laboratory's standard report format within 45 days of sample delivery, and in an approved electronic data format.

All results meeting data quality objectives and results having satisfactory explanations for deviations from objectives shall be reported in final analytical data reports. Final analytical data reports shall include the results of all field and laboratory quality control samples. Any anomalies regarding sample condition noted by the laboratory and a report of any adjustments made to samples prior to running analyses shall be reported. The contractors may also provide a summary of the data with the final laboratory data sheet. All results will also be provided in an electronic format agreed to by the Monitoring Program Manager and Analytical Contractor.

A.9.3 Retention of Records

Original field logs and COCs will be retained by the field sampling consultants for at least one year after the date of sample collection. The contract laboratory will retain original chain-of-custody forms, sample integrity forms, and copies of the preliminary and final data reports for at least five years. Hard copies of field logs, COCs, and final analytical data reports will be retained by the Monitoring Manager for at least one year or until the Annual Monitoring Report is completed and approved by the Coalition and the Regional Board.

A.9.4 Backup of Electronic files

Data collected for this program and by coordinating Subwatershed Groups will be stored in a database maintained by the Monitoring Manager. All electronic data files and databases will be regularly backed up (at least weekly) to a separate location.

A.9.5 QAPP Distribution

The Monitoring Manager is responsible for providing all individuals identified in Table 1 with the final approved QAPP in an electronic or hardcopy format.

B DATA GENERATION AND AQUISITION

B.1 SAMPLING PROCESS DESIGN

B.1.1 Experimental and Data Collection Design

Data collection design is discussed in the Coalition MRP (Order No. R5-2009-0875, CVRWQCB 2009b). Details are provided for each of the Coalition's ten subwatersheds, describing the designated monitoring sites, monitoring completed, known impairments, and beneficial uses. Pesticide use information will be evaluated, and parameter specific monitoring periods and schedule, and the parameters to be monitored will be determined as described in the Coalition MRP and in Section A.7.3 of the QAPP. The monitoring sites for this program were selected from a list of candidate drainages prepared for each subwatershed identified as high

priorities for monitoring. These drainages were prioritized based on a summary of characteristics and criteria presented in the Coalition's initial MRPP (SVWQC 2004) and 2009 Monitoring Plan (SVWQC 2008). Drainages and sites were selected to be representative of agricultural practices and conditions in each subwatershed, as discussed in the MRP and Monitoring Plan. The specific factors considered for selection of representative drainages and sites for monitoring included:

(1) Total subwatershed area (acres);
(2) Acres of irrigated land;
(3) Crop types;
(4) Pesticide use in pounds based on most recent PUR data;
(5) Periods of high use for pesticides;
(6) Potential for implementation of Best Management Practices (BMPs);
(7) Presence of 303(d)-listed waterbodies or other known water quality problems, including TMDLs adopted in the Basin Plan;
(8) Presence of historical monitoring sites or planned monitoring sites by other organizations.

The final list of monitoring locations is provided **APPENDIX C**.

B.1.2 Rationale for Design

Sampling design for the Coalition monitoring program was developed to comply with the requirements of the previous ILRP MRP (CVRWQCB 2008) and complies with the requirements of the current MRP (Order No. R5-2009-0875, CVRWQCB 2009b). Development of the sampling design is documented in the Coalition's MRP (SVWQC 2008a). Monitoring sites were selected to be representative of waterbodies (drains, ditches, etc.) that convey agricultural drainage in each subwatershed. Monitoring sites do not include mainstem water bodies on the 303(d) list unless sites in these areas should be monitored to evaluate success of management practices. Monitoring sites upstream from 303(d) listed waterbodies may be monitored if these sites meet the site selection criteria described above.

B.1.3 Monitoring Schedule

The monitoring schedule for each monitoring location is documented in the Coalition Monitoring Plan (SVWQC 2008a) and Management Plan (SVWQC 2008b). Sample events are planned to occur monthly according to the schedule set by the Monitoring Program Manager. Storm season events will be targeted to conditions resulting in significant runoff. Event-specific sample plans will be prepared at least one week prior to each scheduled event. Sample events will typically be conducted over several days. After collection, all samples will be shipped to the appropriate laboratories in time to initiate analysis within allowable hold times

B.1.4 Site-specific Exceedance Follow-up Plans

Exceedances of objectives and trigger limits will be addressed as required by the ILRP MRP. Details of the specific responses to individual exceedances of toxicity or chemical objectives are provided in Section B.4.1.4. All exceedances will be reported to designated Regional Water Board ILRP staff in Exceedance Reports. When more than one exceedance is observed at a site for a specific parameter, development of a management plan will be required. The Coalition's Management Plan provides details on all site-specific follow-up activities.

B.1.5 Sample Types and Numbers of Analyses

Samples to be collected and analyzed for monitoring by the Coalition are summarized in **APPENDIX E**. All water samples are collected as instantaneous grab samples. All sediment samples are collected as spatial composites.

B.1.6 Sampling Sites

The locations of sampling sites are provided in **APPENDIX A**. Specific sampling protocols are described in Section B.2 Sample Collection Methods.

B.1.7 Sampling Site Contingency Logistics

Sampling sites were selected for continuing accessibility. However, it is possible that sites may become inaccessible or inappropriate due to changes in the water body, flooding or high flows, or other unavoidable circumstances. Under these conditions, the Monitoring Manager will coordinate with Coalition representatives and the sampling crews to determine whether to (1) sample at an alternate location, (2) identify a new permanent location, or (3) temporarily suspend sampling until adequate access is reestablished. The rationale for this decision will also be discussed with the appropriate Water Board staff.

B.1.8 Classification of Measurements

All measurements resulting from the monitoring described in this QAPP are classified as *Critical*, i.e., they are required to achieve project objectives or have a limit on the number of errors in order to be acceptable. Critical measurements undergo additional scrutiny during the data gathering and review process. The expected number of samples, specific analytical methods and procedures, and defined acceptance criteria for QC samples (as described in Section B.5) will be included as part of the assessment of critical measurements.

B.1.9 Sources of Natural Variability

Sources of natural variability in water and sediment quality include normal seasonal variations in flows and climatic factors (e.g., temperature, rainfall), spatial variation in geology and other watershed characteristics, and wildlife activities. None of these sources of variability are controllable and are inherently reflected in the variability of the monitoring results. Sources of natural variability will be considered when evaluating the causes of exceedances of water quality objectives.

B.1.10 Sources of Bias

Bias is a systematic error occurring in a measurement that is inherent in the sampling or analytical method itself or caused by some artifact in the analytical system, such as a temperature effect. Bias can be introduced by the field or laboratory technicians as they conduct their work. Analytical bias is controlled primarily by routine assessments of accuracy as described above and the use of standard accepted methods with proven accuracy. Bias can also be introduced in the sampling design. For example, the sampling design for this program focuses on specific conditions with a higher potential to cause changes in water quality (e.g. periods of higher pesticide applications), and on sites and drainages with the greatest potential for impacts due to agricultural runoff. Because these conditions are sampled more often than would occur during a completely random or uninterrupted regular sampling schedule, this will bias the data set produced toward the water quality that is affected by these conditions. This type of bias is

accepted in order to build data sets for conditions of interest in a reasonable time frame, and is balanced by selecting types of conditions characterizing the reasonable expected range of factors affecting water quality. If necessary, this type of bias may be moderated retroactively through specific statistical analysis methods that address seasonal or other factors responsible for potential bias.

B.2 SAMPLE COLLECTION METHODS

Surface water samples will be collected for analysis of ILRP constituents in water and sediment, as appropriate for the specific sample event. Surface water and sediment samples will be collected for physical and chemical analyses, and biological toxicity testing.

B.2.1 Criteria for Sample Acceptance

B.2.1.1 Water Column Samples

Water quality samples will be collected using clean techniques that minimize sample contamination. Sampling methods will generally conform to USEPA "clean" sampling methodology described in *Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (USEPA 1996). Although these methods are specifically for trace metals, the techniques are appropriate for collection of samples for other analytes. Samples shall typically be mid-stream, mid-depth grab samples taken at approximately mid-stream and mid-depth at the location of greatest flow (where feasible). Grab samples will be collected by wading or boating to mid-stream and filling bottles by direct submersion of the sample bottle to approximately mid-depth. Samples may also be collected using a peristaltic pump and acid-cleaned Teflon™ tubing. Alternatively, samples may be collected by bucket from bridges, road crossings, or walkways over the water body, if there is no other access. Clean powder-free nitrile gloves will be worn for collection of all samples. Samples will be collected or transferred into glass, polyethylene, or Teflon™ sample containers appropriate for the analyses to be performed. Samples to be analyzed for dissolved metals will be filtered to 0.45 μm in the field using Gelman in-line filters.

All water column toxicity samples, including follow-up samples, will consist of sufficient volume to allow conducting TIEs, definitive serial dilution tests, and additional chemical testing required by the ILRP Monitoring and Reporting Program Order No. R5-2008-005. Acceptable water samples will be those collected according to the methods described above and the specifications in the SOPs listed in Appendix G, and those that meet the criteria described in Appendix H. Any deviations (and the reasons for them) will be documented in detail on field data sheets or sample integrity forms and reported as appropriate with the data. Additionally, acceptable samples are those that are representative of the water body (i.e., not collected in a pool to the side of the creek, not directly beneath a discharge pipe, etc.).

B.2.1.2 Flow Measurements

Flow data will be collected for all water column sampling events when sampling conditions allow. When possible, the USGS method (*Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge*, USGS 1982) should be used at all stream sites for accurately determining flow during each specific monitoring event. If the USGS method cannot be used then flow measurements should be taken near the stream bank of the site, or the float method can be used. The approximate location and number of stream flow measurements

should be documented on the data sheets. Photo documentation will also be completed at these sites. Data files for flow data should contain a comment column that will allow a flag for flow measurements that have a high degree of uncertainty. Flow data with a high degree of uncertainty should not be used for instantaneous loading calculations for pesticides or other constituents.

B.2.1.3 Sediment Samples

Collection of in-stream sediment samples for chemical analysis and toxicity testing may be conducted according to methods developed by the U.S. Geological Survey (USGS 1994), or by Pacific EcoRisk Standard Operating Procedure (SOP), depending on site-specific conditions. Sediment sampling will be performed on up to a 50 meter reach of the waterbody near the same location as water quality sampling stations. The specific reach definition may vary based on conditions at each sampling station. If USGS methods are applicable, sediment sub-samples will be collected from 5 to 10 wadeable depositional zones. Depositional zones are defined as locations in streams where the energy regime is low and fine-grained particles accumulate in the stream bed. Depositional zones may include areas on the inside bend of a stream or areas downstream from obstacles such as boulders, islands, sand bars, or simply shallow waters near the shore. In low energy waterbodies, composite samples may be collected from the bottom of the channel using appropriate equipment using the Pacific EcoRisk SOP.

Sediment samples shall be collected with overlying water present at a collection site, or in the absence of overlying water, when the sediment is moist. Analysis results from sediment samples collected in the absence of overlying water should be flagged as potential outlying data points. Dry sediments shall not be collected, however alternative sampling events will be planned to meet the minimum sample collection requirements as outlined in the ILRP MRP.

Sediment samples for chemical and toxicity analyses will be collected in such a manner to minimize air above sediment and to prevent exposure to air. Following collection, sample containers will be sealed from air and transported to the laboratory at 4˚C. Samples for chemical analysis (organochlorine pesticides & PCBs, organophosphate pesticides, synthetic pyrethroids) must be extracted within 14 days and analyzed within 40 days of extraction. Toxicity testing of sediments with *Hyalella* will be initiated within 7 days of collection. If these performance requirements are not met, the sample should be re-collected.

Reporting of the sediment sample results (in Exceedance Reports or Annual Reports) will include a detailed description of site conditions antecedent to the sampling event to aid in the analysis of the results (e.g., duration of storm, hydrograph, or relevant irrigation characteristics). Sampling conditions will be documented in both the field notes and photographs for every successful and non-successful monitoring event (i.e., including planned events when the site is dry upon arrival).

B.2.1.4 QC Sample Collection

Field blanks and field duplicates are collected at a frequency of about 1 per 20 normal samples, but no less than one per sampling event. Additional sample containers will be collected for matrix spike analyses at a frequency of about 1 per 20 normal samples. Matrix spikes will be collected as normal samples at a frequency of about 1 per 20 normal samples and will be spiked at the laboratory prior to sample preparation. Field blanks will be collected before collecting any other samples at a site. Field duplicates and samples for matrix spikes will be collected immediately following the corresponding samples for a specific analysis.

B.2.2 Pre-Sample Collection Preparation Methods

Sample event plans will be prepared prior to each event, and will include site-specific sample lists, COCs, log sheets, and bottle labels. Laboratories will be informed prior to the event of the expected number and timing of sample receipt. See also section **B.2.4 Sample Container Sizes, Preservation, and Transportation.**

B.2.3 Sample Collection Method SOPs

All samples will be collected in a manner appropriate for the specific analytical methods to be used. Proper sampling techniques must be used to ensure that water column and sediment samples are representative of the water bodies sampled. Standard operating procedures (SOPs) for collection of surface water and sediment samples are provided in **APPENDIX G** of this QAPP.

B.2.4 Sample Container Sizes, Preservation, and Transportation

Sample containers must be pre-cleaned and certified free of contamination according to the specification for the appropriate analytical methods. Specific requirements for sample volumes and containers are provided in **APPENDIX H**. Preservation methods are described in the SOPs for sample collection (**APPENDIX G**) and for specific analyses (**APPENDIX I** and **APPENDIX J).**

B.2.5 Decontamination Procedures

All field and sampling equipment that may contact samples must be decontaminated after each use in a designated area if it will be used for subsequent sampling. A detailed description of cleaning procedures for water sampling equipment is included in **APPENDIX G** of this QAPP.

B.2.6 Corrective Actions

During the course of sample collection and analysis for this study, field supervisors and team members, and laboratory supervisors and analysts, will strive to ensure that all measurements and procedures are followed as specified in this QAPP and that measurements meet the prescribed acceptance criteria. If problems or deviations from specified procedures are observed, prompt action will be taken to correct the immediate problem and to identify its cause(s). Any related systematic problems must also be identified. Problems regarding field data quality that may require corrective action will be documented in the field data sheets. It is the collective responsibility of the members of field crews to ensure that appropriate corrective actions are taken and documented. The responsibility for documentation and oversight of corrective actions resides with the QA Officer for each specific sampling or laboratory contractor. Specific corrective actions for this project are also documented in **APPENDIX K.**

B.2.7 Initial Sample Processing

Methods for required filtration, splitting, or compositing of samples are specified in the SOPs for sample collection (**APPENDIX G**) and for specific analyses (**APPENDIX I** and **APPENDIX J**)

B.2.8 Field Procedures

Field procedures will incorporate the following requirements:

- All monitoring events will include photo documentation and recording of actual GPS coordinates at the time of sampling. Any changes in monitoring locations during an event must be photo-documented and accompanied by GPS coordinates.
- Field personnel will be instructed in the proper collection of samples prior to the sampling event and in how to recognize and avoid potential sources of contamination.
- Field personnel will be able to distinguish acceptable versus unacceptable water and sediment samples in accordance with pre-established criteria in this QAPP.
- A field activity coordinator will be responsible for ensuring that the field sampling team adheres to proper custody and documentation procedures. A master sample logbook or field datasheets shall be maintained for all samples collected during each sampling event.
- All field activities will be adequately and consistently documented to ensure defensibility of any data used for decision-making and to support data interpretation. Pertinent field information, including (as applicable), the width, depth, flow rate of the stream, the surface water condition, location of the tributaries, and the actual GPS coordinates where the sample was taken must be recorded on the field sheets, along with field measurements.
- All sampling events will include flow information.

All samples must be identified with a unique identification code to ensure that results are properly reported and interpreted. Samples will be identified such that the site, sampling location, matrix, sampling equipment and sample type (i.e., normal field sample or QC sample) can be distinguished by a data reviewer or user. Sample identification codes will consist of a site identification code, a matrix code, and a unique sample ID number assigned by the monitoring manager. The format for sample ID codes is ###.#-ABCDE-MS#, where:

- ###- identifies the serially numbered sample event and .# is an optional indicator for resamples collected for the same event. Sample events are numbered sequentially from 001 to 999 and will not be repeated.
- ABCDE indicates the unique 5-letter site identification code assigned to each site.
- - *MS#* identifies the *Matrix* (W for Water, S for Sediment), *Sample Type* and replicate number (*E* for Environmental, *B* for Field Blank, # for replicate number).

Sampling date and time information will be recorded at the time of sample collection on the sample labels, in the field logs, and on the COCs by the sampling contractors. All samples collected at a specific site for an event will be assigned the sample time of the first sample collected at that site.

B.3 SAMPLE HANDLING AND CUSTODY

B.3.1 Sample Holding Times, Integrity, and Storage Measures

Allowable hold times and immediate storage and processing requirements for specific samples and analyses are provided in **APPENDIX H**. The following procedures are used to prevent bottle breakage and cross-contamination:

- Prior to packaging, outsides of the bottles need to be rinsed off with DI water.
- Bubble wrap or foam pouches are used to keep glass bottles from contacting one another to prevent breakage.
- All samples are transported inside hard plastic coolers or other contamination-free shipping containers.

- The coolers are taped shut and sealed with chain-of-custody seals to prevent accidental opening.
- If pre-arrangements are not made, field staff must notify laboratory sample control prior to shipment of the samples.

B.3.2 Corrective Actions for Samples that Do Not Meet Preservation or Holding Times

The maximum holding times for all analyses are identified in Appendix H. The analytical laboratories must report to the QA Officer any sample that does not meet the project holding time limit or preservation requirements, and must implement internal corrective actions to eliminate reoccurrences, if appropriate.

Samples that do not meet preservation and/or holding times may need to be resampled. However, because monitoring conducted by the Coalition is intended to be a long-term program, samples that are not successfully collected or analyzed for a specific sample event or site can typically be recollected at a later sampling event.

B.3.3 Physical Transport of Samples from the Field

All water quality samples will be transported to the analytical laboratory by the field crew or by overnight courier inside plastic coolers on ice. Chain of custody forms will accompany all samples during shipment to contract laboratories.

B.3.4 Sampling Handling and Custody Documentation

A chain-of-custody (COC) form must be completed after sample collection and prior to sample shipment or release.

B.3.5 Chain-of-Custody Procedures

Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. Sample custody must be traceable from the time of sample collection until results are reported. 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).

COC forms used for this project will be provided to field crews by the Monitoring Manager.

B.3.6 Individuals Responsible for Verifying Procedures

A field activity coordinator must be responsible for ensuring that each field sampling team adheres to proper custody and documentation procedures. A master sample logbook of field datasheets shall be maintained by the sampling contractor for all samples collected during each sampling event.

B.3.7 Field Custody Procedures

Sample custody must be traceable from the time of sample collection until the results are reported. A chain-of-custody (COC) form must be completed after sample collection and prior to sample shipment or release. The COC form, sample labels, and field documentation will be

cross-checked to verify sample identification, type of analyses, number of containers, sample volume, preservatives, and type of containers. All necessary COC forms, field logs, sample lists, and sample labels will be provided to field crews by the Monitoring Manager.

All sample shipments are accompanied by the COC form, which identifies the contents. The original COC form accompanies the shipment and a copy is retained in the project file.

All shipping containers must be secured with COC seals for transportation to the laboratory. The samples must be placed with ice to maintain the temperature between 2-4 degrees C. The ice packed with samples must be sealed in re-sealable bags, be approximately 2 inches deep at the top and bottom of the cooler, and must contact each sample to maintain temperature. Samples must be shipped to the contract laboratories according to Department of Transportation standard. The method(s) of shipments, courier name, and other pertinent information is entered in the "Received By" or "Remark" section of the chain of custody form.

B.3.8 Chain of Custody Forms

Chain of custody forms should include the following items:

(a) Sampler name.
(b) Address (where the results need to be sent).
(c) Ice chest temperature at log-in.
(d) To whom the laboratory results need to be sent.
(e) Laboratory number.
(f) Field number.
(g) Lab storage.
(h) Sample identification.
(i) Analysis required.
(j) Number of containers of each type (i.e. plastic, glass, vial, whirlpak).
(k) Sample collection date and time.
(l) Comments/special instructions.
(m) Samples relinquished by (signature, print name, date).
(n) Samples received by (signature, print name, date).

B.3.9 Sample Control Activities

The following sample control activities must be conducted at the laboratory as well as in the field. Laboratory custody procedures must include:

- Initial sample login and verification of samples received with the COC form;
- Document any discrepancies noted during login on the COC;
- Initiate internal laboratory custody procedure;
- Verify sample preservation (*e.g.*, temperature);
- Notify the project monitoring manager if any problems or discrepancies are identified; and
- Maintain proper sample storage, including daily refrigerator temperature monitoring and sample security.

The individual field and laboratory staff releasing and receiving samples are required to complete and verify the information on the COC forms.

B.4 ANALYTICAL METHODS AND FIELD MEASUREMENTS

B.4.1 Project SOPs

Standard operating procedures (SOPs) for all sampling and analytical procedures performed for this program are listed and provided in **APPENDIX G, APPENDIX I**, and **APPENDIX J**. These SOPs document any options or modifications from standard method procedures and identify all equipment or instrumentation necessary for the analyses. Corrective measures, responsibilities, and documentation requirements are detailed in the QA Manuals for individual laboratories. Corrective measures to address specific QA problems are also summarized in **APPENDIX K**.

Specific analytical methods for water and sediment are listed in **APPENDIX I** and **APPENDIX J**.

B.4.1.1 Sample Preparation Methods

Surface water and sediment samples will be prepared in solvent or via other extraction techniques prior to sample analyses. All procedures must follow the methods or SOPs referenced in this QAPP.

Preparations of water and sediment samples for analysis for this monitoring program are as follows:

- Water and sediment samples to be analyzed for trace elements will be prepared using the extraction procedures described in EPA 200.7 and EPA 200.8, as specified in the method SOPs in **APPENDIX I**.
- Water samples to be analyzed for pesticides will be prepared using Separatory Funnel Liquid-Liquid Extraction (EPA 3510) or Continuous Liquid-Liquid Extraction (EPA 3520).
- Sediment samples to be analyzed for pesticides will be prepared using Soxhlet or Automated Soxhlet Extraction (EPA 3540C, or EPA 3541, respectively).

B.4.1.2 Laboratory Standards and Reagents

All stock standards and reagents used for extraction and standard solutions must be tracked through the laboratory. The preparation and use of all working standards must be recorded in bound laboratory notebooks that document standard tractability to U.S. EPA, A2LA or National Institute for Standards and Technology (NIST) criteria. Records must have sufficient detail to allow determination of the identity, concentration, and viability of the standards including any dilutions performed to obtain the working standard. Date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard.

B.4.1.3 Chemical Analyses

Water quality samples may be analyzed for filtered (dissolved) or unfiltered/ whole (total) fractions of the samples. Pesticide analyses must be conducted on unfiltered (whole) fractions of the samples. Prior to the analysis of any environmental samples, the laboratory must have demonstrated the ability to meet the minimum performance requirements for each analytical method. Initial demonstration of laboratory capabilities includes the ability to meet the project-specified quantitation limits (QL), the ability to generate acceptable precision and recoveries, and

other analytical and quality control parameters documented in this QAPP. Analytical methods used for chemical analyses follow accepted standard methods and the procedures for analysis are documented in the SOPs provided in **APPENDIX I**, and available for review at each laboratory.

For the ILRP Program, only calibration with a linear regression is acceptable for organic analyses. Non-linear calibration is not allowed because using a non-linear option creates a potential for poor quantitation or biased concentrations of compounds at concentrations near the high and low ends of the calibration range. The linear calibration shall be prepared with an initial 5-point calibration curve, where the low level standard concentration is less than or equal to the analyte quantitation limit.

Laboratory calibration curves and recovery acceptance limits are method dependent. However, when these are changed during Project implementation, these changes need to be communicated to the ILRP Staff in order to ensure that new limits will meet the Program requirements.

B.4.1.4 Toxicity Testing and Toxicity Identification Evaluations

Water quality samples will be analyzed for toxicity to *Ceriodaphnia dubia*, *Pimephales promelas*, and *Selenastrum capricornutum*. Sediment samples will be analyzed for toxicity to *Hyalella azteca*.

- Determination of acute toxicity to *Ceriodaphnia* and *Pimephales* shall be performed generally as described in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition* (USEPA 2002a). Toxicity tests with *Ceriodaphnia* and *Pimephales* are conducted as 96-hour static renewal tests, with renewal 48 hours after test initiation. If found to be necessary to control pathogen-related mortality for acute tests with *Pimephales*, test procedures may be modified as described in Geis *et al*. (2003). These modifications consist of using smaller test containers (30 mL), including only two fish per container, and increasing the number of replicates to ten.
- Determination of toxicity to *Selenastrum* shall be performed using the non-EDTA procedure described in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition* (USEPA 2002b). Toxicity tests with *Selenastrum* are conducted as a 96-hour static non-renewal test.
- Determination of sediment toxicity to *Hyalella* will be performed as described in Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates–Second Edition (USEPA 2000). Toxicity tests with *Hyalella* are conducted as a 10-day whole-sediment toxicity test with renewal of overlying water at 12 hour intervals. Per guidance from the Water Board, only the survival endpoint of this test will be evaluated. The requirement to evaluate the growth endpoint may be reinstated at any time by order of the Water Board Executive Officer.

For all initial screening toxicity tests at each site, 100% ambient water and a control will be used for the acute water column tests. If 100% mortality to a test species is observed any time after the initiation of the initial screening aquatic toxicity test, a multiple dilution test using a minimum of five sample dilutions will be conducted with the initial water sample to estimate the magnitude of toxicity.

If any measurement endpoint from any of the three aquatic toxicity tests exhibits a statistically significant reduction in survival (*Ceriodaphnia* and *Pimephales*) or cell density (*Selenastrum*) of

greater than or equal to 50% compared to the control, Toxicity Identification Evaluation (TIE) procedures will be initiated with that species to investigate the cause of toxicity. The 50% mortality threshold is consistent with the approach recommended in guidance published by U.S. EPA for conducting TIEs (USEPA 1996b), which recommends a minimum threshold of 50% mortality because the probability of completing a successful TIE decreases rapidly for samples with less than this level of toxicity. At a minimum, a Phase 1 TIE will be conducted to determine the general class of constituent (i.e., metal, non-polar organics) causing toxicity (U. S. EPA, 1998a). Phase 2 TIEs may also be utilized to identify specific constituents causing toxicity if warranted (U. S. EPA, 1998b). TIE methods will generally adhere to EPA procedures documented in conducting TIEs (USEPA 1991, 1992, 1993a-b). For samples exhibiting toxic effects consistent with carbofuran, diazinon, or chlorpyrifos, TIE procedures will follow those documented in Bailey *et al*. (1996). Laboratory Standard Operating Procedures for conducting TIEs are documented in **APPENDIX J**. Any project-specific modifications to these methods will be documented in future amendments to this QAPP. TIE procedures will be initiated as soon as possible after toxicity is observed to reduce the potential for loss of toxicity due to extended sample storage.

The focus and scope of TIE procedures will be determined through consultation between the monitoring manager, the project manager for the laboratory responsible for performing toxicity testing and TIEs, the Coalition project manager, and any staff or consultants specifically identified by the Coalition as responsible for this decision. When initiating TIE procedures for a specific site and sample event, this group will also consider a number of different factors including the history of toxicity at the site, the level of toxicity, and the species and endpoints exhibiting toxic effects, in addition to the primary technical basis for triggering TIEs described above. The rationale for determining the TIE procedures for a specific sample will be clearly documented in subsequent data reports.

Sediment toxicity testing at each site will be conducted once in the storm season and once in the irrigation season. Any required continuation of sediment toxicity monitoring will be designed and implemented based on the results of testing and follow-up analyses, as described in the MRP. If initial sediment toxicity tests indicate toxicity at a monitoring site, then follow-up analyses will be conducted to evaluate potential causes of the toxicity. Because there are currently no standardized TIE methods for sediments, investigation of the causes of significant and persistent sediment toxicity will follow an “estimated toxic units approach” to infer potential causes of toxicity. This approach is based on comparison of documented effect levels (e.g., LC50s) to concentrations of suspected toxicants in the toxic sediment samples. This approach may require analyses of various non-toxic sediment parameters (e.g., acid volatile sulfides, simultaneously extractable metals [SEM], total organic carbon, grain size distribution) to interpret the results of chemical analysis for suspected toxicants. Follow-up actions may also include retesting of the original sample for persistence of toxicity, and collection and testing of additional samples to identify potential sources or causes of toxicity. At a minimum, sediment samples exhibiting a significant reduction in survival of at least 20% compared to the control will be analyzed for chlorpyrifos and pyrethroid pesticides and organic carbon.

A flow chart of the triggers and actions in response to exceedances observed in toxicity or chemistry testing is provided in Figure 2.

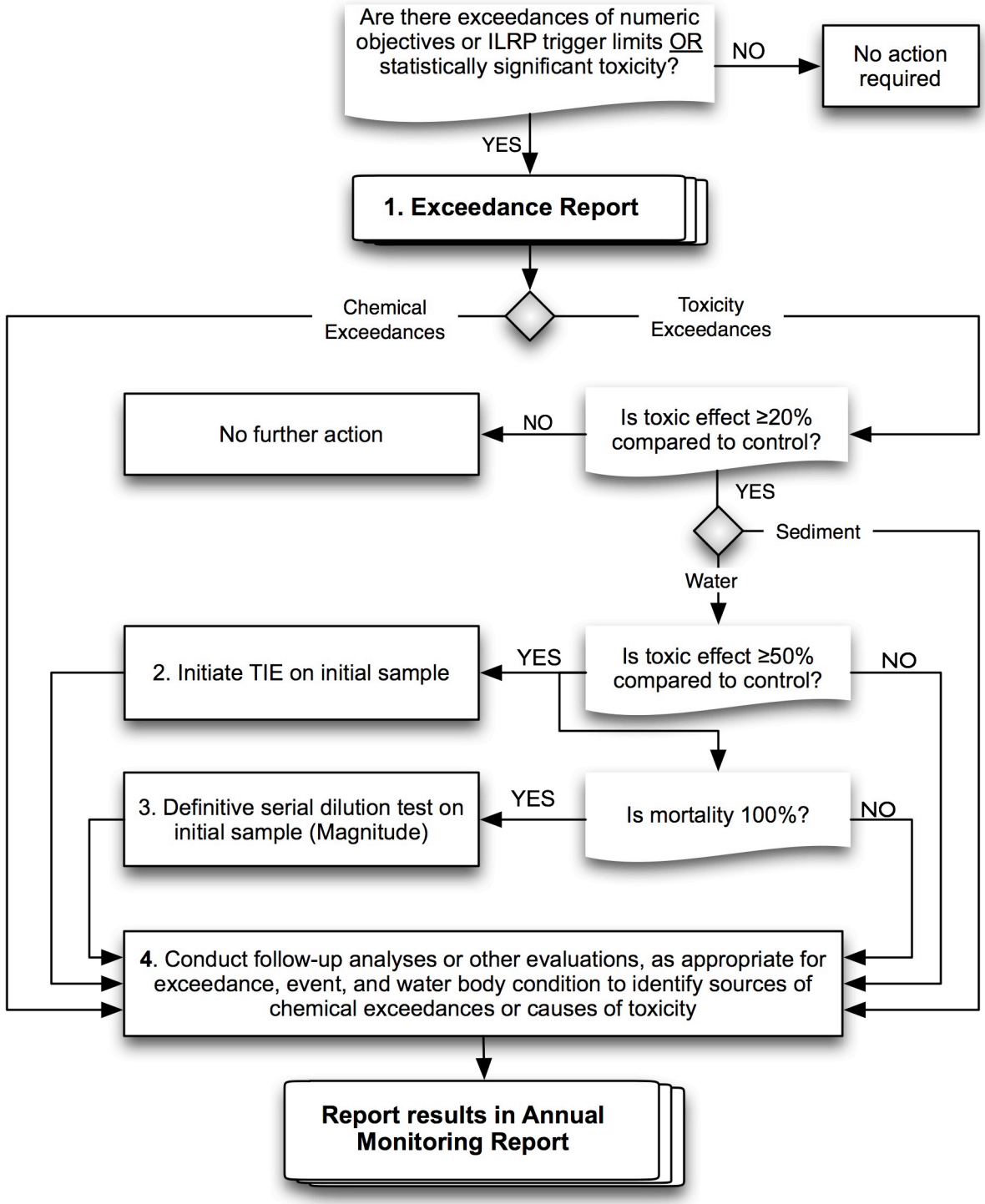

Figure 2. Responses to Exceedances of Water Quality Objectives and ILRP Trigger Limits

B.4.2 Instrumentation and Kits Associated with Field and Lab Measurements

For all water bodies sampled, water quality parameters including pH, specific conductance, dissolved oxygen, and temperature must be measured prior to collecting samples for laboratory analyses. Field parameters will be measured using a YSI Model 57 Oxygen Meter for dissolved oxygen, VWR Scientific Traceable Digital Thermometer (Cat. #61220416) for temperature, Orion Model 230A pH meter, and an Orion Model 130 conductivity meter, or comparable instrument(s).

Equipment or instrumentation required for specific laboratory analyses are documented in the Quality Assurance Manuals for each laboratory (**APPENDIX F**) and in the SOPs for each specific analytical procedure (**APPENDIX I** and **APPENDIX J**).

B.4.3 Sample Disposal Procedures

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. Procedures for proper disposal are documented in Laboratory QA Manuals (**APPENDIX F**).

B.4.4 Method Performance Criteria

Performance criteria for each method conform to ILRP and SWAMP standards and are documented in the Quality Assurance Manuals for each laboratory (APPENDIX F) and in the SOPs for each specific analytical procedure (APPENDIX I and APPENDIX J).

B.4.4.1 Project Quantitation Limits

Method detection limits (MDL) and quantitation limits (QLs) must be distinguished for proper understanding and data use. The MDL is the minimum analyte concentration that can be measured and reported with a 99% confidence that the concentration is greater than zero. The QL represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and confidence in both identification and quantitation. For this program, QLs must be verifiable by having the lowest non-zero calibration standard or calibration check sample concentration at or less than the QL.

Laboratories generally establish the QLs that are reported with the analytical results—these may be called *reporting limits*, *detection limits*, *reporting detection limits*, or several other terms by the reporting laboratory. These laboratory limits must be less than or equal to the project QLs listed in **APPENDIX D**. Wherever possible, project QLs are lower than the proposed or existing relevant numeric water quality objectives or toxicity thresholds. Laboratories performing analyses for this project must have documentation to support quantitation at the required levels. Note that Appendix K tables include some pesticide parameters that are part of standard analytical scans and may not necessarily be constituents of concern for the Coalition.

For this program, QLs have been established that comply with the reporting requirements specified in the ILRP MRP (CVRWQCB 2008). Project QLs are based on the verifiable levels and general measurement capabilities demonstrated for each method. These QLs should be considered as maximum allowable quantitation limits to be used for laboratory data reporting. Note that samples diluted for analysis or corrected for percent moisture for sediment samples may have sample-specific QLs that exceed these method QLs. This will be unavoidable in some cases.

Laboratories must report analytical results between the MDL and QL. These results must be reported as numerical values and qualified as estimates. Reporting as "*trace*", "*ND*", or "*<QL*" is not acceptable. Sample results less than the MDL will be reported only for GC/MS analyses if the mass spectral fingerprint can prove positive identification; these results must be qualified as estimated values by the laboratory.

B.4.4.2 Method Detection Limit Studies

Each laboratory performing analyses under this program must routinely conduct method detection limit (MDL) studies to document that the MDLs are less than the project-specified QLs. If any analytes have MDLs that do not meet the project QLs, the following steps must be taken:

1. Perform a new MDL study using concentrations sufficient to prove analyte quantitation at concentrations less than the project-specified QLs per the procedure for the Determination of the Method Detection Limit presented in Revision 1.1," 40 Code of Federal Regulations (CFR) 136, 1984.
2. No samples may be analyzed until the issue has been resolved. MDL study results must be available for review during audits, data review, or as requested. Current MDL study results must be reported at the beginning of every project for review and inclusion in project files.

An MDL is developed from seven aliquots of a standard containing all analytes of interest spiked at five times the expected MDL. These aliquots are taken through the analytical method sample processing steps. The data are then evaluated and used to calculate the MDL. If the calculated MDL is less than 0.33 times the spiked concentration, another MDL study should be performed using lower spiked concentrations.

B.4.5 Corrective Actions

During the course of sample analysis for this study laboratory supervisors and analysts will strive to ensure that all procedures are followed as specified in this QAPP and appropriate SOPs and that measurements meet the prescribed acceptance criteria. If problems or deviations from specified procedures are observed, prompt action will be taken to correct the immediate problem and to identify its cause(s).

When an out of control situation occurs, analyses or work must be stopped until the problem has been identified and resolved. The analyst responsible must document the problem and its solution and all analyses since the last in control point must be repeated or discarded. The nature and disposition of the problem must be documented in the data report that is sent to the CVRWQCB.

Any related systematic problems must also be identified. Problems regarding analytical data quality that may require corrective action will be documented in the final lab reports. The responsibility for documentation and implementation of corrective actions resides with the QA Officer for each specific laboratory. Specific corrective actions are summarized in **APPENDIX K** and documented in the QA Manual for each laboratory (**APPENDIX F**).

B.4.6 Instrument Storage of Raw Data

Storage and maintenance of raw data for specific analytical instruments is addressed in laboratory QAMs (**APPENDIX F**) method SOPs (**APPENDIX I**).

B.4.7 Laboratory Turnaround Times

Unless specifically requested by the Monitoring Manager, all "turnaround times" required for laboratory analyses are the standard turnaround times for each individual laboratory. Typical acceptable turnaround times for final laboratory reports are approximately 30 days for chemical analyses of water and sediment, and 45 days for toxicity analyses, from the date of sample receipt.

B.4.8 Validation of Non-Standard and Performance Based Methods

No non-standard sampling and analytical methods are currently used for this project. If non-standard sampling and analytical methods for new sample matrices or other unusual situations are required in the future, appropriate method validation study information is required to confirm the performance of the method for the particular need. The purpose of this validation is to assess the potential impact on the representativeness of the data generated. Such validation studies may include round-robin studies performed by USEPA or other organizations. At a minimum, method validation information for new or modified methods (under the Performance Based Measurement/Method System (PBMS) afforded by the SWAMP QMP) requires submittal of a copy of the validation package showing that the new or modified method meets or exceeds the ILRP MRP data quality objective.

Laboratory development of a performance based method (PBM) validation package and Standard Operating Procedures (SOP) are required when analytes or quantification levels are outside the analyte list or differ by ten times the measurement levels stated in the published method. The validation package shall include all data for the "Initial Demonstration of Laboratory Capability", which includes:

1. MDL Studies (the analyst shall determine the MDL for each analyte according to the procedure in 40 Code of Federal Regulation (CFR) 136, Appendix B using the apparatus, reagents, and standards that will be used in the practice of this method).
2. Initial precision and recovery (IPR)
3. QC samples, where applicable
4. Linear calibration ranges

B.4.9 Validation Records for Performance Based Methods

Records supporting validation for PBMS are maintained at the laboratory conducting the validation. These records will be made available for review by the Water Board or State Board QA Officer responsible for approving the new or PBMS methods. Due to the potentially proprietary nature of this information, any other requests to access these records will be honored at the discretion of the individual laboratory.

B.5 QUALITY CONTROL

Quality control (QC) is achieved by collecting and/or analyzing a series of duplicate, blank, spike, and spike duplicate samples to ensure that analytical results are within the specified QC objectives. The QC sample results are used to quantify precision and accuracy and identify any problem or limitation in the associated sample results. The internal QC components of a sampling and analyses program will ensure that data of known quality are produced and documented. The internal QC samples, frequency, acceptance criteria, and corrective action must meet the minimum requirements presented in the following sections.

For basic water quality analyses, quality control samples prepared in the contract laboratory will typically consist of method blanks, laboratory control samples, laboratory duplicates, matrix spikes and duplicates, and surrogate compounds added to each sample (organic analysis). Note that while laboratories strive to achieve recoveries between 70-130% for pesticide analyses, it is not possible to achieve those limits for all analytes in a specific scan. Laboratory acceptance criteria for all analyte recoveries are equal to or better than *mean recovery ± 3 standard deviation* control limits used by the Surface Water Ambient Monitoring Program (SWAMP).

Formulas for calculating data quality indicators resulting from QC analyses are provided in Section A.7.

The following field-generated and lab-generated QC samples will be analyzed for each analyte per sampling event.

The minimum required samples and frequency for QC analyses are provided in Table 5. The Coalition may have several entities responsible for sampling. The Coalition will collect and submit one set of Field QC samples per sampling event for all sampling entities trained by a single designated sampling entity. Otherwise, each sampling entity is required to collect and submit a set of Field QC samples for each sampling event.

Table 5. Quality Control Samples and Frequency

QC Sample Type	Minimum Frequency		
	Chemical Analyses	Microbiological Analyses	Toxicity Analyses
Field blank	One per event and at least 5% of samples	One per event	N/A
Travel blanks	Optional	Optional	N/A
Equipment blanks	Optional	Optional	N/A
Field duplicate	One per event and at least 5% of samples	One per event	One per event
Field splits	Optional	N/A	N/A
Matrix spike (MS) and matrix spike duplicate (MSD)	One per analytical batch	N/A	N/A
Laboratory control spike (LCS), and duplicate (LCSD)	One per analytical batch	N/A	N/A
Laboratory blank	One per analytical batch	N/A	N/A
Laboratory duplicate (MS/MSD or LS/LSD pair may serve this function)	One per analytical batch	N/A	N/A
Negative Control	N/A	One per analytical batch	One per analytical batch
Positive Control	N/A	One per analytical batch	N/A
Reference toxicant	N/A	N/A	One per batch

B.5.1 Method Blank Specifications

Method blanks will be prepared and analyzed by the contract laboratory with each batch of samples. Improvements in analytical sensitivity have lowered detection limits to the point where some amount of analyte may be detected in even the cleanest laboratory blanks. In these circumstances, the magnitude of a contaminant found in blanks should be compared to the concentrations found in the samples. Method blank concentrations may not be subtracted from environmental sample results. However, any blank contamination should be discussed with project management, and must be reported in the monitoring reports that are submitted to the ILRP Staff.

If laboratories obtain detectable concentrations of a specific analyte in the method blanks as part of their laboratory quality control, they need to re-extract and re-analyze in the following circumstances. If samples can not be re-digested and re-analyzed due to sample volume or holding time limitations, the associated results must be qualified as appropriate.

Trace metals, Nutrients, and Inorganics: If any analyte is detected in the method blank above the PQL, the lowest concentration of that analyte in all associated samples must be 10 times the method blank concentration. Otherwise, all samples associated with that method blank with the analyte concentration less than 10 times the method blank concentration **and** above the PQL must be re-digested and re-analyzed for that analyte. Sample concentrations may not to be corrected for the method blank value. If re-digestion and analysis are not possible, results for associated analyte concentrations less than 10 times the method blank concentration will be qualified.

Trace Organics: If any analyte is detected in the method blank above the PQL, all samples associated with that method blank must be re-extracted and re-analyzed for that analyte. The exception to the above requirement is for common laboratory contaminants such as volatile solvents and phthalates where all samples associated with that method blank and with an analyte concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte. If re-digestion and analysis are not possible, results for associated analyte concentrations less than 10 times the method blank concentration will be qualified.

B.5.2 Matrix Spike and Spike Duplicate Specifications

Matrix spikes and matrix spike duplicates will be analyzed at the rate of one pair per sample event. Matrix spike samples are collected at the same time as the environmental samples and are spiked at the laboratory. An MS and MSD set must be prepared in the laboratory using sample water collected specifically by the project and be analyzed within the same analytical batch as the original samples. Certified Reference Materials (CRM) shall be used to prepare MS samples if appropriate CRMs are available. After measurement of the MS/ MSD, the accuracy and precision must be calculated and noted on the monitoring report and electronic record. Laboratory acceptance criteria and corrective actions for specific analyses are documented in **APPENDIX K**.

The Data Quality Objective (DQO) for Precision in MS/MSD pairs is 25% or less. If results for any analytes do not meet this DQO, calculations and instruments must be checked, and the analyst may be required to repeat the analysis to confirm the results. If the results repeatedly fail to meet the objectives indicating inconsistent homogeneity, unusually high concentrations of analytes, or poor laboratory precision, then the laboratory is obligated to:

- Halt the analysis of samples,
- Identify the source of the imprecision, and
- Make corrections where appropriate before proceeding.

If an explanation for a low or high percent recovery value is not determined, the instrument response may be checked using a calibration standard. Low or high matrix spike recoveries may be a result of matrix interferences and further instrument response checks may not be warranted. An explanation for low or high percent recovery values for MS/MSD results must be discussed in a cover letter accompanying the data package to project management and included in the monitoring report to the Central Valley Water Board.

Failure to meet the designated QOs for MS and MSD is indicative of poor laboratory performance. In this case, the laboratory is obligated to halt the analysis of the samples and to identify the source of the problem and make corrections before proceeding.

B.5.3 Laboratory Control Spike, Spike Duplicates, and Surrogate Specifications

Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (LCSD) samples provide information on the analytical accuracy, precision, and instrument bias. After measurements of the LCS and LCSD, the Percent Recovery (Accuracy) and Relative Percent Difference (Precision) must be calculated and noted on the report and electronic record. Laboratory control samples (LCS) will be analyzed at the rate of one per analytical batch.

The data quality objective (DQO) for precision in the LCS/LCSD pair is 25% or less. If results do not meet the DQO, the laboratory must follow the steps described above in section B.5.2.

Surrogate compounds are added to samples for organic analyses by EPA 625(m), EPA 8321, and EPA 8270. Laboratory acceptance criteria and corrective actions for specific analyses are documented in **APPENDIX K**.

B.5.4 Test Acceptability Criteria For Toxicity Tests

The following assessments will be made for all toxicity tests:

Decision Step 1: If the Control treatment meets all USEPA method test acceptability criteria (TAC), then proceed to statistical analyses for determination of the presence of statistically significant reductions in organism survival or algal growth.

Decision Step 2a (*Ceriodaphnia* and *Pimephales* tests): If the Control treatment exhibits <90% survival and an acute test of a water sample exhibits 90-100% survival, and the program completeness standard for the test is met (e.g., ≥90% of testing performed successfully), no further testing is required. The test result will be "flagged" to denote <90% survival in the Control treatment. If an acute test of a water sample exhibits 90-100% survival, and the program completeness standard for the test is not met, then a re-test must be initiated within 24 hours of the observation of a Control treatment with <90% survival. In this case, both the original test results and the re-test results must be reported; the re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected if the re-test does not meet US EPA TAC. For the *Pimephales* test, the laboratory must take the steps to procure test species within one working day, and the re-test must be initiated within one day of fish being available from a supplier.

Decision Step 2b (*Selenastrum* tests): If the Control treatment does not meet the USEPA method TAC for variability (coefficient of variation <20%) and an algal toxicity test of a water sample exhibits an algal cell density that is greater than the algal cell density of the Control treatment, a

2-tailed statistical test will be performed. If the results of that test indicate that the algal growth in the water sample is significantly greater than the Control treatment, and the program completeness standard for the test is met, then the sample should be determined to be not toxic; test result should be "flagged" to indicate the type of failure for the Control treatment. If the program completeness standard for the test is not met, then a re-test must be initiated within 24 hours of the termination of the initial algal test. In this case, both the original test results and the re-test results must be reported, and the re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected within five working days if the re-test does not meet USEPA TAC.

If an algal test Control treatment does not meet the minimum growth TAC of ≥200,000 cell/mL, then a retest of the original sample must be initiated within 24 hours of the termination of the initial algal test. Both the original test results and the re-test results must be reported by the Project; the re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected within five working days of the laboratory identifying a second failure in TAC, if the re-test does not meet USEPA TAC.

Decision Step 3 (all toxicity tests): If a Control treatment does not meet USEPA method TAC, and the associated ambient water sample(s) have <90% survival (for an acute toxicity test) or the mean algal growth is less than the Control treatment, re-testing will be required within 24 hours of the observed test failure and test results will be flagged. Additionally, Water Board staff will be notified within 1 business day of the observation of the results in question so that an agreement can be reached on how to proceed. If re-testing does not begin within 24 hours, then re-sampling must be conducted within 48 hours of the observed test failure, unless it is agreed by Water Board staff that re-sampling is not required. For the *Pimephales* test, the laboratory must take the steps to procure test species within one working day, and the re-test must be initiated within one day of fish being available from a supplier.

The reporting of data that do not meet USEPA TAC must also include an assessment from the laboratory as to what may have caused the test control performance issue, what the laboratory is doing to prevent this from happening again in the future, a comparison of the data against the EPA test performance measures, and a comparison of the data against the 90% completeness criteria in the QAPP.

B.5.5 Toxicity Procedures – Toxicity Identification Evaluation (TIE)

Water Column toxicity procedures and triggers for initiating TIEs are described in Section B.4.1.4.

B.5.6 Field Duplicate Specifications

Field duplicates will be collected at the rate of 5% of samples or one per sampling event, whichever is more frequent. Field duplicates will be analyzed along with the associated environmental samples. Field duplicates will be collected at the same time as environmental samples and should consist of two grab samples collected in rapid succession. If the relative percent difference (RPD) of field duplicate results is greater than 25% and the absolute difference is greater than the PQL, the data will be qualified and field teams will be notified so that possible sources of variability can be evaluated and any appropriate corrective actions taken. For bacterial analyses, no assessment of field precision is required (however, laboratories are required to meet method precision requirements).

B.6 INSTRUMENTATION AND EQUIPMENT TESTING, INSPECTIONS, AND MAINTENANCE

Equipment and instruments used for sampling and analysis are identified in the Quality Assurance Manuals for each laboratory and sampling contractor. Testing, inspection, maintenance requirements, and corrective actions for assessments of the equipment and instrumentation used by the contract laboratories are documented in the Quality Assurance Manuals for each analyzing laboratory (**APPENDIX F**). As a minimum requirement, laboratory equipment will be tested and maintained according to the manufacturer-recommended schedules of maintenance and SOPs. Due to the cost of some laboratory equipment, back up capability may not be possible. Commonly replaced parts will have spares available on-site for rapid maintenance of failed equipment. Such parts include but are not limited to batteries, tubes, light bulbs, tubing, specific ion electrodes, electrical conduits, glassware, and pumps.

All field equipment will receive preventive maintenance and testing according to the manufacturer-recommended schedules of maintenance. Other equipment used only occasionally will be inspected for availability of spare parts, cleanliness, and battery strength prior to being taken into the field. Common spare parts which should be available in the contractor's facilities (laboratory or office) include, but are not limited to: batteries, tubes, light bulbs, tubing, replacement probes, and glassware. After use in the field, equipment will be re-checked for needed maintenance. Equipment used for sample collection must be cleaned according to the specific procedures documented in each sampling SOP. Cleaning of sample equipment will otherwise conform to the SOP provided in **APPENDIX G**.

Separate log books documenting all preventive and corrective maintenance will be maintained for each type of field or laboratory equipment. Maintenance logs will be available for inspection during systems audits. Individuals responsible for maintenance shall be identified in the QA Manual for each laboratory and sampling contractors.

B.7 INSTRUMENT/EQUIPMENT CALIBRATIONS AND FREQUENCY

B.7.1 Instruments Requiring Calibration

Equipment and instruments requiring periodic calibration are identified in the SOPs for each analytical or measurement method. These include meters used for field measurements and all analytical instrumentation.

B.7.2 Calibration Procedures and Schedule

Calibration procedures and frequency for analytical instruments will follow the methods specified in each analytical SOP (**APPENDIX I**) and the SOPs for use of each instrument. For this program, only linear calibration, with either an average response factor or a linear regression, is acceptable for organic analyses.

At a minimum, calibration of instruments used for field measurements should be performed at a frequency recommended by the manufacturer. During sampling, routine field instrument calibration must be performed at least once per day prior to instrument use to ensure instruments are operating properly and producing accurate and reliable data.

B.7.3 Calibration Documentation Methods

Calibration procedures are performed according to the specific method SOPs. Calibrations will be documented in a calibration log or field sheet, as applicable. Any deviations from these procedures must be recorded in the log for the specific instrument.

B.7.4 Corrective Actions and Documentation of Equipment Deficiencies

Corrective actions are documented in each laboratory's Quality Assurance Manual. In general, corrective actions for calibration deficiencies are to identify and correct the cause, and recalibrate and reanalyze any suspect samples or qualify all suspect data. Any calibration deficiencies resulting in qualification of analytical results must be documented and reported in final laboratory data reports.

B.8 INSPECTION/ACCEPTANCE FOR SUPPLIES AND CONSUMABLES

B.8.1 Critical Supplies and Consumables for the Field and Laboratory

Supplies and consumables for specific sampling processes and analyses are listed in the specific SOPs in **APPENDIX G, I,** and **J**.

B.8.2 Source, Acceptance Criteria, and Procedures for Tracking, Storing and Retrieving Critical Supplies and Consumables

The procurement of supplies, equipment, and services must be controlled to ensure that specifications are met for the high quality and reliability required for each field and laboratory function. Inspection protocols and acceptance criteria for laboratory analytical reagents and other consumables are documented in the QAMs for individual laboratories. All stock standards and reagents used for extraction and standard solutions must be tracked through the laboratory. The preparation and use of all working standards must be recorded in bound laboratory notebooks that document standards traceable to USEPA, A2 LA, or NIST criteria. Equipment and materials are purchased independently by laboratories and sampling contractors. It is the responsibility of each staff person doing the ordering to inspect the equipment and materials for quality.

Gloves, sample containers, and any other consumable equipment used for sampling will be inspected by the sampling crew on receipt and will be rejected or returned if any obvious signs of contamination (*e.g.,* torn packages, etc.) are observed. Calibration supplies must be ordered on a timely basis to ensure that they are available when needed, and have not exceeded the manufacturer's expiration date.

Upon receipt of materials or equipment, staff designated in the QAM receives and signs for the materials. The items are reviewed to ensure the shipment is complete and they are then delivered to the proper storage location. All chemicals are dated upon receipt. All supplies are stored appropriately and are discarded upon expiration date.

B.8.3 Individuals Responsible for Supplies and Consumables

Staff responsible for supplies and consumables is designated in the laboratory QAMs.

B.9 NON-DIRECT MEASUREMENTS

B.9.1 Non-Direct Data Sources

No previously collected or generated non-direct measurements are required for completion of this project. However, information or measurement ancillary to addressing the project's objectives may be used to interpret or support the results of direct measurements. Non-direct data sources may include, but are not limited to the following:

- existing sampling and analytical data and reports from previous efforts
- flows or meteorological data from sources or databases outside of this project (e.g., California Data Exchange Center (http://cdec.water.ca.gov/) or U.S. Geological Survey (http://nwis.waterdata.usgs.gov/ca/nwis/)
- pesticide use and other data from the California Department of Pesticides (http://www.cdpr.ca.gov/dprdatabase.htm)
- photographs or topographical maps produced outside of this project
- information from the published literature

Generally, quality assurance indicators are not available for these types of information. Typically these data will be acquired through internet access or through personal communications and requests to the individuals responsible for maintaining the data.

B.9.2 Intended Use of Non-Direct Data

No previously collected or generated non-direct measurements are required for completion of this project. However, information or measurement ancillary to addressing the project's objectives may be used to interpret or support the results of direct measurements.

B.9.3 Acceptance Criteria for Non-Direct Data Use

Generally, quality assurance indicators are not available for these types of information. Typically this data will be acquired through internet access and through personal communications and requests to the individuals responsible for maintaining the data. Because they are not required for project completion, there are no specific acceptance criteria and the quality or reliability of these data must be evaluated on a case by cases basis for their intended purpose. The data sources utilized have generally undergone a quality review before being made available for public use.

B.9.4 Required Resources and Support Facilities

This element is not applicable to the project.

B.9.5 Limits to Validity and Operating Conditions

This element is not applicable to the project.

B.10 DATA MANAGEMENT

B.10.1 Data Management Scheme

The Monitoring Manager will maintain an inventory of data and its forms (e.g., field logs, lab reports, electronic data documents) and will periodically check the inventory against the records in their possession. Analytical laboratories will maintain a record of transferred records and will assess these against those received by the project on request of the Monitoring Manager.

Data will be evaluated and documented after each sample event to determine whether project quality assurance objectives have been met, to quantitatively assess data quality, and to identify potential limitations on data use. The following assessments of compliance with quality control procedures will be performed during the data collection phase of the project:

- Performance assessment of the sampling procedures will be performed by the field sampling crews. Corrective action shall be carried out by the field sampling crew and reported to the quality assurance manager.
- The laboratory is responsible for following the procedures and operating the analytical systems within the statistical control limits. These procedures include proper instrument maintenance, calibration of the instruments, and the laboratory QC sample analyses at the required frequency (i.e. method blanks, laboratory control samples, etc.). Associated QC sample results are reported with all sample results so that project staff can evaluate the analytical process performance.

All project data must be reviewed as part of the data assessment. Review is conducted on a preparation batch basis by assessing QC samples and all associated field sample results.

Project data review established for this project includes the following steps:

- Initial review of analytical and field data for complete and accurate documentation, chain of custody procedures, analytical holding times compliance, and required frequency of field and laboratory QC samples;
- Evaluation of analytical and field blank results to identify random and systematic contamination;
- Comparison of all spike and duplicate results with project objectives for precision and accuracy;
- Assigning data qualifier flags to the data as necessary to reflect data use limitations identified by the assessment process; and
- Calculating completeness by matrix and analyte.

The monitoring management contractor is responsible for conducting the data assessment and for ensuring that data qualifier flags are assigned, as needed, based on the established QC criteria.

In addition to assessments of data quality and completeness, all valid monitoring results will be compared to relevant water quality criteria to identify exceedances and determine compliance with the requirements of the ILRP Conditional Waiver.

Generally, data handling and reduction will conform to the procedures in the Quality Assurance Manual for each laboratory. Procedures for data reduction with respect to significant figures must incorporate the following conventions:

- The number of significant digits in a measurement must be restricted by the least accurate of its input measurements. These input measurements include all of those associated with sample processing, including aliquots measured during sampling, preparation, and laboratory analysis.
- Results of mathematical calculations shall have the same number of significant figures as the calculation's least precise input value. This is especially relevant in the discussion of MDLs and reporting limits (RLs). In these instances, the number of reported significant digits must realistically reflect the laboratory's analytical precision.

- If the result of a calculation contains too many significant digits, it must be rounded using standard mathematical convention.

B.10.2 Standard Record Keeping and Tracking Practices

Documentation and records will be maintained as described in Section A.9. Copies of field logs, a copy of COC forms, original preliminary and final lab reports, and electronic media reports will be kept by the Monitoring Manager for review by the Project Manager, designated Water Board staff, and the State Water Resources Control Board grant manager for the project (if applicable). Original field logs and COCs will be retained by the field crew manager or designee. Contract laboratories shall retain original COC forms. The contract laboratories will retain copies of the preliminary and final data reports. These records will be kept for a minimum of three years after the completion of monitoring described in this document.

B.10.3 Data Entry and Upload

Concentrations of chemicals and toxicity endpoints, and all numerical biological parameters shall be calculated as described in the referenced method document for each analyte or parameter, or laboratory SOP. Field data will be entered by staff designated by the sampling contractor's field crew leader into a standard electronic format (supplied or approved by the Monitoring Manager). Laboratory analyses data will be transferred or converted by the designated laboratory staff directly into a standard SWAMP-comparable electronic format approved by the Monitoring Manager.

Direct electronic transfer or conversion of data from analytical instrumentation or Laboratory Information Management System (LIMS) will be used whenever possible to process, compile, and transmit analysis results to minimize manual data entry and potential transcription errors.

The data generated for this project will be converted to a standard database format maintained on personal computers in the Monitoring Manager's office and made available for the Regional Board staff review. Monitoring data will be submitted quarterly to the Regional Board in a SWAMP-compatible electronic format.

B.10.4 Data Control Mechanisms

Direct electronic transfer or conversion of data from analytical instrumentation or Laboratory Information Management System (LIMS) will be used whenever possible to process, compile, and transmit analysis results to minimize manual data entry and potential transcription errors. Generally, data handling and reduction will conform to the procedures in the Quality Assurance Manual for each laboratory. The use of direct electronic transfers wherever possible minimizes the risk of data loss due to human error during data entry. Original sources of data (e.g., chromatograms, bench sheets, field logs, etc.) are retained by the laboratory or field crews to prevent the loss of data during the data reduction, entry, and reporting procedures. Procedures for data reduction with respect to significant figures must incorporate the following conventions:

- The number of significant digits in a measurement must be restricted by the least accurate of its input measurements. These input measurements include all of those associated with sample processing, including aliquots measured during sampling, preparation, and laboratory analysis.
- Results of mathematical calculations shall have the same number of significant figures as the calculation's least precise input value. This is especially relevant in the discussion of

MDLs and reporting limits (RLs). In these instances, the number of reported significant digits must realistically reflect the laboratory's analytical precision.

After data entry or data transfer procedures are completed for each sample event, data will be inspected for data transcription errors, and corrected as appropriate. After the final QA checks for errors are completed, the data are added to the final database. Electronic data files and reports and the project database are backed up to a separate location on a weekly basis, at a minimum. Back up files are maintained for at least four weeks.

B.10.5 Individuals Responsible for Data Management

For laboratories or sampling contractors performing work for this project, individuals responsible for specific data management tasks are identified in their respective Quality Assurance Manuals (**APPENDIX F**). The Monitoring Manager is responsible for overseeing document management, data assessment, and maintenance of the project database.

B.10.6 Continuous Data and SONDE Files

This element is not currently applicable to this project. If continuous monitoring is implemented in the future for supplemental monitoring purposes, raw data files will be maintained in the original file format on a personal computer, and appropriate endpoints will be calculated and maintained in the project database.

B.10.7 Checklists and Forms

Checklists and forms to guide data review procedures are provided in **APPENDIX L**.

C ASSESSMENT AND OVERSIGHT

C.1 ASSESSMENTS AND RESPONSE ACTIONS

C.1.1 Project Assessment Activities

The following assessments of compliance with quality control procedures are undertaken on a routine basis during the data collection phase of the project:

- Performance assessments of sampling procedures will be performed by the field sampling crews. These assessments consist of observation of field operations to ensure consistency and compliance with sampling specifications. They are performed continually during sampling. There are no formal reports for this assessment activity.
- Assessment of laboratory QC results will be the responsibility of the QA officer at each laboratory and shall be reported to the Quality Assurance Manager as part of any data reports.

Routine procedures to assess precision and accuracy, criteria for success, and corrective actions have been discussed previously (Section B.5) and presented in **APPENDIX K**. These assessments will be performed for every sample event.

The following additional assessments may be performed for this project, but have no required schedule.

Performance Evaluation Audits

Performance evaluation (PE) audits quantitatively assess the data produced by a measurement system. Performing an evaluation audit involves submitting certified samples for each analytical method. The matrix standards are selected to reflect the concentration range expected for the sampling program. No Performance Evaluation Audits are planned because this project relies on the State laboratory certification process to assure adequate overall laboratory performance.

Field Technical Audits

Sampling contractors should routinely observe field operations to ensure consistency and compliance with sampling specifications presented in this QAPP. No audits of field operations are currently planned for this project. However, the Monitoring Program manager may perform audits of field operations, if it is determined to be necessary based on QC data.

Laboratory System Audit

Water Board staff may conduct laboratory system audits during conduction of sample analysis for this program. A laboratory system audit is a quantitative review of a sampling or analytical system.

Critical items for a laboratory system audit include:

- Sample storage procedures;
- Availability of and compliance with calibration procedures and documentation requirements;
- Standard operating procedures;
- Source and handling of standards;
- Completeness of data forms, notebooks and other records of analysis and QC activities;
- Data review and verification procedures;
- Data storage, filing and record keeping procedures;
- Sample custody procedures;
- Establishments and use of quality control procedures, control limits and corrective actions that comply with specification in this QAPP;
- Operating conditions of the facilities and the equipment;
- Documentation of the instruments maintenance activities; and
- Laboratory staff training and documentation.

C.1.2 Responsible Individuals and Authority to Stop Work

Assessment of field QC results and oversight of implementation of corrective actions shall be the responsibility of the Quality Assurance Manager. The Project Quality Assurance Manager has the authority to issue a "stop work order", if warranted by inadequate QA performance or lack of appropriate corrective actions.

C.1.3 Assessment Information Reports

Assessment Reports are the responsibility of the individual(s) conducting the assessments. Assessment reports will summarize findings, observations, and recommendations; supporting evidence for each; and references to this QAPP or other applicable requirements. It is acceptable for the assessment report to include recommendations for corrective actions and their associated

due dates. Reports will be provided to the assessed entity (e.g., laboratory, field crew, data manager) and the Coalition monitoring manager and quality assurance manager.

C.1.4 Corrective Action Measures and Documentation of Assessment Conclusions

Based on the performance assessment of sampling procedures, corrective actions shall be carried out by the field sampling crew and reported to the Quality Assurance Manager in subsequent Event Summary Reports.

Based on the assessment of laboratory QC results, corrective actions will be implemented according to the laboratories QAM and reported to the Project Quality Assurance Manager.

Field QC results shall be included in QA reports to project management.

Any problem associated with Performance Evaluations must be evaluated to determine the influence on field samples analyzed during the same time period. The laboratory must provide a written response to any PE sample result deficiencies.

C.2 REPORTS TO MANAGEMENT

The Reports to Management element provides for information regarding how management will be kept informed of project oversight, assessment, activities, scheduling, and findings.

Status Reports will be produced by the Monitoring Program Manager to document project status, results of any performance evaluations conducted, data quality assessments, and any significant QA problems and recommended solutions. For the purpose of this project, the Annual Monitoring Reports required for the ILRP will serve as the Status Reports for the project. A quality assurance report will be prepared by the Quality Assurance Manager following each monitoring season, as part of the Annual Monitoring Report for the ILRP. The quality assurance report will summarize the results of QA/QC assessments and evaluations, including precision, accuracy, comparability, representativeness, and completeness of the monitoring data. The quality assurance report will include results of any performance evaluation audits or field technical audits performed. The annual reports will be distributed to the Coalition Project Manager and to designated Regional Water Board staff, as well as to other program participants.

D DATA VALIDATION AND USABILITY

D.1 DATA REVIEW, VERIFICATION, AND VALIDATION

Data will be reviewed and validated using the criteria documented in Section A.7 and the assessment procedures documented in Section B.5. The Project QAPP must be used to accept, reject, or qualify the data generated by the laboratory. The Project Manager shall convey the QA/QC acceptance criteria to the laboratory management. The laboratory management will be responsible for validating the data generated by the laboratory. The laboratory's personnel must verify that the measurement process was "in control" (i.e., that all specified data quality objectives were met or acceptable deviations explained) for each batch of samples before proceeding with analysis of a subsequent batch. In addition, each laboratory will establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data.

Only data that have met data quality objectives, or data that have acceptable deviations explained will be submitted by the laboratory. When QC requirements have not been met, the samples will be reanalyzed when possible and only the results of the reanalysis will be submitted, provided

they are acceptable. The Monitoring Manager will be responsible for determining if the validated laboratory data meets the project acceptance criteria.

After data entry or data transfer procedures are completed for each sample event, data should be inspected for data transcription errors, and corrected as appropriate. After the final QA checks for errors are completed, the data should be added to the final database.

D.2 VERIFICATION AND VALIDATION METHODS

Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications. Primary responsibility for data verification is with the field crews and laboratories.

- Field crews are responsible for verifying field records for completeness and accuracy, including field logs and records of samples collected and COCs, and for field measurement data. Completeness is assessed against the sample plans provided by the Monitoring Manager. The outputs for this verification process are the verified field documents and data, and the sample event summary documents whether all samples were successfully collected and reasons for any lack of completeness.
- Laboratories are responsible for verifying that all samples are analyzed by the project specified methods and meet other project-specific requirements (e.g., reporting limits), and that the data are accurately calculated, transcribed, and reported.

Data validation is an analyte- and sample– specific process that extends the evaluation of data beyond method, procedure, or contractual compliance to determine the quality of a specific data set relative to the end uses. Data validation includes inspection of the verified data and data verification records; a review of the verified data to determine the analytical quality of the data set; and production of a data validation report and qualified data (if applicable). Specific items that will be reviewed during data validation are:

- Chain of custody records
- Documentation of the laboratory procedures (e.g., standard preparation records, run logs, data reduction and verification)
- Accuracy of data reduction, transcription, and reporting
- Adherence to method-specific calibration procedures and quality control parameters
- Precision and accuracy of recorded results

Completeness is assessed against the sample plans provided by the Monitoring Manager. The Monitoring Manager is responsible for data validation prior to submitting any data to Regional Board. The Project QA Manager will provide independent oversight and resolution of any specific QA issues.

D.2.1 Documentation and Corrective Action for Discrepancies

The outputs of field verification are the verified field documents and data, as well as the sample event summary documents (whether all samples were successfully collected), and reasons for any lack of completeness. For the purpose of this project, data validation documentation consists of the data quality review provided in the Annual Monitoring Reports, and the final data submitted to the Regional Water Board for the ILRP.

It is the responsibility of the individual(s) maintaining Coalition's monitoring database to correct errors in field or laboratory generated data before they are transferred to the validated side of the database. Communication with field crews and laboratories responsible for generating the data will be conducted as necessary to correct errors and omissions. If revised laboratory data reports or data files are required to correct the error(s), only the final amended reports and data files will be reported. Superseded data reports and data files will be retained and stored separately from final amended documents.

D.2.2 Checklists, Forms and Calculations

Checklists and forms used in data review, validation, and verification are provided in Appendix L. All necessary calculations are provided in previous sections of this QAPP.

D.3 RECONCILIATION WITH USER REQUIREMENTS

D.3.1 Procedures to Evaluate Validated Data

The primary user requirement for the data generated for the ILRP is the assessment of potential exceedances of water quality objectives. Other specific uses of the data are described in Section A.5. Satisfaction of this requirement, and consequently compliance with the ILRP MRP requirements, are evaluated based on the overall completeness and quality of the data as determined by data quality assessments described previously in Section A.7 and Section B.5.

D.3.2 Reporting Limitations on Data Use

Any limitations on the uses of the validated data will reported as qualifications of the reported data. Any applicable qualifications will be included with the data reported in Annual Monitoring Reports and provided to the Regional Water Board for the ILRP.

E REFERENCES

Bailey H, C DiGiorgio, K Kroll, J Miller, D Hinton, and G Starrett, 1996. Development of procedures for identifying pesticide toxicity in ambient waters: Carbofuran, diazinon, and chlorpyrifos. *Environmental Toxicology and Chemistry* 15: 837-845.

Geis, S., K Fleming, A Mager, L Reynolds, 2003. Modifications to the fathead minnow (Pimephales promelas) chronic test method to remove mortality due to pathogenic organisms. *Environmental Toxicology and Chemistry*, Vol. 22: 2400-2404.

CVRWQCB 2009a. Water Quality Control Plan (Basin Plan) For The Sacramento River And San Joaquin River Basins. Fourth Edition, Revised September 2009 (with Approved Amendments). California Regional Water Quality Control Board Central Valley Region.

CVRWQCB 2009b. Monitoring and Reporting Program Order No. R5-2009-0875 for Sacramento Valley Water Quality Coalition under Amended Order No. R5-2006-0053, Coalition Group Conditional Waiver Of Waste Discharge Requirements For Discharges From Irrigated Lands. California Regional Water Quality Control Board, Central Valley Region.

CVRWQCB 2005. Monitoring And Reporting Program Order No. R5-2005-0833 for Coalition Groups Under Resolution No. R5-2003-0105, Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. California Regional Water Quality Control Board Central Valley Region.

SVWQC 2004. Monitoring and Reporting Program Plan – Sacramento River Basin. Sacramento Valley Water Quality Coalition, Sacramento, California. April 2004.

SVWQC 2007. Monitoring Program for 2007. Prepared by Larry Walker Associates, Davis, California for the Sacramento Valley Water Quality Coalition. March 2007.

SVWQC 2008a. Monitoring and Reporting Program Plan – Sacramento River Basin. Sacramento Valley Water Quality Coalition, Sacramento, California. July 2008.

SVWQC 2008b. Water Quality Management Plan, DRAFT. Prepared by Larry Walker Associates for Sacramento Valley Water Quality Coalition (SVWQC), Sacramento, California. September 2008.

USEPA 1983. *Methods for Chemical Analysis of Water and Wastes.* EPA-600/4-79-020, third edition. U.S. Environmental Protection Agency (USEPA).

USEPA 1988. *Methods for Determination of Organic Compounds in Drinking Water* (EPA-600/4- 88/039)

USEPA 1996a. *Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*. U.S. Environmental Protection Agency (USEPA), Office of Water. (EPA 821-R-96-011). July 1996.

USEPA 1996b. *Marine Toxicity Identification Evaluation (TIE) Phase I Guidance Document*. September, 1996. EPA/600/R-96/054.

USEPA 2000. Final California Toxics Rule (CTR), Vol. 65, No. 97, Federal Register, §§31682 *et seq*..

USEPA 2000. *Prediction of Sediment Toxicity Using Consensus-Based Freshwater Sediment Quality Guidelines*. EPA 905/R-00/007. U.S. Environmental Protection Agency (USEPA), Great Lakes Program Office. Chicago, Illinois

USEPA 2001. *Laboratory Documentation Requirements for Data Evaluation* (R9QA/004.1)

USEPA 2002a. *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition*. Office of Water, Washington, D.C. EPA-821-R-02-012

USEPA 2002b. *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition*. U.S. Environmental Protection Agency (USEPA), Office of Water, Washington, D.C. EPA-821-R-02-01

USEPA 1994. *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates.* U.S. Environmental Protection Agency (USEPA), Office of Research and Development, Washington, D.C. EPA-600-R-94-024.

USGS 1994. *Guidelines for Collecting and Processing Samples of Stream Bed Sediment for Analysis of Trace Elements and Organic Contaminants for the National Water-Quality Assessment Program.* United States Geological Survey (USGS). Open-File Report 94-458. Sacramento, CA 1994.

USGS 1982. *Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge*, Geological Survey Water-Supply Paper 2175. United States Geological Survey (USGS).

APPENDIX A. WATER QUALITY OBJECTIVES

Adopted Basin Plan and California Toxics Rule Water Quality Objectives for ILRP Analytes

Analyte	Most Stringent Objective[1]	Units	Objective Source[2]
Ammonia, Total as N	narrative	mg/L	Basin Plan
Arsenic, dissolved	150	ug/L	CTR
Arsenic, total	50	ug/L	CA 1˚ MCL
Atrazine	1	ug/L	CA 1˚ MCL
Cadmium, dissolved	hardness dependent[4]	ug/L	CTR
Carbofuran	0.4	ug/L	Basin Plan
Chlorpyrifos	0.015	ug/L	Basin Plan
Color	15[3]	CU	CA 1˚ MCL
Copper, dissolved	hardness dependent[4]	ug/L	CTR
DDD (o,p' and p,p')	0.00083	ug/L	CTR
DDE (o,p' and p,p')	0.00059	ug/L	CTR
DDT (o,p' and p,p')	0.00059	ug/L	CTR
Diazinon	0.10	ug/L	Basin Plan
Dieldrin	0.00014	ug/L	CTR
Dissolved Oxygen	5	mg/L	Basin Plan
Endrin	0.036	ug/L	CTR
Fecal coliform	400	MPN/100mL	Basin Plan
Glyphosate	700	ug/L	CA 1˚ MCL
Lead, dissolved	hardness dependent[4]	ug/L	CTR
Malathion	0.1	ug/L	Basin Plan
Molinate	10	ug/L	Basin Plan
Nickel, dissolved	hardness dependent[4]	ug/L	CTR
Nitrate, as N	10	mg/L	CA 1˚ MCL
Oxamyl	50	ug/L	CA 1˚ MCL
Parathion, Methyl	0.13	ug/L	Basin Plan
pH	6.5-8.5	-log[H+]	Basin Plan
Selenium, total	5	ug/L	Basin Plan
Simazine	4	ug/L	CA 1˚ MCL
Temperature	narrative	ug/L	Basin Plan
Thiobencarb	1	ug/L	Basin Plan
Total Suspended Solids	narrative	mg/L	Basin Plan
Toxicity, Algae Cell Density	narrative	ug/L	Basin Plan
Toxicity, Fathead Minnow Survival	narrative	ug/L	Basin Plan
Toxicity, Water Flea Survival	narrative	ug/L	Basin Plan
Turbidity	narrative	ug/L	Basin Plan
Zinc, dissolved	hardness dependent[4]	ug/L	CTR

(1) For analytes with more than one limit, the most limiting applicable adopted water quality objective is listed.

(2) *CA 1˚ MCLs* are the California's Maximum Contaminant Levels for treated drinking water; *CTR* indicates California Toxics Rule criteria.

(3) Applies only to treated drinking water.

(4) Objective varies with the hardness of the water.

Unadopted Water Quality Limits Used to Interpret Narrative Water Quality Objectives for Monitored Analytes

Analyte	Unadopted Limit[(1)]	Units	Limit Source
Boron, total	700	ug/L	Ayers and Westcott 1988
Conductivity	900	uS/cm	CA Recommended 2˚ MCL
E. coli [(1)]	235	MPN/100mL	Basin Plan Amendment
Conductivity	700	uS/cm	Ayers and Westcott 1988
Total Dissolved Solids	500	mg/L	CA Recommended 2˚ MCL
Total Dissolved Solids	450	mg/L	Ayers and Westcott 1988

(1) Adopted by the Water Board but not approved by State Water Resources Control Board

APPENDIX B. IRRIGATED LANDS REGULATORY PROGRAM TRIGGER LIMITS

INTERIM
Water Quality Trigger Limits Table
SVWQC
(Revised on 5 September 2008)

All Water Quality Objectives and Limits listed in this table are based on the protection of the following beneficial uses: Agricultural Supply; Freshwater Habitat; Municipal and Domestic Supply; Spawning, Reproduction, and/or Early Development of Freshwater Aquatic Life; Water Contact Recreation; and Wildlife Habitat. Clarification of specific objectives and beneficial uses for each monitoring site will be confirmed over time utilizing an iterative process that has been identified through the TIC. These limits will apply in the interim.

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
pH	6.5 - 8.5 units	Numeric		Sacramento/San Joaquin Rivers Basin Plan (page III.6.00)	1
Electrical Conductivity (maximum)	700 umhos/cm	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
	230 umhos/cm (50 percentile) or 235 umhos/cm (90 percentile)	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-3, page III.7.00) Sacramento River at Knights Landing above Colusa Basin Drain.	1
	240 umhos/cm (50 percentile) or 340 umhos/cm (90 percentile)			Sacramento/San Joaquin Rivers Basin Plan (Table III-3, page III.7.00) Sacramento River at I Street Bridge, based on previous 10 years of record.	1
	150 umhos/cm (90 percentile)			Sacramento/San Joaquin Rivers Basin Plan (Table III-3, page III.7.00) In well-mixed waters of the Feather River, including: North Fork Feather River; Middle Fork Feather River from Little Last Chance Ck to Lk Oroville; and the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River.	1
Dissolved Oxygen (minimum)	7 mg/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan. Water Quality Control Plan for the Tulare Lake Basin.	1
	5 mg/L		Warm Freshwater Habitat	Basin Plan Objective, page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan	
	7 mg/L			Sacramento/San Joaquin Rivers Basin Plan (Table III-2, page III.5.00) Sacramento River below the I Street Bridge and all Delta Waters west of the Antioch Bridge	1
	5 mg/L			Sacramento/San Joaquin Rivers Basin Plan (Table III-2, page III.5.00) All other Delta waters except those constructed for special purpose and from which fish have been excluded or the fishery is not important as a beneficial use	1
	9 mg/l			Sacramento/San Joaquin Rivers Basin Plan (Table III-2, page III.5.00) 1 June to 31 August in the Sacramento River from Keswick Dam to Hamilton City (see Basin Plan)	1
	8 mg/L			Sacramento/San Joaquin Rivers Basin Plan (Table III-2, page III.5.00) 1 September to 31 May in the Feather River from the Fish Barrier Dam at Oroville to Honcut Creek.	1
Turbidity	variable	Numeric	Municipal and Domestic Supply	Basin Plan Objective - increase varies based on natural turbidity See Basin Plan page III-9.00	1
Total Dissolved Solids	450 mg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
	125 mg/L (90 percentile)	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-3, page III.7.00) North Fork American River from the source to Folsom Lake; Middle Fork American River from the source to Folsom Lake; South Fork American River from the source to Folsom Lake; and American River from Folsom Dam to the Sacramento River.	
Total Suspended Solids	NA				
Temperature	variable	Numeric		Basin Plan Objective (see objectives for COLD, WARM, and Enclosed Bays and Estuaries)	1
E coli	235 MPN/100 ml	Narrative	Water Contact Recreation	EPA ambient water quality criteria, single-sample maximum	3
Fecal coliform	200 MPN/100 ml **400 MPN/100 ml**	Numeric	Water Contact Recreation	Sacramento/San Joaquin Rivers Basin Plan (page III.3.00) Geometric mean of not less than five samples for any 30- day period, **nor No more than 10% of the total number of samples taken during a 30 -day period.**	1
TOC	NA				
Pesticides - Carbamates					
Aldicarb	3 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health)	1
Carbaryl	2.53 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average	3
Carbofuran	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
	0.4 ug/L	Numeric		Sacramento/San Joaquin Basin Plan - Performance Goal for Dischargers under Board Approved Management Practices	2
Methiocarb	0.5 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates	3
Methomyl	0.52 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life)	3
Oxamyl	50 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Dept of Health Services. Primary MCL	3
Pesticides - Organochlorines					
DDD(p,p')	0.00083 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
DDE(p,p')	0.00059 ug/L				
DDT(p,p')	0.00059 ug/L				
Dicofol	NA				
Dieldrin	0.00014 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.056	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) / Continuous Concentration 4-day average (total)	1
Endrin	0.036 ug/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-Day Average	1
	0.76 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
Methoxychlor	0.03 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum	3
	30 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Pesticides - Organophosphates					
Azinphos methyl	0.01 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - instantaneous maximum	3
Chlorpyrifos	0.015 ug/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Rivers Basin Plan: page III-6.01; San Joaquin River & Delta, Sacramento & Feather Rivers; more stringent 4-day average.	1
Diazinon	0.1 ug/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan: San Joaquin River & Delta numeric standard. Sacramento & Feather Rivers numeric standard	1

INTERIM
Water Quality Trigger Limits Table
SVWQC
(Revised on 5 September 2008)

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Dichlorvos	0.085 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. Cal/EPA Cancer Potency Factor as a drinking water level	3
Dimethoate	1.0 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Notification Level – DHS (MUN, human health). California Notification Levels. (Department of Health Services)	3
Demeton-s	NA				
Disulfoton	0.05 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum	3
Malathion	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
	0.1 ug/L	Numeric		Sacramento/San Joaquin Basin Plan - Performance Goal for Dischargers under Board Approved Management Practices	2
Methamidophos	0.35 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3
Methidathion	0.7	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose (MUN, human health)	3
Parathion, Methyl	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
	0.13 ug/L	Numeric		Sacramento/San Joaquin Basin Plan - Performance Goal for Dischargers under Board Approved Management Practices	2
Phorate	0.7 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3
Phosmet	140 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3

INTERIM
Water Quality Trigger Limits Table
SVWQC
(Revised on 5 September 2008)

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Group A Pesticides					
Aldrin	0.00013 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	3 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Instantaneous maximum	
Chlordane	0.00057 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0043 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Heptachlor	0.00021ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0038 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Heptachlor Epoxide	0.0001 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0038 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Total Hexachlorocyclohexane (including lindane)	0.0039 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.95 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Maximum Concentration (1-hour Average)	
Endosulfan	110 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.056 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR (USEPA) - Continuous Concentration 4-day average (total)	
Toxaphene	0.00073 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0002 ug/L		Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Pesticides - Herbicides					
Atrazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Cyanazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Health Advisory (human health)	3
Diuron	2 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. USEPA Health Advisory. Likely to be carcinogenic to humans (U.S. Environmental Protection Agency, 2005 Guidelines for Carcinogen Risk Assessment).	3
Glyphosate	700 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Linuron	1.4 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level	3
Molinate	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition	2
	10 ug/L	Numeric		Sacramento/San Joaquin Basin Plan - Performance Goal for Dischargers under Board Approved Management Practices	2
Paraquat dichloride	3.2 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level	3
Simazine	4.0 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Thiobencarb	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition	2
	1.5 ug/L	Numeric		Sacramento/San Joaquin Basin Plan - Performance Goal for Dischargers under Board Approved Management Practices	2
	1.0 ug/L	Numeric		Sacramento/San Joaquin Basin Plan - Performance Goal for Dischargers under Board Approved Management Practices and discharging to waters designated as MUN	2
Trifluralin	5 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Cancer Risk Level. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water	3

INTERIM
Water Quality Trigger Limits Table
SVWQC
(Revised on 5 September 2008)

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Metals (c)					
Arsenic	10 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health)	1
Boron	700 ug/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
Cadmium	for aquatic life; variable (see cadmium worksheet).	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness	1
	variable (see Basin Plan)	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-1, page III.3.00) Applies to the Sacramento River and its tributaries above State Hwy 32 bridge at Hamilton City	1
	5 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Copper	for aquatic life; variable (see copper worksheet).	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness/	1
	variable (see Basin Plan)	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-1, page III.3.00) Applies to the Sacramento River and its tributaries above State Hwy 32 bridge at Hamilton City	1
	10 ug/L	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-1, page III.3.00) Applies to the Sacramento River from Hwy 32 bridge at Hamilton City to the I Street Bridge at City of Sacramento; the American River from Folsom Dam to the Sacramento River; Folsom Lake; and the Sacramento-San Joaquin Delta.	1
	1,300 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Lead	for aquatic life; variable (see lead worksheet).	Numeric	Freshwater Habitat	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
	15 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Molybdenum	15 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan - San Joaquin River, Mouth of the Merced River to Vernalis	1
	50 ug/L			Sacramento/San Joaquin Basin Plan - Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River	
	10 ug/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
	35 ug/L		Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level.	
Nickel	For aquatic life variable (see Nickel worksheet).	Numeric	Freshwater Habitat	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
	100 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Selenium	50 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
	5 ug/L (4-day average)	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR Freshwater Aquatic Life Protection - Continuous Concentration - 4-Day Average	
Zinc	For aquatic life variable (see Zinc worksheet).	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness/	1
	variable (see Basin Plan)	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-1, page III.3.00) Applies to the Sacramento River and its tributaries above State Hwy 32 bridge at Hamilton City	1
	100 ug/L	Numeric		Sacramento/San Joaquin Rivers Basin Plan (Table III-1, page III.3.00) Applies to the Sacramento River from Hwy 32 bridge at Hamilton City to the I Street Bridge at City of Sacramento; the American River from Folsom Dam to the Sacramento River; Folsom Lake; and the Sacramento-San Joaquin Delta.	1
	5,000 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Secondary MCL (MUN, human health)	1
Nutrients					
Nitrate as NO3 Nitrate as N	45,000 ug/L as NO3 10,000 ug/L as N	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Nitrite as Nitrogen	1,000 ug/L as N	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Ammonia	For aquatic life variable (see ammonia worksheet).	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Freshwater Aquatic Life Criteria, Continuous Concentration	1
	1.5 mg/L (regardless of pH and Temperature values)	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Taste and Odor Threshold (Ammore and Hautala)	1
Hardness	NA				
Phosphorus, total	NA				
Orthophosphate, soluble	NA				
TKN	NA				

Notes:
Category 1: Constituents that have numeric water quality objectives in the Sac-SJR Basin Plan or other WQO listed by reference such as MCLs (Page III-3.0)* , CTRs (Page III-10.1)*, and chlorinated hydrocarbon pesticides (Page III-6.0, third bullet)*. Other numeric objectives may only apply to specific water bodies sections, or during specified time periods (see Basin Plan for more details).
Category 2: Pesticides with discharge prohibitions. Prohibitions apply to any discharges not subject to board-approved management practices (Page IV-25.0)*. Apply Performance Goal numbers to Rice Coalition areas. Any other detections are considered to be a violation of the Prohibition and should be discussed.
Category 3: Constituent does not have numeric WQO, and does not have a MCL. WQ Trigger Limit exceedance is based on implementation of narrative objective. All detections should be tracked. None are default exceedances.

NA Not Available. Until completion of evaluation studies and MRP Plan submittals with site specific information on beneficial uses.
ND Non Detect
(*) Water Quality Control Plan for the Sacramento and San Joaquin River Basins. Revised on October 2007
Narrative WQTLs are based on Water Quality Goals Database. Updated by Jon Marshack on 16 July 2008

This page intentionally blank

APPENDIX C. COALITION MONITORING SITES

Subwatershed	Location	Lat	Long
Butte-Sutter-Yuba	Lower Snake R. at Nuestro Rd	39.18531	-121.70358
Butte-Sutter-Yuba	Sacramento Slough bridge near Karnak	38.785	-121.6533
Butte-Sutter-Yuba	Lower Honcut Creek at Hwy 70	39.30915	-121.59542
Butte-Sutter-Yuba	Pine Creek at Nord Gianella Road	39.78114	-121.98771
Butte-Sutter-Yuba	Gilsizer Slough at George Washington Road	39.009	-121.6716
Butte-Sutter-Yuba	Butte Slough at Pass Road	39.1873	-121.90847
Butte-Sutter-Yuba	Wadsworth Canal at South Butte Rd	39.15337	-121.73435
Colusa Glenn	Colusa Basin Drain above KL	38.8121	-121.7741
Colusa Glenn	Freshwater Creek at Gibson Rd	39.17664	-122.18915
Colusa Glenn	Walker Creek near 99W and CR33	39.62423	-122.19652
Colusa Glenn	Logan Creek at 4 Mile-Excelsior Rd	39.3653	-122.1161
Colusa Glenn	Lurline Creek at 99W	39.21215	-122.18331
Colusa Glenn	Rough and Ready Pumping Plant (RD 108)	38.86209	-121.7927
Colusa Glenn	Stone Corral Creek near Maxwell Road	39.2751	-122.1043
Colusa Glenn	Stony Creek on Hwy 45 near Rd 24	39.71005	-122.00404
El Dorado	North Canyon Creek	38.7604	-120.7102
El Dorado	Coon Hollow Creek	38.75335	-120.72404
Lake-Napa	Middle Creek u/s from Highway 20	39.17641	-122.91271
Lake-Napa	McGaugh Slough at Finley Road East	39.00417	-122.86233
Lake-Napa	Pope Creek upstream from Lake Berryessa	38.64637	-122.36424
Lake-Napa	Capell Creek upstream from Lake Berryessa	38.48252	-122.24107
Pit River	Pit River at Pittville	41.0454	-121.3317
Pit River	Pit River at Canby Bridge	41.4017	-120.931
Pit River	Fall River at Fall River Ranch Bridge	41.0351	-121.4864
PNSNSS	Coon Creek at Brewer Road	38.93399	-121.45184
PNSNSS	Coon Creek at Striplin Road	38.8661	-121.5803
PNSNSS	Coon Creek at DLX Ranches	38.9353	-121.408
Sac-Amador	Cosumnes River at Twin Cities Rd	38.29098	-121.38044
Sac-Amador	Grand Island Drain near Leary Road	38.2399	-121.5649
Sac-Amador	Dry Creek at Alta Mesa Road	38.248	-121.226
Sac-Amador	Laguna Creek at Alta Mesa Rd	38.31102	-121.2263
Shasta-Tehama	Anderson Creek at Ash Creek Road	40.418	-122.2136
Shasta-Tehama	Burch Creek west of Rawson Rd	39.9254	-122.2182
Shasta-Tehama	Coyote Creek at Tyler Road	40.09261	-122.15898
Solano-Yolo	Shag Slough at Liberty Island Bridge	38.30677	-121.69337
Solano-Yolo	Willow Slough Bypass at Pole Line	38.59015	-121.73058
Solano-Yolo	Cache Creek at Capay Diversion Dam	38.7137	-122.0851
Solano-Yolo	Tule Canal at I-80	38.5728	-121.5827
Solano-Yolo	Ulatis Creek at Brown Road	38.307	-121.794
Solano-Yolo	Z Drain – Dixon RCD	38.45215	-121.6752
Upper Feather	Middle Fork Feather River above Grizzly Cr	39.816	-120.426
Upper Feather	Spanish Creek below Greenhorn Creek	39.9735	-120.9103
Upper Feather	Indian Creek at Arlington Bridge	40.0846	-120.9161

This page intentionally blank

APPENDIX D. MONITORING PARAMETERS

Laboratory Method Detection Limit and Quantitation Limit (QL) Requirements for Analyses of Surface Water

Method	Analyte	Fraction	Units	MDL	QL
Physical and conventional Parameters					
EPA 130.2	Hardness, total as $CaCO_3$	Unfiltered	mg/L	3	5
EPA 180.1; SM2130B	Turbidity	Unfiltered	NTU	0.1	1.0
EPA 160.2; SM2540D	Total Suspended Solids (TSS)	Particulate	mg/L	2	3
EPA 415.1; SM5310C	Organic Carbon, Total (TOC)	Unfiltered	mg/L	0.1	0.5
Pathogen Indicators					
SM 9223	*E. Coli* bacteria	NA	MPN/100 mL	2	2
Organophosphorus Pesticides					
EPA 625(m)	Azinphos-methyl	Unfiltered	µg/L	0.05	0.1
EPA 625(m)	Chlorpyrifos	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Diazinon	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Demeton-S	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Dichlorvos	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Dimethoate	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Disulfoton	Unfiltered	µg/L	0.01	0.02
EPA 625(m)	Malathion	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Methamidophos	Unfiltered	µg/L	0.05	0.1
EPA 625(m)	Methidathion	Unfiltered	µg/L	0.01	0.02
EPA 625(m)	Parathion, Methyl	Unfiltered	µg/L	0.01	0.02
EPA 625(m)	Parathion, Ethyl	Unfiltered	µg/L	0.01	0.02
EPA 625(m)	Phorate	Unfiltered	µg/L	0.01	0.02
EPA 625(m)	Phosmet	Unfiltered	µg/L	0.05	0.1
Organochlorine pesticides					
EPA 625(m)	4,4'-DDT (o,p' and p,p')	Unfiltered	µg/L	.001	.005
EPA 625(m)	4,4'-DDE (o,p' and p,p')	Unfiltered	µg/L	.001	.005
EPA 625(m)	4,4'-DDD (o,p' and p,p')	Unfiltered	µg/L	.001	.005
EPA 625(m)	Dieldrin	Unfiltered	µg/L	.001	.005
EPA 625(m)	Endrin	Unfiltered	µg/L	.001	.005
EPA 625(m)	Methoxychlor	Unfiltered	µg/L	.001	.005
EPA 625(m)	Aldrin	Unfiltered	µg/L	.001	.005
EPA 625(m)	Dicofol	Unfiltered	µg/L	.05	.1
EPA 625(m)	Dieldrin	Unfiltered	µg/L	.001	.005
EPA 625(m)	Chlordane	Unfiltered	µg/L	.001	.005
EPA 625(m)	Endrin	Unfiltered	µg/L	.001	.005
EPA 625(m)	Endosulfan	Unfiltered	µg/L	.001	.005
EPA 625(m)	Heptachlor	Unfiltered	µg/L	.001	.005
EPA 625(m)	Heptachlor epoxide	Unfiltered	µg/L	.001	.005
EPA 625(m)	Hexachlorocyclohexane	Unfiltered	µg/L	.001	.005
EPA 625(m)	Methoxychlor	Unfiltered	µg/L	.001	.005
EPA 625(m)	Toxaphene	Unfiltered	µg/L	.01	.05
Carbamate and Urea Pesticides					
EPA 8321	Aldicarb	Unfiltered	µg/L	0.2	0.4
EPA 8321	Carbaryl	Unfiltered	µg/L	0.05	0.07

Method	Analyte	Fraction	Units	MDL	QL
EPA 8321	Carbofuran	Unfiltered	µg/L	0.05	0.07
EPA 8321	Diuron	Unfiltered	µg/L	0.2	0.4
EPA 8321	Linuron	Unfiltered	µg/L	0.2	0.4
EPA 8321	Methiocarb	Unfiltered	µg/L	0.2	0.4
EPA 8321	Methomyl	Unfiltered	µg/L	0.05	0.07
EPA 8321	Oxamyl	Unfiltered	µg/L	0.2	0.4
Pyrethroid Pesticides					
EPA 625(m)	Biphenthrin	Unfiltered	µg/L	.005	.025
EPA 625(m)	Cyfluthrin	Unfiltered	µg/L	.005	.025
EPA 625(m)	Cypermethrin	Unfiltered	µg/L	.005	.025
EPA 625(m)	Esfenvalerate/Fenvalerate	Unfiltered	µg/L	.005	.025
EPA 625(m)	Lambda-Cyhalothrin	Unfiltered	µg/L	.005	.025
EPA 625(m)	Permethrin	Unfiltered	µg/L	.005	.025
Herbicides					
EPA 625(m)	Atrazine	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Simazine	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Cyanazine	Unfiltered	µg/L	0.005	0.01
EPA 625(m)	Trifluralin	Unfiltered	µg/L	0.001	0.005
EPA 549.2	Paraquat	Unfiltered	µg/L	0.2	0.5
EPA 547	Glyphosate	Unfiltered	µg/L	4	5
Trace Elements					
EPA 200.8	Arsenic	Filtered, Unfiltered	µg/L	0.08	0.5
EPA 2008	Boron	Filtered, Unfiltered	µg/L	1	10
EPA 200.8	Cadmium	Filtered, Unfiltered	µg/L	0.04	0.1
EPA 200.8	Copper	Filtered, Unfiltered	µg/L	0.2	0.5
EPA 200.8	Lead	Filtered, Unfiltered	µg/L	0.02	0.25
EPA 200.8	Molybdenum	Filtered, Unfiltered	µg/L	0.01	0.1
EPA 200.8	Nickel	Filtered, Unfiltered	µg/L	0.2	0.5
EPA 200.8	Selenium	Unfiltered	µg/L	0.5	1
EPA 200.8	Zinc	Filtered, Unfiltered	µg/L	0.6	1
Nutrients					
EPA 351.3; EPA 351.2	Total Kjeldahl Nitrogen	Unfiltered	mg/L	0.07	0.1
EPA 353.2	Nitrate + Nitrite as N	Unfiltered	mg/L	0.02	0.05
EPA 350.1; EPA 350.2	Ammonia as N	Unfiltered	mg/L	0.02	0.1
EPA 365.2; SM4500-P E	Soluble Orthophosphate	Filtered	mg/L	0.01	0.05
EPA 365.2; SM4500-P E	Phosphorus, Total	Unfiltered	mg/L	0.02	0.05

Laboratory Method Detection Limit and Quantitation Limit (QL) Requirements for Analyses of Sediments for the Coalition Monitoring and Reporting Program Plan

Method	Analyte	Fraction	Units	MDL	QL	LAB
Physical and conventional Parameters						
SM 2560D	Grain Size Analysis	various	% fraction	NA	1	ABC
EPA 160.3	Solids (TS)	Total	%	NA	0.1	CALTEST
EPA 9060	Organic Carbon	Total	mg/kg d.w.	50	200	AMS
Pyrethroids and Chlorpyrifos						
EPA 8270C(m)	Biphenthrin	Total	ng/g d.w.	0.1	1	CRG
EPA 8270C(m)	Chlorpyrifos	Total	ng/g d.w.	0.1	3	CRG
EPA 8270C(m)	Cyfluthrin	Total	ng/g d.w.	0.1	1	CRG
EPA 8270C(m)	Cypermethrin	Total	ng/g d.w.	0.1	1	CRG
EPA 8270C(m)	Esfenvalerate/Fenvalerate	Total	ng/g d.w.	0.15	1	CRG
EPA 8270C(m)	Fenpropathrin	Total	ng/g d.w.	0.15	1	CRG
EPA 8270C(m)	Lambda-Cyhalothrin	Total	ng/g d.w.	0.1	1	CRG
EPA 8270C(m)	Permethrin	Total	ng/g d.w.	0.1	1	CRG
Organochlorine pesticides						
EPA 8270C(m)	4,4'-DDT (o,p' and p,p')	Total	ng/g d.w.	1	5	CRG
EPA 8270C(m)	4,4'-DDE (o,p' and p,p')	Total	ng/g d.w.	1	5	CRG
EPA 8270C(m)	4,4'-DDD (o,p' and p,p')	Total	ng/g d.w.	1	5	CRG
EPA 8270C(m)	Dieldrin	Total	ng/g d.w.	1	5	CRG
EPA 8270C(m)	Endrin	Total	ng/g d.w.	1	5	CRG
EPA 8270C(m)	Methoxychlor	Total	ng/g d.w.	1	5	CRG

This page intentionally blank

APPENDIX E. MONITORING SUMMARIES

- 2010 Monitoring Summary

Additional summaries will be appended annually as they are developed

Sacramento Valley Water Quality Coalition Sample Events, 2010

Month	Event	Dates (Tuesday Start Assumed)
January	47	January 19, 2010 to January 21, 2010
February	48	February 16, 2010 to February 18, 2010
March	49	March 16, 2010 to March 18, 2010
April	50	April 20, 2010 to April 22, 2010
May	51	May 18, 2010 to May 20, 2010
June	52	June 15, 2010 to June 17, 2010
July	53	July 20, 2010 to July 22, 2010
August	54	August 17, 2010 to August 19, 2010
September	55	September 21, 2010 to September 23, 2010
October	56	October 19, 2010 to October 21, 2010
November	57	November 9, 2010 to November 11, 2010
December	58	December 7, 2010 to December 9, 2010

Schedule of these events may be adjusted for up to 2 "Storm" events in 2010

Monitoring Summary Notes:
Tabled values indicate number of regular samples planned for each site in 2010. "0" indicates no sampling planned for a parameter at the site.
Implementation Column indicates whether monitoring is conducted by the Coalition (SVWQC), Northeastern California Water Association (NECWA), Lake County, Putah Creek Watershed Group (PCWG), Upper Feather River Watershed Group (UFRW). "CRC" indicates that sampling is coordinated with the California Rice Commission.
Summary of Adjustments to Base 2010 Monitoring Plan:
(1) Sample counts were initially modified based on management plan requirements *estimated* for 2010. Subsequently modified in April 2010 based on Management Plan Progress Report update.
(2) Adjustments for exceedances from 2009:
Malathion: Willow Slough (included in OP pesticides)
Diuron: UCBRD (included in carbamate pesticides)
Diazinon and Malathion: Gilsizer Sl (included in OP pesticides)
Chlorpyrifos: Walker Creek (JUL-SEP)
Pyrethroids in sediment: Willow Slough (see Ceriodaphnia mgt plan)
Selenastrum: Willow Slough, UCBRD (addressed with herbicide sampling). "*Exceedances" observed by CRC at COLDR & SSKNK were less than 20% reductions & no follow-up was required or conducted by CRC*
Hyalella: ZDDIX (addressed with sediment chemistry sampling)
Lead: Pit River (TBD pending preliminary source identification justification)
(3) OP analyses added to address diazinon/chlorpyrifos TMDLs
SSKNK, COLDR, GILSL, WADCN, RARPP, CRTWN, GIDLR, SSLIB
(4) Sampling reduced to one site (MFFGR) in the UFRW subwatershed.

Coalition Monitoring Plan for 2010

Subwatershed	Location	Category	Core and Assessment Sampling Schedule	Water Column Sample Events	Sediment Sample Events	Infependent MP Sediment Samples	pH, conductivity, DO, temperature, flow	Turbidity, TSS, TOC	Nutrients	Pathogen Indicators: *E. Coli*	Trace metals and Hardness	Organophosphate pesticides	Triazines	Organonochlorines in water	Organonochlorines in sediment	Pyrethroids and Chlorpyrifos in sediment	Carbamate and Urea Pesticides	trifluralin	glyphosate	paraquat	Ceriodaphnia, 96-h acute	Pimephales, 96-hour acute	Selenastrum, 96-h short-term chronic	Hyalella, 10-day short-term chronic	grain size in sediments	OPs and pyrethroids and TOC in sediments	Implementation
Butte-Sutter-Yuba	Lower Snake R. at Nuestro Rd	Core & SP	JAN-DEC	12	0	0	12	12	9	12	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Butte-Sutter-Yuba	Sacramento Slough bridge near Karnak	Core & SP	JAN-DEC	12	0	0	12	12	9	12	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Butte-Sutter-Yuba	Lower Honcut Creek at Hwy 70	Core	JAN-DEC	12	0	0	12	12	9	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Butte-Sutter-Yuba	Pine Creek at Nord Gianelli Rd	Core & SP	JAN-DEC	12	0	0	12	12	9	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Butte-Sutter-Yuba	Gilsizer Sl. at G. Washington Rd	SP only		2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Butte-Sutter-Yuba	Butte Slough at Pass Road	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC+CRC
Butte-Sutter-Yuba	Wadsworth Canal at S. Butte Rd	SP only		2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Colusa Drain above KL	Core	JAN-DEC	12	0	0	12	12	8	12	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC+CRC
Colusa Glenn	Freshwater Creek at Gibson Rd	Core & SP	JAN-DEC	12	2	0	12	12	8	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Walker Creek at 99W and CR33	Core & SP	JAN-DEC	12	0	0	12	12	8	12	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Logan Cr. at 4 Mile-Excelsior Rd	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Lurline Creek at 99W	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Rough and Ready Pumping Plant (RD 108)	SP only		8	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Stone Corral Creek near Maxwell Road	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Colusa Glenn	Stony Creek on Hwy 45 near Rd 24	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
El Dorado	North Canyon Creek	Core & SP	DEC-AUG	9	0	0	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
El Dorado	Coon Hollow Creek	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Lake-Napa	Middle Creek u/s Hwy 20	Core	DEC-SEP	10	0	0	10	10	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Lake-Napa	McGaugh Slough	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Lake-Napa	Pope Cr u/s from L. Berryessa	Core	DEC-MAY	6	0	0	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PCWG
Lake-Napa	Capell Cr u/s from L. Berryessa	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PCWG
Pit River	Pit River at Pittville	Core & SP	APR-NOV	8	0	0	8	8	5	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NECWA
Pit River	Pit River at Canby Bridge	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NECWA
Pit River	Fall R. at Fall R. Ranch Bridge	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NECWA

Subwatershed	Location	Category	Core and Assessment Sampling Schedule	Water Column Sample Events	Sediment Sample Events	Infependent MP Sediment Samples	pH, conductivity, DO, temperature, flow	Turbidity, TSS, TOC	Nutrients	Pathogen Indicators: *E. Coli*	Trace metals and Hardness	Organophosphate pesticides	Triazines	Organonochlorines in water	Organonochlorines in sediment	Pyrethroids and Chlorpyrifos in sediment	Carbamate and Urea Pesticides	trifluralin	glyphosate	paraquat	Ceriodaphnia, 96-h acute	Pimephales, 96-hour acute	Selenastrum, 96-h short-term chronic	Hyalella, 10-day short-term chronic	grain size in sediments	OPs and pyrethroids and TOC in sediments	Implementation
PNSNSS	Coon Creek at Brewer Rd	Core & SP		12	0	0	12	12	8	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
PNSNSS	Coon Creek at Striplin Rd	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
PNSNSS	Coon Creek at DLX Ranch	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Sac-Amador	Cosumnes River at Twin Cities Rd	Core & SP	JAN-DEC	12	0	0	12	12	8	12	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Sac-Amador	Grand Island Drain near Leary Road	Core & SP	JAN-DEC	12	0	0	12	12	8	12	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Sac-Amador	Dry Creek at Alta Mesa Road	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Sac-Amador	Laguna Creek at Alta Mesa Rd	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Shasta-Tehama	Anderson Creek at Ash Creek Road	Core & SP		12	0	0	12	12	9	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Shasta-Tehama	Burch Creek west of Rawson Rd	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Shasta-Tehama	Coyote Creek at Tyler Road	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Solano-Yolo	Shag Sl. at Liberty Island Bridge	Core		12	0	0	12	12	12	12	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Solano-Yolo	Willow Sl. Bypass at Pole Line	Core & SP		12	0	0	12	12	12	12	0	4	0	0	0	1	6	6	0	0	0	0	0	0	0	0	SVWQC
Solano-Yolo	Cache Cr. at Diversion Dam	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Solano-Yolo	Tule Canal at I-80	SP only		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SVWQC
Solano-Yolo	Ulatis Creek at Brown Road	Core & SP		12	0	0	12	12	12	12	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	SVWQC
Solano-Yolo	Z Drain – Dixon RCD	SP only		0	0	4	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	SVWQC
Upper Feather	Middle Fork Feather River above confluence with Grizzly Creek	Core & SP	MAY-SEP	5	0	0	5	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UFRW
Upper Feather	Spanish Creek below confluence with Greenhorn Creek	Core & SP	MAY-SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UFRW
Upper Feather	Indian Creek below Arlington Bridge	Core & SP	MAY-SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UFRW

APPENDIX F. LABORATORY QA MANUALS

- Pacific EcoRisk Quality Assurance/Quality Control Manual, August 2008 Revision
- CalTest QA Manual, December 2008 Revision
- CRG Marine Labs Quality Assurance Program Document Revision G (2008)
- APPL Quality Assurance Program Plan, October 09, 2007 [revision 27]
- North Coast Laboratories QAM, April 2008
- Basic Laboratory QAP, Revision 13.1, 2008
- ABC Laboratories QAM, March 2007
- SEM Laboratory QAP, April 2007
- BC Laboratories QAPP/QAPM, April 2010

These documents are provided by the contract laboratories. Additional manuals may be added to the QAPP as needed for new laboratories.

All QA Manuals are provided on the accompanying CD-ROM.

This page intentionally blank

APPENDIX G. STANDARD OPERATING PROCEDURES FOR FIELD SAMPLING

- Ambient Water Sampling (Pacific EcoRisk 2008)
- Sediment Core/Sample Collection Using An Eckman Grab And/Or A Push-Corer (Pacific EcoRisk 2004)
- Field Equipment Decontamination (Pacific EcoRisk 2006)

Copies of the following document will be provided on request:

USGS. 1994. *Guidelines for Collecting and Processing Samples of Stream Bed Sediment for Analysis of Trace Elements and Organic Contaminants for the National Water-Quality Assessment Program.* United States Geological Survey (USGS). Open-File Report 94-458. Sacramento, CA 1994.

All other SOPs are provided on the accompanying CD-ROM.

This page intentionally blank

APPENDIX H. SAMPLE CONTAINER, VOLUME, INITIAL PRESERVATION, AND HOLDING TIMES FOR WATER AND SEDIMENT SAMPLES

WATER SAMPLES

Parameter	Sample Container	Sample Volume[1]	Immediate Processing and Storage	Holding Time[2]
Toxicity				
Aquatic toxicity and chemistry[5]	1-Gallon Amber glass	5 Gal	Store at 4˚C	36 hours[4]
Physical and Conventional Chemical Constituents in Water				
Turbidity	1 L polyethylene	150 mL	Store at 4˚C	48 hours
Dissolved Orthophosphate		250 mL	Store at 4°C; Filter in lab to 0.45 µm	48 hours
Total Suspended Solids		100 mL	Store at 4˚C	7 days
Total Organic Carbon [second row only applies for BC Labs analyses]	3x40 mL amber VOA, PTFE-lined cap	120 mL	Preserved with HCl or H_2SO_4 (HCl is preferred); Store at 4˚C;	28 days
	500 mL Amber glass	500 mL	Preserved with H_2SO_4; Store at 4˚C;	28 days
Ammonia as N	500 mL polyethylene	100 mL	Preserve to pH<2 with H_2SO_4; Store at 4˚C	28 days
Total Kjeldahl Nitrogen		100 mL		
Nitrate + Nitrite as N		250 mL		
Total Phosphorus		50 mL		
Pathogen Indicator Organisms				
E. coli	1x125 mL Polyethylene	125 mL	Store at 4˚C	24 hours[3]
Pesticides				
Organophosphates Organochlorines Carbamates Pyrethroids Herbicides	1-L I-Chem 200-series certified trace clean amber glass bottle, with PTFE-lined cap	1-2 Liters for each category	Store at 4˚C; Extract as soon as possible within 7 days	40 days after extraction
Glyphosate	40-mL VOA	40 mL	Store at 4˚C; Freeze if not immediately analyzed	18 months
Paraquat	1 L amber polyethylene	500 mL	Store at 4˚C; Extract as soon as possible within 7 days	21 days after extraction
Trace Metals				
Total and Dissolved As, B, Cd, Cu, Pb, Mo, Ni, Se, Zn Hardness as CaCO3	500 mL polyethylene	500 mL	Filter for dissolved metals at sample site using 0.45 micron filter. Cool all samples to 4°C, dark. Acidify to pH<2 with ultra-pure HNO_3 within 48 hrs.	6 months at room temperature after filtration and acidification

1. Additional volumes may be required for QC analyses;
2. Holding time after initial preservation or extraction.
3. Samples for bacteria analyses should be set up as soon as possible. Lab should be notified well in advance.
4. Tests should be initiated by 36 hours after collection. The 36-hour hold time does not apply to subsequent analyses for TIEs.
5. For interpretation of toxicity results, samples may be split from toxicity samples in the laboratory and analyzed for specific chemical parameters. All other sampling requirements (sample containers, filtration, preservation, holding times) for these samples are as specified in this document for the specific analytical method. Results of these analyses are qualified for any other use (e.g. characterization of ambient conditions) because of potential holding time exceedances and variance from sampling requirements.

SEDIMENT SAMPLES

Parameter	Sample Container	Sample Volume[1]	Immediate Processing and Storage	Holding Time[2]
Sediment Toxicity	2x1-L Glass	2 L	Store at 4°C	14 days
Grain Size	250-mL glass	250 mL	Store at 4°C	28 days
Organophosphates Pyrethroids	250-mL glass I-Chem certified trace clean amber glass bottle, with PTFE-lined cap	250 mL	Freeze within 48 hours(6)	40 days after extraction
Total Organic Carbon	125-mL glass	125 mL	Freeze within 48 hours(6)	6 months if frozen

6. For interpretation of sediment toxicity results, samples for TOC and pesticides will be split from sediment toxicity samples by the laboratory. These samples should be frozen during the initial 48 hours after sampling. These frozen sediment aliquots may be held for up to 12 months at -20C, and will only be analyzed if there is a significant reduction in survival of at least 20% compared to the control.

APPENDIX I. STANDARD OPERATING PROCEDURES FOR CHEMICAL AND MICROBIOLOGICAL ANALYSES

SOPs for these laboratory analyses are treated as proprietary documents and are not available for public review. Hard copies of the SOPs are provided for review to the Regional Waterboard QA Officer. Electronic versions of these SOPs will be maintained by the Monitoring Manager and will not be made available for public distribution. QA procedures for all laboratory methods are consistent with accepted standards for calibration, MDL determination, and precision and accuracy assessments.

Title	Laboratory	File Name
Ammonia as Nitrogen, Automated by EPA 350.1	BASIC	BASIC SOP Ammonia by EPA 350.1 Rev 7
Nitrate, Nitrite, and Nitrate+Nitrite as Nitrogen by EPA 353.2 (automated)	BASIC	BASIC SOP Nitrate & Nitrite by EPA 353.2 Rev 7
Ortho Phosphorus by SM 4500P E	BASIC	BASIC SOP OPO4 by SM4500P Rev 12
Total Coliform and E.coli Detection and Enumeration by Quantitray	BASIC	BASIC SOP Quantitray SOP rev 2
Total Dissolved Solids and Total Volatile Dissolved Solids by SM 2540C E	BASIC	BASIC SOP TDS & TVDS by SM 2540 CE Rev 9
Total Kjeldahl Nitrogen (TKN) by EPA 351.2	BASIC	BASIC SOP TKN by EPA 351.2 Rev 6
Total and Dissolved Organic Carbon by SM 5310C	BASIC	BASIC SOP TOC Analysis by SM 5310C Rev 3
Total Phosphorus by SM 4500P B/E	BASIC	BASIC SOP Total Phosphorus by SM 4500P Rev 9
TSS & TVSS by SM 2540	BASIC	BASIC SOP TSS & TVSS by SM 2540 Rev 6
Turbidity by SM 2130B / EPA 180.1	BASIC	BASIC SOP Turbidity by SM 2130 Rev 7
THE DETECTION OF TOTAL COLIFORMS AND E. COLI USING COLILERT MEDIA, Standard Methods 9223 B	CALTEST	CALTEST SOP SM9223B MMOMUG-rev10.pdf
Total Dissolved Solids (TDS), SM 2540C / EPA 160.1	CALTEST	CALTEST SOP EPA 160.1 TDS-rev7.pdf
Residue, Non-Filterable, EPA 160.2 / SM 2540D (Gravimetric, Dried at 103-105°C)	CALTEST	CALTEST SOP EPA 160.2 TSS-rev6.pdf
Turbidity, EPA 180.1 / SM 2130B	CALTEST	CALTEST SOP EPA 180.1 TURB-rev6.pdf

Title	Laboratory	File Name
EPA 200.8, Inductively Coupled Argon Plasma-Mass Spectrometry Analyses, Three Modes	CALTEST	CALTEST SOP EPA 200.8 2008-3MODE rev1.pdf
Analysis Of Ammonia As N, Method 350.2 AND Total Kjeldahl Nitrogen, Method 351.3	CALTEST	CALTEST SOP EPA 350.2_351.3 NH3-TKN-rev9.pdf
ORTHO AND TOTAL PHOSPHATE, EPA 365.2 / SM 4500P E	CALTEST	Caltest SOP EPA 365.2 PHOS-rev6.pdf
Total And Dissolved Organic Carbon, (TOC and DOC), EPA Method 415.1 / SM5310B/9060	CALTEST	CALTEST SOP EPA 415.1 TOC-DOC-rev9.pdf
Total Hardness, EPA 130.2 / SM2340C	CALTEST	CALTEST SOP EPA 130.2 HARD-rev7.pdf
EPA Method 300.0/300.1/9056, Inorganic Anions By Ion Chromatography	CALTEST	CALTEST SOP EPA 300 DIONEX-rev7.pdf
Nitrate+Nitrite AS N, EPA Method 353.2 / SM 4500NO3-F	CALTEST	CALTEST SOP EPA 353.2 N-NO3-2rev2.pdf
EPA 6020 Inductively Coupled Argon Plasma-Mass Spectrometry Analyses	CALTEST	CALTEST SOP 6020-rev5.pdf
method 625: Separatory Funnel Liquid-Liquid Extraction And Analysis By Gas Chromatography/Mass Spectrometry	CRG	CRG METHOD 625(m) Rev E.pdf
Acid And Base/Neutral Extractable Compounds By Gas Chromatography/Mass Spectrometry (FULL SCAN)	CRG	CRG 8270 by GCMS Revision A.pdf
Total Organic Carbon Content Of Sediments By Coulometric Detection	AMS	AMS SOP 2201 TOC Sediment Method 2001
Standard Operating Procedure For Total Particle Size (Light Scattering Method)	ABC	ABC SOP Grain Size Rev001 2005
Method 8321A LC-Mass Spec Instrument Analysis (APPL 2008)	APPL	APPL SOP carbamates HPL8321A
EPA Method 549.2 Diquat and Paraquat Aqueous Sample Solid Phase Extraction and Analysis by LC-UV Diode Array (APPL 2008)	APPL	APPL SOP Paraquat HPL549.2.pdf
Analytical Methodology for the Analysis of Glyphosate and/or AMPA (Aminomethyl phosphonic acid) in Drinking Water by EPA 547, Method # ME 019 version 08. (NCL 2008)	NCL	NCL Glyphosate Method 2003 Proprietary.pdf provided
Standard Laboratory Operating Procedure: Total Dissolved Solids, Revision 9 (SEM 2007)	SEM	TDS Rev9 4-16-07.pdf
Standard Laboratory Operating Procedure: Determination of Turbidity in Water Samples, Revision 7 (SEM 2007)	SEM	Turbidity Rev7 4-16-07.pdf
Standard Laboratory Operating Procedure: Suspended Solids, manual weighing, Revision 8 (SEM 2007)	SEM	Suspended Solids Rev8 3-22-07.pdf

Title	Laboratory	File Name
Standard Laboratory Operating Procedure: Calculation of Hardness, Ion Balance, and Total Dissolved Solids, Revision 3 (SEM 2003)	SEM	Hard, Ion Bal & TDS Calcs REv3 1-02-03.pdf
Standard Operating Procedure: Total Organic Carbon (TOC) (DOC) (NPOC) / SM 5310C/EPA 415.1. Revision 12 (BC 2008)	BC Labs	BCGEN039-TOC by SM 5310C_EPA 415.1.pdf

This page intentionally blank

APPENDIX J. STANDARD OPERATING PROCEDURES FOR TOXICITY TESTING AND TOXICITY IDENTIFICATION EVALUATIONS

Title	Lab	File Name
Ceriodaphnia dubia Acute Bioassay Standard Operating Procedures (Pacific EcoRisk 2007)	Pacific EcoRisk	PER AcuteCerio_SOP_Rev3 2007.pdf
Pimephales promelas (Fathead Minnow) Acute Bioassay Standard Operating Procedures (Pacific EcoRisk 2002)	Pacific EcoRisk	PER AcuteFHMSOP_Rev3 2002.pdf
Selenastrum capricornutum Algal Growth Bioassay Standard Operating Procedures (Pacific EcoRisk 2008)	Pacific EcoRisk	PER ChronicSelenastrumSOP_Rev5_ SOP 2008.pdf
Hyalella azteca Acute (10-day) Survival & Growth Sediment Toxicity Test (Pacific EcoRisk 2008)	Pacific EcoRisk	PER 10-DHyalellaAcuteSedSOP_Rev3 2008.pdf
Flow Charts of TIE Procedures	Pacific EcoRisk	PER tie flow charts_001.pdf
The Use of Ion Exchange Resins to Determine the Biotoxicity and Concentration of Dissolved Trace Metals in Natural Waters (Connor 1991)	Pacific EcoRisk	PER D6A ion exchange pt1_001.pdf; PER D6B ion exch col prep_001.pdf

All Toxicity testing SOPs are provided on the accompanying CD-ROM.

This page intentionally blank

APPENDIX K. QUALITY CONTROL ACCEPTANCE CRITERIA AND CORRECTIVE MEASURES FOR ANALYSES OF WATER AND SEDIMENT

- Summary of Measurement Quality Objectives
- Analyte-specific acceptance criteria
- Corrective Actions

This page intentionally blank

Table K5: Summary of Measurement Quality Objectives

		Quality Objectives			
	Parameters	**Accuracy**	**Precision**	**Recovery**	**Complete-ness**
Field Measures	Dissolved Oxygen	± 0.5 mg/l	± 0.5 mg/l or 10%	NA	90%
	Temperature	± 0.5 ˚C	± 0.5 ˚C or 5%	NA	90%
	Conductivity	± 5 %	± 5 %	NA	90%
	pH	± 0.5 Units	± 0.5 Units or 5%	NA	90%
	Turbidity	± 10 % or 0.1 NTU, whichever is greater	± 10 % or 0.1 NTU, whichever is greater	NA	90%
Lab Analyses	Conventional parameters in water	SRM within 95% CI for material, or 80-120% of "true value".	Lab duplicates and MSD ≤25% RPD (if >10 x MDL). Minimum requirement: Lab duplicates	MS REC 80-120%, or control limits of ±3 standard deviations based on lab data.	90%
	Trace Organics in water	SRM within 95% CI for material; LCS 50-150% of "true value".	Field duplicate, LCSD, and MSD ≤25% RPD (if >10 x MDL). Minimum requirement: field duplicate, MSD, LCSD	MS REC 50-150%, or control limits of ±3 standard deviations based on lab data.	90%
	Trace Metals in water	SRM within 75-125% of "true value".	Field duplicate, lab duplicate, and MSD ≤25% RPD (if >10 x MDL). Minimum requirement: field duplicate, MSD	MS REC 75-125%	90%
	Trace Organics in sediment	SRM within 95% CI for material, or 50-150% of "true value".	Field duplicate, LCSD, and MSD ≤25% RPD (if >10 x MDL). Minimum requirement: field duplicate, MSD, LCSD	MS REC 50-150%, or control limits of ±3 standard deviations based on lab data.	90%
	TOC in sediment	SRM within 95% CI for material; LCM ±25% of stated value.	Lab duplicate ±20% of Result, if >10x MDL	REC 75-125%	90%
	Grain Size, sediment	No accuracy criteria	Lab duplicate ±20% of Result, if >10x MDL	No recovery criteria	90%
	Bacteria	Correct negative and positive control responses; PT sample result within stated acceptance limits.	R_{log} within 3.27*mean R_{log} (reference Section 9020B of Standard Methods 18^{th} – 20^{th} Ed.)	NA	90%
	Toxicity Testing	Meets method performance criteria for Reference toxicant	Meets method performance criteria for replicate samples and analyses	NA	90%

LAB	Matrix	Category	Method	AnalyteName	Units	MDL	PQL	METH BLANK	LCS REC MIN	LCS REC MAX	LCS RPD MAX	MS REC MIN	MS REC MAX	MSD RPD MAX	SURR REC MIN	SURR REC MAX
CRG	SEDIMENT	OP Pesticides	EPA 8270	Azinphos-methyl	ng/g d.w.	10	40	<PQL	60	120	25	60	120	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Chlorpyrifos	ng/g d.w.	0.1	3	<PQL	65	125	25	65	125	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Diazinon	ng/g d.w.	5	40	<PQL	65	125	25	65	125	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Dimethoate	ng/g d.w.	5	40	<PQL	65	125	25	65	125	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Disulfoton	ng/g d.w.	10	40	<PQL	45	105	25	45	105	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Malathion	ng/g d.w.	5	40	<PQL	65	125	25	65	125	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Methamidophos	ng/g d.w.	10	40	<PQL	0	211	25	0	211	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Methidathion	ng/g d.w.	10	40	<PQL	60	120	25	60	120	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Parathion, Methyl	ng/g d.w.	10	40	<PQL	60	120	25	60	120	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	PCB 030 (Surrogate)	%	0	0	NA	46	119	25	46	119	25	46	119
CRG	SEDIMENT	OP Pesticides	EPA 8270	PCB 112 (Surrogate)	%	0	0	NA	52	123	25	52	123	25	52	123
CRG	SEDIMENT	OP Pesticides	EPA 8270	PCB 198 (Surrogate)	%	0	0	NA	59	123	25	59	123	25	59	123
CRG	SEDIMENT	OP Pesticides	EPA 8270	Phorate	ng/g d.w.	10	40	<PQL	45	105	25	45	105	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Phosmet	ng/g d.w.	10	40	<PQL	60	120	25	60	120	25	NA	NA
CRG	SEDIMENT	OP Pesticides	EPA 8270	Tetrachloro-m-xylene-2,4,5,6 (Surrogate)	%	0	0	NA	40	110	25	40	110	25	40	110
AMS	SEDIMENT	Physical and conventional	EPA 9060	Total Organic Carbon	mg/kg d.w.	50	200	<PQL	90	110	25	NA	NA	NA	NA	NA
ABC	SEDIMENT	Physical and conventional	SM 2560D	Grain Size Analysis	%	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	Biphenthrin	ng/g d.w.	0.1	1	<PQL	70	130	25	70	130	25	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	Cyfluthrin	ng/g d.w.	0.1	1	<PQL	70	130	25	70	130	25	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	Cypermethrin	ng/g d.w.	0.1	1	<PQL	70	130	25	70	130	25	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	Esfenvalerate/Fenvalerate	ng/g d.w.	0.15	1	<PQL	70	130	25	70	130	25	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	Fenpropathrin	ng/g d.w.	0.15	1	<PQL	70	130	25	70	130	25	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	L-Cyhalothrin	ng/g d.w.	0.1	1	<PQL	70	130	25	70	130	25	NA	NA
CRG	SEDIMENT	Pyrethroids	EPA 8270	Permethrin	ng/g d.w.	0.1	1	<PQL	70	130	25	70	130	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Aldicarb	ug/L	0.2	0.4	<PQL	31	133	25	31	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Aminocarb	ug/L	0.2	0.4	<PQL	31	133	25	31	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Barban	ug/L	1.75	3.5	<PQL	40	136	25	40	136	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Benomyl/Carbendazim	ug/L	0.2	0.4	<PQL	10	137	25	10	137	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Bromacil	ug/L	0.2	0.4	<PQL	52	127	25	52	127	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Carbaryl	ug/L	0.05	0.07	<PQL	44	133	25	44	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Carbofuran	ug/L	0.05	0.07	<PQL	36	165	25	36	165	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Chloroxuron	ug/L	0.2	0.4	<PQL	31	133	25	31	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Chlorpropham	ug/L	1.75	3.5	<PQL	47	130	25	47	130	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Diuron	ug/L	0.2	0.4	<PQL	52	136	25	52	136	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Fenuron	ug/L	0.2	0.4	<PQL	37	132	25	37	132	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Fluometuron	ug/L	0.2	0.4	<PQL	49	144	25	49	144	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Linuron	ug/L	0.2	0.4	<PQL	49	144	25	49	144	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Methiocarb	ug/L	0.2	0.4	<PQL	35	142	25	35	142	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Methomyl	ug/L	0.05	0.07	<PQL	23	152	25	23	152	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Mexacarbate	ug/L	0.4	0.8	<PQL	55	126	25	55	126	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Monuron	ug/L	0.2	0.4	<PQL	53	130	25	53	130	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Neburon	ug/L	0.2	0.4	<PQL	49	137	25	49	137	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Oryzalin	ug/L	0.2	0.4	<PQL	31	133	25	31	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Oxamyl	ug/L	0.2	0.4	<PQL	10	117	25	10	117	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Propachlor	ug/L	1.75	3.5	<PQL	31	133	25	31	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Propham	ug/L	1.75	3.5	<PQL	54	123	25	54	123	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Propoxur	ug/L	0.2	0.4	<PQL	56	121	25	56	121	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Siduron	ug/L	0.2	0.4	<PQL	31	133	25	31	133	25	NA	NA
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Surrogate: Isoxaben	%	0	0	NA	47	134	25	47	134	25	47	134
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Surrogate: Tributyl_phosphate	%	0	0	NA	36	140	25	36	140	25	36	140
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Surrogate: Triphenyl_phosphate	%	0	0	NA	58	121	25	58	121	25	58	121
APPL	WATER	Carbamate and Urea Pesticides	EPA 8321	Tebuthiuron	ug/L	0.2	0.4	<PQL	49	136	25	49	136	25	NA	NA
BASIC	WATER	Microbiological	SM 9223B	E. Coli	MPN/100 mL	2	2	<PQL	NA	NA	NA	NA	NA	NA	NA	NA
CALTEST	WATER	Microbiological	SM 9223B	E. Coli	MPN/100 mL	2	2	<PQL	NA	NA	NA	NA	NA	NA	NA	NA
BASIC	WATER	Microbiological	SM 9221	Fecal coliforms	MPN/100 mL	2	2	<PQL	NA	NA	NA	NA	NA	NA	NA	NA
CALTEST	WATER	Microbiological	SM 9221	Fecal coliforms	MPN/100 mL	2	2	<PQL	NA	NA	NA	NA	NA	NA	NA	NA
BASIC	WATER	Nutrients	EPA 350.2	Ammonia, Total as N	mg/L	0.02	0.1	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Nutrients	EPA 350.2	Ammonia, Total as N	mg/L	0.02	0.1	<PQL	80	120	25	80	120	25	NA	NA
BASIC	WATER	Nutrients	EPA 353.2	Nitrate+Nitrite, as N	mg/L	0.02	0.1	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Nutrients	EPA 353.2	Nitrate+Nitrite, as N	mg/L	0.02	0.1	<PQL	80	120	25	80	120	25	NA	NA
BASIC	WATER	Nutrients	SM 4500-P E	Orthophosphate, as P	mg/L	0.01	0.05	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Nutrients	EPA 365.2	Orthophosphate, as P	mg/L	0.01	0.05	<PQL	80	120	25	80	120	25	NA	NA
BASIC	WATER	Nutrients	SM 4500-P E	Phosphorus as P, Total	mg/L	0.01	0.05	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Nutrients	EPA 365.2	Phosphorus as P, Total	mg/L	0.01	0.1	<PQL	80	120	25	80	120	25	NA	NA
BASIC	WATER	Nutrients	EPA 351.3	Total Kjeldahl Nitrogen	mg/L	0.1	0.2	<PQL	80	120	25	80	120	25	NA	NA

LAB	Matrix	Category	Method	AnalyteName	Units	MDL	PQL	METH BLANK	LCS REC MIN	LCS REC MAX	LCS RPD MAX	MS REC MIN	MS REC MAX	MSD RPD MAX	SURR REC MIN	SURR REC MAX
CALTEST	WATER	Nutrients	EPA 351.3	Total Kjeldahl Nitrogen	mg/L	0.07	0.1	<PQL	80	120	25	80	120	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Aldrin	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Chlordane, cis	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Chlordane, trans	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Dacthal	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	DDD(o,p')	ug/L	0.001	0.005	<PQL	50	140	25	50	140	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	DDD(p,p')	ug/L	0.001	0.005	<PQL	60	140	25	60	140	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	DDE(o,p')	ug/L	0.001	0.005	<PQL	60	130	25	60	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	DDE(p,p')	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	DDT(o,p')	ug/L	0.001	0.005	<PQL	40	130	25	40	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	DDT(p,p')	ug/L	0.001	0.005	<PQL	50	150	25	50	150	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Dicofol	ug/L	0.05	0.1	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Dieldrin	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Endosulfan I	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Endosulfan II	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Endosulfan sulfate	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Endrin	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Endrin Aldehyde	ug/L	0.001	0.005	<PQL	50	149	25	50	149	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Endrin Ketone	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	HCH, alpha	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	HCH, beta	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	HCH, delta	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	HCH, gamma	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Heptachlor	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Heptachlor epoxide	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Methoxychlor	ug/L	0.001	0.005	<PQL	50	155	25	50	155	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Mirex	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Nonachlor, cis	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Nonachlor, trans	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Oxychlordane	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Perthane	ug/L	0.001	0.005	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OC pesticides	EPA 625m	Toxaphene	ug/L	0.01	0.05	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Azinphos methyl	ug/L	0.01	0.02	<PQL	60	120	25	60	120	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Chlorpyrifos	ug/L	0.005	0.01	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Demeton-s	ug/L	0.01	0.02	<PQL	45	105	25	45	105	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Diazinon	ug/L	0.005	0.01	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Dichlorvos	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Dimethoate	ug/L	0.005	0.01	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Disulfoton	ug/L	0.01	0.02	<PQL	45	105	25	45	105	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Ethoprop	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Fenchlorphos	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Fenitrothion	ug/L	0.01	0.1	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Fensulfothion	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Fenthion	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Malathion	ug/L	0.005	0.01	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Merphos	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Methamidophos	ug/L	0.01	0.02	<PQL	0	211	25	0	211	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Methidathion	ug/L	0.01	0.02	<PQL	60	120	25	60	120	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Mevinphos	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Parathion, Ethyl	ug/L	0.01	0.02	<PQL	60	120	25	60	120	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Parathion, Methyl	ug/L	0.01	0.02	<PQL	60	120	25	60	120	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	PCB 030 (Surrogate)	%	0	0	NA	46	119	25	46	119	25	46	119
CRG	WATER	OP Pesticides	EPA 625m	PCB 112 (Surrogate)	%	0	0	NA	52	123	25	52	123	25	52	123
CRG	WATER	OP Pesticides	EPA 625m	PCB 198 (Surrogate)	%	0	0	NA	59	123	25	59	123	25	59	123
CRG	WATER	OP Pesticides	EPA 625m	Phorate	ug/L	0.01	0.02	<PQL	45	105	25	45	105	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Phosmet	ug/L	0.01	0.02	<PQL	60	120	25	60	120	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Sulprofos	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Tetrachloro-m-xylene-2,4,5,6 (Surrogate)	%	0	0	NA	40	110	25	40	110	25	40	110
CRG	WATER	OP Pesticides	EPA 625m	Tetrachloro-m-xylene-2,4,5,6 (Surrogate)	%	0	0	NA	40	110	25	40	110	25	40	110
CRG	WATER	OP Pesticides	EPA 625m	Tetrachlorvinphos	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Tokuthion	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
CRG	WATER	OP Pesticides	EPA 625m	Trichloronate	ug/L	0.01	0.02	<PQL	65	125	25	65	125	25	NA	NA
NCL	WATER	Other herbicides	EPA 547	Glyphosate	ug/L	2	10	<PQL	78	128	25	78	128	25	NA	NA
CRG	WATER	Other herbicides	EPA 625m	Molinate	ug/L	0.05	0.1	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Other herbicides	EPA 625m	Oxyfluorfen	ug/L	0.05	0.1	<PQL	60	140	25	60	140	25	NA	NA

LAB	Matrix	Category	Method	AnalyteName	Units	MDL	PQL	METH BLANK	LCS REC MIN	LCS REC MAX	LCS RPD MAX	MS REC MIN	MS REC MAX	MSD RPD MAX	SURR REC MIN	SURR REC MAX
APPL	WATER	Other herbicides	EPA 549.2	Paraquat	ug/L	0.2	0.5	<PQL	50	141	25	50	141	25	NA	NA
CRG	WATER	Other herbicides	EPA 625m	Pendimethalin	ug/L	0.05	0.1	<PQL	60	140	25	60	140	25	NA	NA
CRG	WATER	Other herbicides	EPA 625m	Thiobencarb	ug/L	0.05	0.1	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Other herbicides	EPA 625m	Trifluralin	ug/L	0.001	0.005	<PQL	60	140	25	60	140	25	NA	NA
CALTEST	WATER	Physical and conventional	EPA 130.2	Hardness	mg/L	3	5	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Physical and conventional	EPA 160.1	Total Dissolved Solids	mg/L	6	10	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Physical and conventional	EPA 415.1	Total Organic Carbon	mg/L	0.1	0.5	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Physical and conventional	EPA 160.2	Total Suspended Solids	mg/L	2	3	<PQL	80	120	25	80	120	25	NA	NA
CALTEST	WATER	Physical and conventional	EPA 180.1	Turbidity	NTU	0.1	1	<PQL	80	120	25	80	120	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Allethrin	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Bifenthrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Cyfluthrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Cypermethrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Danitol	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Deltamethrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Esfenvalerate/Fenvalerate	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	L-Cyhalothrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Permethrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Pyrethroids	EPA 625m	Prallethrin	ug/L	0.005	0.025	<PQL	70	130	25	70	130	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Arsenic	ug/L	0.08	0.5	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Boron	ug/L	1	10	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Cadmium	ug/L	0.04	0.1	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Copper	ug/L	0.2	0.5	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Lead	ug/L	0.02	0.25	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Molybdenum	ug/L	0.01	0.1	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Nickel	ug/L	0.2	0.5	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Selenium	ug/L	0.5	2	<PQL	75	125	25	75	125	25	NA	NA
CALTEST	WATER	Trace Elements	EPA 200.8	Zinc	ug/L	0.3	10	<PQL	75	125	25	75	125	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Ametryn	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Atraton	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Atrazine	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Cyanazine	ug/L	0.005	0.01	<PQL	60	120	25	60	120	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Prometon	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Prometryn	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Propazine	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Secbumeton	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Simazine	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Simetryn	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Terbuthylazine	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA
CRG	WATER	Triazines	EPA 625m	Terbutryn	ug/L	0.005	0.01	<PQL	70	130	25	70	130	25	NA	NA

Table K1: Corrective Actions – Trace Metals and Conventional Analytes (Water)

Laboratory Quality Control	Corrective Action
Calibration Standard[1]	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Initial/Continuing Calibration Verification[1]	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last calibration verification must be reanalyzed.
Laboratory Blank[2]	If any analyte is detected in the method blank above the PQL, the lowest concentration of that analyte in all associated samples must be 10 times the method blank concentration. Otherwise, all samples associated with that method blank with the analyte's concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte. If reanalysis is not possible due to sample volume, flag associated samples as estimated.
Reference Materials and Laboratory Control Samples[2]	Affected samples and associated quality control must be reanalyzed following instrument recalibration.
Matrix Spike and Matrix Spike Duplicate[1]	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, and reference material recoveries are acceptable, the matrix spike result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	As method requires. The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Field Quality Control	**Corrective Action**
Field Duplicate[3]	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, results exceeding the DQO may be qualified. Results exceeding the DQO should be communicated to the sampling team so that possible sources of variability can be evaluated and any appropriate corrective actions taken before the next sample event.
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the affected data should be qualified, and the contamination communicated to the sampling team so that possible sources of contamination can be evaluated and any appropriate corrective actions taken before the next sample event.
Periodic Quality Control	**Corrective Action**
MDL Study	If results do not meet analytical method requirements and the requirements of 40 CFR part 136 Appendix B, a new new MDL study must be performed before sample analysis begins. Deviations from ILRP target PQLs must obtain written approval prior to sample analysis.

1 Does not apply to TDS or TSS
2 Refer to method requirements for TDS and TSS analyses
3 Does not apply to TSS or bacteria analyses

Table K2: Corrective Action - Organic Chemistry

Laboratory Quality Control	Corrective Action
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Initial/Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last acceptable continuing calibration verification must be reanalyzed.
Laboratory Blank	If any analyte is detected in the method blank above the PQL, all samples associated with that method blank must be re-extracted and re-analyzed for that analyte. The exception to the above requirement is for common laboratory contaminants such as volatile solvents and phthalates where all samples associated with that method blank, with an analyte concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte. If reanalysis is not possible due to sample volume, flag associated samples as estimated.
Reference Material	Affected samples and associated quality control must be reanalyzed following instrument recalibration.
Matrix Spike and Matrix Spike Duplicate	The spiking level should be approximately 2-5 times the ambient concentration of the spiked sample. Appropriately spiked results should be compared to the matrix spike duplicate to investigate matrix interference. If matrix interference is suspected, and reference material recoveries are acceptable, the matrix spike result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	Analyze as appropriate per method. Troubleshoot as appropriate. If, after trouble-shooting, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Surrogate	Analyze as appropriate per method. All affected results should be qualified. The analytical method or quality assurance project plan must detail procedures for updating surrogate measurement quality objectives.
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix or ambient levels below the reporting limit, results exceeding the DQO may be qualified. Results exceeding the DQO should be communicated to the sampling team so that possible sources of variability can be evaluated and any appropriate corrective actions taken before the next sample event.
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the affected data should be qualified, and the contamination communicated to the sampling team so that possible sources of contamination can be evaluated and any appropriate corrective actions taken before the next sample event.
Periodic Quality Control	**Corrective Action**
MDL Study	If results do not meet analytical method requirements and the requirements of 40 CFR part 136 Appendix B, a new MDL study must be performed before sample analysis begins. Deviations from ILRP target PQLs must obtain written approval prior to sample analysis.

Table K3: Corrective Action - Toxicity Testing

Negative Controls	Corrective Action
Laboratory Control Water	Refer to Section 5.4 of the QAPP
Conductivity Control Water	Affected samples and associated quality control must be qualified if they are in the same EC range as the conductivity control.
Additional Control Water (Method Blank)	A water sample that has similar qualities to the test sample may be used as an additional control based on the objectives of the study. Results that show statistical differences from the laboratory control should be qualified. This is not applicable for TIE method blanks.
Laboratory Control Sediment	Refer to Section 5.4 of the QAPP
Additional Control Sediment	A sediment sample that has similar qualities to the test sample may be used as an additional control based on the objectives of the study. Results that show statistical differences from the laboratory control should be qualified. The laboratory should try to determine the source of contamination, document the investigation, and document steps taken to prevent recurrence.
Positive Controls	**Corrective Action**
Reference Toxicant Tests	Re-set up the test within 48 hours and investigate source of failure.
Field Quality Control	**Corrective Action**
Field Duplicate	For duplicates with a heterogeneous matrix, results that do not meet SWAMP criteria should be qualified. All field duplicate results that do not meet SWAMP criteria should be communicated to the project coordinator, who in turn will notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.

Table D4: Corrective Action - Field Measurements

Field Quality Control	Corrective Action
Depth, Dissolved Oxygen, pH, Salinity, Specific Conductance, Temperature, Turbidity, Velocity	The instrument should be recalibrated following its manufacturer's cleaning and maintenance procedures. If measurements continue to fail measurement quality objectives, affected data should not be reported and the instrument should be returned to the manufacturer for maintenance. All troubleshooting and corrective actions should be recorded in the calibration and field data logbooks.

This page intentionally blank

APPENDIX L. CHECKLISTS FOR DATA REVIEW

OVERVIEW

These checklists serve as a prompt for the flow of processing and reviewing sampling documentation, laboratory data reports and supporting documents as they are received by LWA. At least one checklist should be completed for every sample event.

ANALYTICAL LABORATORIES

Reports are expected from the following laboratories (see Event Sample Plan):

APPL, Inc.	Caltest Analytical Laboratory
CRG Marine Laboratories, Inc.	Pacific EcoRisk
Applied Marine Sciences	North Coast Labs

SVWQC EVENT NUMBER

SAMPLE COLLECTION AND ANALYSIS

☐ Event documentation complete? *Request missing documents.*

- ☐ Event Sample Plan
- ☐ Field Log(s)
- ☐ COC(s)
- ☐ EDDs
- ☐ Report and Data (hard copy lab report)

Check field logs and COCs against Event Sample Plan.

☐ Were all planned samples collected?

List exceptions and reasons for uncollected samples

Reviewer: Your name here! **Completion Date:**

INITIAL SCREENING OF LABORATORY REPORTS

Check EDDs and lab reports for complete sets of analyses. If not complete, check COCs and sample collection checklist, determine reasons for missing analyses. List exceptions and reasons.

Completeness

☐ Are COCs completed and included with lab reports? *Request any missing*.

☐ Are all requested analyses completed?

List missing COCs, analyses and reasons

Quality Assurance Objectives Review

☐ Reviewed for typographical errors, correct sample IDs, correct units, etc.

☐ Hold Times: Were analyses performed within the allowable hold times?

Check reported data against QAPP specifications (QA Criteria Table). List failures:

☐ Detection Limits: Did reported MDLs and PQLs meet program requirements?

Elevated MDLs or PQLs

☐ Lab Blanks ☐ LCS/SRM Recoveries ☐ Lab Dup RPD

☐ Surrogate Recoveries ☐ MS/MSD Recoveries ☐ MS/MSD RPD

☐ Out-of-range analytical results (e.g., dissolved > total concentration; BPJ)

List problems with Lab QA

☐ Field Blanks ☐ Field Duplicates

Problems with Field QA

Request amended laboratory reports as needed. (When an amended laboratory report is issued, it supersedes previously issued reports.)

☐ NA ☐ Requested *List Requested Amended Reports by Lab and Number:*

Requested amended reports: Lab and Rpt #

☐ All Amended Reports Received

Reviewer: Your name here! **Completion Date:**

This page intentionally blank