Quality Assurance Project Plan

For Monitoring By The

San Joaquin County & Delta Water Quality Coalition

(Revision 3.0)

Originally submitted on: August 25, 2008
Amendment submitted on: October 20, 2010
Amendment submitted on: June 16, 2015

For The

Irrigated Lands Regulatory Program
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, California 95670-6114

Prepared by

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Table A. Updates to SJCDWQC QAPP submitted on August 25, 2008 and amended on October 20, 2010 and June 6, 2015.

Item No.	Update Description	QAPP Reference Page No.	CVRWQCB Approval Date
Amended on October 20, 2010			
1	**MRP reference number**		
	Updated MRP reference to the current number, R5-2008-0005.	List of Acronyms, Page 8	October 20, 2010
2	**Caltest QA Officer**		
	Updated Caltest QA Officer. Sonya Babcock replaced Carmelita Oliveros as the Caltest QA Officer and assumed all the associated responsibilities.	Verbiage, Page 10 Figure 1, Page 13 Table 17, Page 56 Table 18, page 58	October 20, 2010
3	**MLJ Sampling Coordinator**		
	Updated MLJ Sampling Coordinator. Frank Wulff replaced Jonathon Katz as MLJ Sampling Coordinator and assumed all the associated responsibilities.	Verbiage, Page 29 Table 8, Page 29 Table 17, Page56 Table 18, Page 58 Table 19, Page 60	October 20, 2010
4	**Regional Board ILRP Monitoring Assessment Supervisor**		
	Updated Regional Board ILRP Monitoring Assessment Supervisor. Susan Fregien replaced Margie Read as the ILRP Monitoring Assessment Supervisor and assumed all associated responsibilities.	Verbiage, Page 10 Figure 1, Page 13	October 20, 2010
5	**Sample sites and zone numbers**		
	Updated Five Mile Slough zone number from 5 to 4.	Verbiage, Page 20	December 17, 2008
	Removed sampling sites Stanislaus River Drain @ South Airport Way, Stanislaus River Drain @ East Division Ave, and Walthall Slough Drain @ Airport Way. Added Walthall Slough @ Woodward Avenue location.	Table 11, Page 35	December 17, 2008
6	**Sampling Process Design**		
	Updated sampling design verbiage to include March 30, 2009 MRPP amendment: SJCDWQC monitored for 5 Core and 1 Assessment site each month instead of the previous 5 Core and 5 Assessment sites each month.	Verbiage, Page 32	March 30, 2009
7	**Monitoring Constituents**		
	Added deltamethrin: tralomethrin to the sediment pyrethroids analysis list. Deltamethrin is listed in the MRP but due to an oversight the analyte was not previously added to our MRPP and QAPP tables.	Table 2, Page 18 Table 5, Page 24 Table 13, Page 45	October 20, 2010
8	**Data Quality Objectives**		
	Separated Matrix Spike/Lab Control Spike Frequency into two columns. Updated sediment TOC MS/LCS frequency to MS=N/A, LCS=1 per batch; grain size updated to N/A for both LCS and MS.	Table 5, Page 24	October 20, 2010
	Updated sediment grain size Accuracy/Recovery from 90-110% to N/A (recoveries are not possible for	Table 5, Page 24	October 20, 2010

Item No.	Update Description	QAPP Reference Page No.	CVRWQCB Approval Date
	grain size).		
	Updated glyphosate Accuracy/Recovery acceptability range from 72-131% to 85.7-121% to match the range recommended by the lab.	Table 5, Page 24	October 20, 2010
	Updated metals Accuracy/Recovery acceptability range from 75-125% to 85-115% and nutrients Accuracy/Recovery range from 80-120% to 90-110% to match the range recommended by the lab; updated lab precision RPDs from 25 to 20 for nutrients, metals and physical parameters to match the acceptability criteria used by the lab.	Table 5, Page 24	October 20, 2010
9	**Analytical Methods**		
	Updated sediment toxicity method to EPA 600/R-99-064 from EPA 100.1. The original method listed is believed to be a typo and all samples analyzed for sediment toxicity have always used the EPA 600/R-99-064 method.	Table 2, Page 18 Table 13, Page 45 Table 15, Page 49 Table 16, Page 50	October 20, 2010
	Updated methamidophos method to EPA 8321 from EPA 8141A. Lab started using EPA 8321 to analyze for methamidophos in July 2010.	Table 2, Page 18 Table 13, Page 45	October 20, 2010
	Updated sediment pyrethroid analytical method from EPA 8270 to GCMS-NCI-SIM. Lab started using GCMS-NCI-SIM to analyze for sediment pyrethroids in April 2010.	Table 2, Page 18 Table 13, Page 45 Table 15, Page 49 Table 16, Page 50	October 20, 2010
	Removed requirement for Lab Control Spike/CRM/SRM from sediment grain size section of the Analytical QC table. This QC level is not required by SWAMP.	Table 16, Page 50	October 20, 2010
	Removed requirements for internal standards performed for Organic Parameters: OPs, OCHs, carbamates, and additional herbicides.	Table 16, Page 50	October 20, 2010
	Updated trifluralin RL to 0.05 µg/L from 0.01 µg/L. The original (and not feasible) value of 0.01 µg/L is believed to be a typo, while the value to 0.05 µg/L is that recommended in the MRP.	Table 13, Page 50	October 20, 2010
	Updated sediment pyrethroid MDL and RL values to match those recommended by the lab.	Table 13, Page 45	October 20, 2010
	Updated glyphosate, cadmium, lead, molybdenum, TKN and ammonia MDL values to match those achievable by the lab.	Table 13, Page 45	October 20, 2010
	Updated turbidity, hardness, molybdenum, lead and TKN RL values to match those achievable by the lab (turbidity 0.5 NTU to 0.05 NTU, hardness 10 mg/L to 5 mg/L, molybdenum 0.3 µg/L to 0.25 µg/L, lead 0.5 µg/L to 0.25 µg/L, and TKN 0.5 mg/L to 0.1 mg/L).	Table 13, Page 45	October 20, 2010
	Updated the spelling of "demeton-s." It was previously misspelled as "dimeton-s."	Table 13, Page 45	October 20, 2010
	Updated dichlorvos and demeton-s RL values from 0.2 µg/L to 0.1 µg/L to correct an original typo.	Table 13, Page 45	October 20, 2010
10	**Quality Control**		
	Updated organic and inorganic Field Blank Acceptable Limits from "<MDL" to "<RL or <sample/5" to agree with Table 7, Element 7, page 24.	Table 15, Page 49	October 20, 2010
	Added precision calculation for sediment grain size.	Verbiage, Page 54	October 20, 2010

Item No.	Update Description	QAPP Reference Page No.	CVRWQCB Approval Date
11	**Data Management**		
	Updated location of Regional Data Center from UCD-AEAL to Central Valley RDC.	Verbiage, Page 61 Figure 4, Page 64	October 20, 2010
12	**Standard Operating Procedures**		
	Updated chemistry and toxicity data verification, validation and loading SOPs; updated sample detail excel file creation SOP.	Appendices XXXV-XXXVII	October 20, 2010
	Updated laboratory organic chemistry SOPs for EPA 619, EPA 8081A, EPA 8141A, EPA 549, EPA 8321A; updated laboratory toxicity SOPs for Acute *Ceriodaphnia*, Acute *Pimephales*, and Chronic *Selenastrum* toxicity tests; updated inorganic chemistry method SOPs as needed.	Appendices XI-XXXII	October 20, 2010
Amended on January 15, 2013			
1	**Sample Handling and Custody**		
	Updated the preservation temperature requirements from 4°C to ≤ 6°C for all water and sediment analysis based on most recent method requirements.	Verbiage, Page 38,40 Table 12, Page 41	January 15, 2013
	Updated *E. coli* holding time temperature from 4°C to < 8°C based on the most recent method requirements, and updated *E. coli* sample volume from 100mL to 150 mL to be consistent with laboratory requirements.	Table 12, Page 41	January 15, 2013
	Updated Sediment Total Organic Carbon Initial Preservation/Holding time to "Store at ≤ 6°C (not frozen), analyze or freeze (-20C) within 28 days" and Maximum Hold Time to "28 days (not frozen 12 Months (frozen)".	Verbiage, Page 38 Table 12, Page 41	January 15, 2013
	Updated Sediment Toxicity maximum hold time from 28 days to 14 days to be consistent with the 2008 MRP.	Verbiage, Page 38 Table 12, Page 41	January 15, 2013
	Updated Sediment Chemistry from "freeze or analyze within 48 hours" to "Store at ≤ 6°C (not frozen), analyze or freeze (-20C) within 14 days" and maximum hold time to "14 days (not frozen) 12 Months (frozen)" to be consistent with approved sediment chemistry and TOC methods.	Verbiage, Page 38 Table 12, Page 41	January 15, 2013
	Updated Sediment Grain Size maximum hold time from 14 days to 28 days to be consistent with the 2008 MRP.	Verbiage, Page 38 Table 12, Page 41	January 15, 2013
2	**Analytical Methods**		
	Triazine method changed from EPA 619 to EPA 8141A for the analysis of Atrazine, Cyanazine and Simazine, as determined by the laboratory.	Table 3, Page 20 Table 13, Page 45	January 15, 2013
Amended on June 16, 2015			
1	**Data Quality Objectives**		
	Updated MS/D and LCS recovery limits for methods: EPA 8140A (organophosphates), EPA 8270_M (sedimentpesticides), and EPA 549.2 (paraquat dichloride).	Table 5, Page 24	June 6, 2015

GROUP A: PROJECT MANAGEMENT

1. APPROVAL SIGNATURES

San Joaquin County & Delta Water Quality Coalition

APPROVAL:

The amendment(s) detailed within this document shall be effective upon signature completion of all parties listed below. By signing this amendment, all parties listed below acknowledge and accept these changes. A copy of this document shall be distributed to all parties within the QAPP distribution list and shall be included and/or attached to all distributed copies of the original QAPP. The amendment(s) will be incorporated into the full QAPP document when a formal QAPP revision takes place.

Steering Committee Co-Chairman:
Mike Wackman — Date: 11/9/2015

Project Manager and Technical Advisor:
Michael L. Johnson — Date: 11/9/15

Project Quality Assurance Officer:
Melissa Turner — Date: 11/9/15

Laboratory Quality Assurance Officer, APPL Inc.:
Frances Lediaev — Date: 8/27/15

Laboratory Quality Assurance Officer, Caltest:
Emily Volkmar — Date: 10/27/15

Laboratory Quality Assurance Officer, North Coast Laboratories Ltd:
Byran Fuhrmann — Date: 08/20/2015

ILRP Staff Liaison
Chris Jimmerson — Date:

SWRCB QA Representative
Renee Spears — Date:

ILRP Monitoring & Implementation Unit Chief
Susan Fregien, Senior Environmental Scientist, CVRWQCB — Date:

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

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LIST OF ACRONYMS

AMR	Annual Monitoring Report
APC	Atmospheric Pressure Chemical Ionization
APPL	Agriculture and Priority Pollutants Laboratories Inc.
BU	Beneficial Use
CCC	Continuing Calibration Check
CD-ROM	Compact Disc Read-Only Memory
COC	Chain of Custody
CRM	Certified Reference Material
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
DAI	Direct Aqueous Injection
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DI	Deionized
DO	Dissolved Oxygen
DQO	Data Quality Objective
E	Environmental sample
EC	Specific Conductance
ECD	Electron Capture Detector
EDD	Electronic Data Deliverable
EPA	Environmental Protection Agency
ESI	Electrospray Ionization
FB	Field Blank
FD	Field Duplicate
FDe	Fluorescence Detection
GC	Gas Chromatography
GPS	Global Positioning System
HDPE	High Density Polyethylene
HPLC	High Performance Liquid Chromatography
ID	Identification
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ILRP	Irrigated Land and Regulatory Program
LC	Liquid Chromatography
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MLJ-LLC	Michael L. Johnson, LLC
MPN	Most Probable Number
MRP	Monitoring and Reporting Program Order No. R5-2008-0005
MRPP	Monitoring and Reporting Program Plan
MS	Matrix Spike or Mass Spectrometry
MSD	Matrix Spike Duplicate
MUN	Municipal and Domestic Supply (beneficial use)
NA	Not Applicable
NCL	North Coast Laboratories Ltd.
ND	Not Detected
NDIR	Non-dispersive Infrared
NM	Normal Monitoring
OP	Organophosphate
PCD	Post Column Detection
PDF	Portable Document Format
PR	Percent Recovery
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMR	Quarterly Monitoring Report
RL	Reporting Limit
RPD	Relative Percent Difference
RS	Resample
RSD	Relative Standard Deviation
SIM	Selective Ion Monitoring
SJCDWQC	San Joaquin County & Delta Water Quality Coalition
SOP	Standard Operating Procedure
SPE	Solid Phase Extraction
SRM	Standard Reference Material
SWAMP	Surface Water Ambient Monitoring Program
TDS	Total Dissolved Solids
TIC	Technical Issues Committee
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids
VOA	Volatile Organic Analyte
WQTL	Water Quality Trigger Limit

LIST OF UNITS

cfs	cubic feet per second
cm	centimeter
kg	kilogram
L	Liter
lbs	pounds
mg	milligram
mL	milliliter
ng	nanogram
NTU	Nephelometric Turbidity Units
pH	Power of Hydrogen
sec	second
TUa	Toxic Unit (acute)
µg	microgram
µm	micrometer
µS	microsiemen

3. Distribution List

Distribution list of the 2008 San Joaquin County & Delta Water Quality Coalition QAPP.

Title:	Name (Affiliation):	Tel. No.:	QAPP No:
Project Manager	Michael Johnson (MLJ-LLC)	(530) 400-6725	
Project QA Officer	Melissa Turner (MLJ-LLC)	(916) 607-5602	
Regional Board Coalition Liaison	Chris Jimmerson (CVRWQCB)	(916) 464-4859	
Regional Board ILRP Monitoring Assessment Supervisor	Susan Fregien (CVRWQCB)	(916) 464-4624	
Regional Board QA Officer	Leticia Valadez (CVRWQCB)	(916) 464-4634	
Steering Committee Co-Chairman, SJCDWQC	Mike Wackman (SJCDWQC)	(916) 716-1358	
Steering Committee Co-Chairman, SJCDWQC	John Brodie (SJCDWQC)	(209) 472-7127 X 125	
Lab Manager	Jeff Miller (AQUA-Science)	(530) 753-5456	
Lab Manager	Diane Anderson (APPL Inc)	(559) 275-2175	
Lab Manager	Todd Albertson (Caltest Labs)	(707) 258-4000	
Lab Manager	Roxanne Golich-Moore (NCL)	(707) 822-4649	

4. PROJECT/TASK ORGANIZATION

4.1 Involved parties and roles.

The San Joaquin County & Delta Water Quality Coalition (SJCDWQC, or Coalition) is a consortium of farms and farmers obligated to monitor agricultural wastewater discharge from member areas. The broad goal of the SJCDWQC is to conform to the Conditional Waiver of the Irrigated Lands Regulatory Program (ILRP) developed by the Central Valley Regional Water Quality Control Board (CVRWQCB) and thereby improve water quality. Monitoring and active outreach are developed by the SJCDWQC Steering Committee. Constituents monitored and associated water quality trigger limits (WQTLs) are defined by the CVRWQCB; the CVRWQCB also reviews and approves all monitoring and activities of the SJCDWQC. To facilitate compliance with the ILRP, the SJCDWQC hired Michael L. Johnson LLC (MLJ-LLC) to provide technical support and sampling services. MLJ-LLC initiates and maintains working contracts with the necessary laboratories, including Agriculture and Priority Pollutants Laboratories Inc. (APPL) in Clovis, Caltest Laboratories (Caltest) in Napa, AQUA-Science in Davis, and North Coast Laboratories Ltd. (NCL) in Arcata.

4.2. Responsibilities of involved parties.

MLJ-LLC is responsible for providing technical support for the selection of sampling locations, techniques and sample collection, including delivery of samples to laboratories, synthesis of data from laboratories, and report submission to the CVRWQCB. MLJ-LLC will submit data to the CVRWQCB and will maintain copies of chains of custody (COC) forms and field sheets at their office. MLJ-LLC will maintain an ILRP SWAMP Comparable database in which the field results and laboratory results are recorded. MLJ-LLC will also submit to the CVRWQCB the reports listed in Table 20. The laboratories mentioned above will provide analytical services for this project in accordance with all method and quality assurance (QA) requirements found in this QAPP, and will return data to MLJ-LLC in both hardcopy and in approved electronic data deliverable (EDD) format.

Table 1. (Element 4) Personnel responsibilities.

Name	Organizational Affiliation	Title	Contact Information (Telephone number, fax number, email address.)
Chris Jimmerson	CVRWQCB	Regional Board Coalition Liaison	Phone: (916) 464-4859 Fax: (916) 464-4774 cjimmerson@waterboards.ca.gov
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Roxanne Golich-Moore	NCL	Lab Manager	Phone: (707) 822-4649 Fax: (707) 822-4649 rgolich@northcoastlabs.com

4.3 Quality Assurance Officer role.

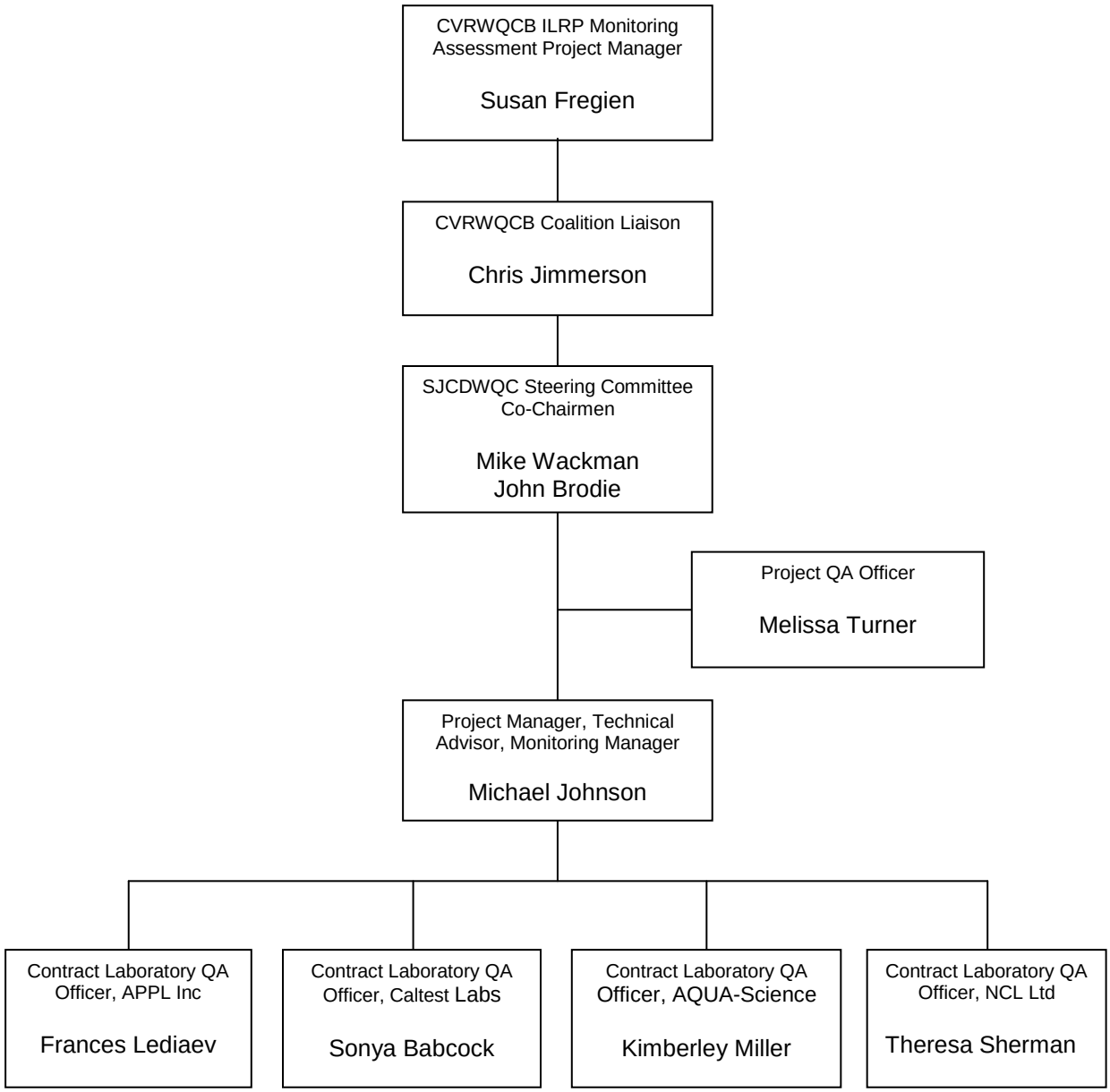
The project QA Officer, Melissa Turner of MLJ-LLC, is responsible for establishing the QA/QC guidelines for field sampling and analysis procedures in this QAPP. In addition to procedural QA/QC, Melissa Turner tracks the percentage of QA/QC samples analyzed during the time frame specified within this QAPP to maintain more than the minimum of 5% field QA/QC samples and 5% or 1 per batch lab QA/QC samples where applicable. Melissa Turner is responsible for reviewing laboratory protocol to confirm laboratory compliance with ILRP analysis guidelines and she is ultimately responsible for reviewing hard-copy and electronic data both for accuracy and SWAMP comparability.

4.4 Persons responsible for QAPP update and maintenance.

Melissa Turner, MLJ-LLC and project QA Officer, is responsible for creating, maintaining, and updating the official approved QAPP. Changes and updates to this QAPP may be made after a review of the evidence for change by CVRWQCB's Project Manager and Quality Assurance Officer, and with the concurrence of the SJCDWQC Steering Committee. The MLJ-LLC QA Officer will be responsible for making the changes, submitting drafts for review, preparing a final copy, and submitting the final version for signature.

4.5 Organizational chart and responsibilities

Figure 1. Organizational chart.



4.6. Project team members and project advisors.

The SJCDWQC monitoring project team is composed of the SJCDWQC Steering Committee (co-chairmen: Mike Wackman & John Brodie) and the QA Officer Melissa Turner of MLJ-LLC. Michael Johnson of MLJ-LLC provides technical support to the SJCDWQC while also managing the monitoring and compiling the data. MLJ-LLC manages the contract laboratories and their individual QA Officers listed in Section 3.1.

5. PROBLEM DEFINITION/BACKGROUND

5.1 Problem statement.

Agricultural lands are source of water discharged to waters of the State. The discharged water may be initially taken into the irrigation system and subsequently discharged as a result of a variety of practices including flood irrigation or as tail water from furrow irrigation. Discharge may also be the result of rains during the storm season. Once water has passed through an irrigation system its physical properties can change, and on occasion its chemical content may change as well. Examples of the physical changes include increasing water temperature, lowered dissolved oxygen, or increased turbidity. Examples of chemical changes include flushing nutrients, pesticides, or salts from fields into the receiving water body. The effect of return flow on a water body can be reduced water quality sufficiently to limit the potential of the water to be used for this same or other beneficial uses. This project is undertaken to characterize discharge from irrigated agriculture and determine if the discharge is impairing beneficial uses of water bodies. Once impaired water bodies are identified, it is the responsibility of the Coalition to contact members and suggest alternative practices or solutions that may prevent further degradation.

5.2 Decisions or outcomes.

The Amended Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands, Order No. R5-2006-0053 (hereafter referred to as the Conditional Waiver), Monitoring and Reporting Program, Order No. R5-2008-0005 (Order), regulates discharge from agricultural lands. The results of the monitoring outlined in this QAPP will allow the SJCDWQC to determine which water bodies are impaired and institute appropriate outreach measures. Impairment is based on Conditional Waiver WQTLs which were developed based on the CVRWQCB Basin Plan. The WQTL's are set at a level to protect the most sensitive beneficial use for a given constituent.

5.3 Water quality or regulatory criteria.

Under the guidelines established by the Conditional Waiver the CVRWQCB set specific WQTLs for a number of parameters and compounds; no waters within Coalition boundaries should exceed these WQTLs. To determine if water discharged within the Coalition area meets the WQTLs, the Coalition conducts monthly monitoring based on the MRPP.

This ongoing project will continue to monitor water quality within the SJCDWQC region (defined in the SJCDWQC Watershed Evaluation Report, submitted April 1, 2004) by regularly analyzing water samples collected from sites within subwatersheds in the region. Field parameters will be measured *in situ*, while physical parameters and chemical content will be analyzed in a laboratory environment. The sampling methods used are adapted from those used in the past by MLJ-LLC; the laboratory analytical methods used are approved EPA methods specific to each compound or test. All methods are explained in detail in the appendices of this QAPP.

Previous monitoring by the SJCDWQC under the Conditional Waiver has characterized water quality issues within the Coalition area as a result of agricultural discharge. Regular monitoring allows Coalition members to take active steps and focus efforts and funding to prevent discharge of waste. Ultimately, the goal of the SJCDWQC is to achieve 100% compliance with all WQTLs through a combination of approaches including but not limited to refining or implementing management practices by the growers responsible for the discharges. The monitoring program will help identify areas in which management practices or different pesticide application practices may be most effective, and also identify areas in which water quality meets the defined objectives. The specific WQTLs that the project has agreed to meet are periodically reviewed and updated; at the time of this QAPP submittal, the WQTLs for each constituent are shown in Table 13 and Table 14 (Element 13), but are subject to change.

6. PROJECT DESCRIPTION

6.1 Work statement and produced products.

Ambient water and sediment quality monitoring for agricultural discharge will occur using three types of monitoring: Core Monitoring Assessment Monitoring, and Management Plan Monitoring. Combined, these three levels of monitoring are designed to characterize the discharge from irrigated agriculture as a result of irrigation and storm water runoff. Core Monitoring will occur at sites that have undergone intensive monitoring in the past to assess general water quality trends over time. Assessment Monitoring will occur at sites that have not been well characterized by previous monitoring. Samples collected from Assessment Monitoring locations will be analyzed for a large suite of constituents to adequately characterize water quality at those sites. This monitoring strategy allows for comprehensive monitoring in the short term and general trend monitoring over successive years.

The Coalition area has been divided into six zones based on hydrology, crop types, land use, soil types, and rainfall. For a description of each zone's land use, hydrology, precipitation, soil types and crop patterns refer to the Description of Coalition Area section of the Monitoring and Reporting Program Plan (MRPP). The zone names are based on the Core Monitoring location within that area and include: 1) Mokelumne River @ Bruella Zone, 2) French Camp @ Airport Way Zone, 3) Terminous Tract Drain @ Hwy 12 Zone, 4) Roberts Island Drain @ Holt Ave Zone, 5) Lower San Joaquin Zone, and 6) Contra Costa Zone. Each zone will be monitored at one Core Monitoring location and one Assessment Monitoring location. The Assessment Monitoring location will rotate every two years except for Lower San Joaquin Zone and Contra Costa Zone. The Coalition has not previously sampled within the Lower San Joaquin Zone due to the limited amount of agricultural discharge and therefore there will be three Assessment Monitoring locations. Two sites will be monitored within this zone as Assessment Monitoring locations from October 2008 to December 2010 to characterize irrigated agriculture for this entire zone. In 2010 one site will be selected to become the Core Monitoring location and the third site will rotate into the Assessment Monitoring rotation in January 2011. The Contra Costa Zone will not have any Core or Assessment Monitoring locations due to the large amount of urban within the zone. The Coalition will continue to conduct Management Plan monitoring within this zone for previously sampled location (Sand Creek @ Hwy 4 Bypass).

To allow the Coalition to monitor a large number of waterbodies across the six zones, the Assessment Monitoring sites will be rotated every two years. If an Assessment Monitoring site exhibits more than one water quality exceedance within the two years of monitoring, it will become part of the SJCDWQC Management Plan monitoring which requires additional monitoring beyond the initial two years. For site subwatersheds that are currently under a management plan, the Coalition will continue to monitor at that location for the constituents within the management plan for which it is listed. For additional details on the monitoring strategy of the Coalition, refer to the MRPP.

Toxicity tests to assess survival or growth relative to a control sample will occur during assessment monitoring. Highly toxic samples that reduce survival >50% relative to the control or for algae exhibit suppressed growth of >50% relative to the control will undergo a Toxicity Identification Evaluation (TIE), and in cases where there is no survival or growth a dilution series is initiated. The results of toxicity tests will be compared to the results of water column chemical analyses to support a stronger interpretation of each toxicity result.

In addition to the water column analyses the Coalition will conduct sediment quality monitoring twice per year between the dates listed in Table 4. Sediment sampling will consist of a toxicity test to *Hyalella azteca* and additional physical parameters identified in Table 2. Samples which show statistically significantly toxicity to *H. azteca* and exhibit a >20% reduction in survival compared to the control will require pesticide analysis of the pesticides listed in Table 2.

During a calendar year MLJ-LLC will provide the CVRWQCB with exceedance reports within five business days of receiving field and analytical results, as well as three quarterly data deliveries and one annual report. Report requirements are described in the MRPP.

6.2 Constituents to be monitored and measurement techniques

All constituents listed in the MRP are included in Table 2 except for fecal coliform (Group A pesticides are listed in Table 3). The Coalition has been monitoring for *E. coli* since 2004 using the water quality trigger limit (WQTL) WQTL of 235 MPN/100mL (a fecal coliform number). *E. coli* is a sub-category of fecal coliform and therefore if the amount of *E. coli* detected in a sample is above the WQTL than it is assumed that the fecal coliform is also above the WQTL and the sample is treated as exceeding a fecal coliform WQTL. It is not necessary therefore to also collect a sample for fecal coliform analysis.

A total of 17 constituents and parameters will be measured at each visit to each Core site, including a three-species water column toxicity test. At each visit to each Assessment site, and every third year for each Core site, a total of 63 constituents and parameters will be measured. Twice per year, once in the storm season and once during irrigation season, sediment will be analyzed for toxicity, total organic carbon, and grain size. Those sediment samples which are demonstrated to be toxic will be analyzed for each of eight pesticides. Measurement techniques for water and sediment constituents vary by analyte and all are listed with the full constituent list in Table 2.

Table 2. (Element 6) Constituents and parameters.

Constituents and parameters measured, grouped by category. Laboratory SOPs are available in the appendices.

Constituent	Matrix	Analyzing Lab	Method	Analysis Type	Assessment (A) and/or Core (C) Monitoring
Physical Parameters					
Photo Monitoring	NA	NA	Digital capture	NA	With every event
Flow	Fresh Water	Field Measure	USGS R2Cross streamflow Method	Electromagnetic Induction	A, C
pH	Fresh Water	Field Measure	EPA 150.1	Glass Electrode	A, C
Electrical Conductivity	Fresh Water	Field Measure	EPA 120.1	Electrode Cell	A, C
Dissolved oxygen	Fresh Water	Field Measure	SM 4500-O	Steady State Polarographic	A, C
Temperature	Fresh Water	Field Measure	SM 2550	Thermistor	A, C
Turbidity	Fresh Water	Caltest	EPA 180.1	Nephelometric	A, C
Total Dissolved Solids	Fresh Water	Caltest	SM2540C	Filtration/Evaporation	A, C
Total Suspended Solids	Fresh Water	Caltest	SM2540D	Filtration/Dry Weight	A, C
Hardness	Fresh Water	Caltest	SM2340C	Na_2EDTA Titration	A, C
Total Organic Carbon	Fresh Water		SM5310B	NDIR Detection	A, C
Pathogens					
Escherichia coli	Fresh Water	Caltest	SM 9223B	Colilert media	A, C
Toxicity					
Water Column Toxicity	Fresh Water	AQUA-Science	EPA 821-R-02-012	Acute 96 Hour Survival	A
	Fresh Water	AQUA-Science	EPA 821-R-02-013	Chronic 96 Hour Growth	A
Sediment Toxicity	Sediment	AQUA-Science	EPA 600/R-99-064	Acute 10 day Survival	A
Carbamates					
Aldicarb	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Carbaryl	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Carbofuran	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Methiocarb	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Methomyl	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Oxamyl	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Organochlorines					
DDD	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
DDE	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
DDT	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
Dicofol	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
Dieldrin	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
Endrin	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
Methoxychlor	Fresh Water	APPL Inc	EPA 8081A	GC,ECD	A
Organophosphates					
Azinphos-methyl	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Chlorpyrifos	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Diazinon	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Dichlorvos	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Dimethoate	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Dimeton-s	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Disulfoton	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Malathion	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Methamidiphos	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Methidathion	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Parathion, methyl	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Phorate	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Phosmet	Fresh Water	APPL Inc	EPA 8141A	Capillary Column, GC/MS	A
Herbicides					
Atrazine	Fresh Water	APPL Inc	EPA 8141A	GC	A
Cyanazine	Fresh Water	APPL Inc	EPA 8141A	GC	A
Diuron	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Glyphosate	Fresh Water	NCL Ltd	EPA 547	DAI HPLC, PCD, FD	A

Constituent	Matrix	Analyzing Lab	Method	Analysis Type	Assessment (A) and/or Core (C) Monitoring
Linuron	Fresh Water	APPL Inc	EPA 8321	HPLC, ESI/APC, LC/MS	A
Paraquat dichloride	Fresh Water	APPL Inc	EPA 549.1	SPE, HPLC, UV detection	A
Simazine	Fresh Water	APPL Inc	EPA 8141A	GC	A
Trifluralin	Fresh Water	APPL Inc	EPA 8141	Capillary Column, GC/MS	A
Metals					
Arsenic	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Boron	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Cadmium	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Copper	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Lead	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Molybdenum	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Nickel	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Selenium	Fresh Water	Caltest	EPA 200.8	ICP-MS (Reaction Cell)	A
Zinc	Fresh Water	Caltest	EPA 200.8	ICP-MS (Collision Cell)	A
Nutrients					
Total Kjeldahl Nitrogen	Fresh Water	Caltest	SM4500NH3 C	Tecator Auto Titration	A, C
Nitrate (as N)+ Nitrite (as N)	Fresh Water	Caltest	EPA 353.2	Colorimetric, Automated Cadmium Reduction	A, C
Total Ammonia	Fresh Water	Caltest	SM4500NH3 C	Tecator Auto Titration	A, C
Total Phosphorus	Fresh Water	Caltest	SM4500PE	Colorimetric Analysis	A, C
Soluble Orthophosphate	Fresh Water	Caltest	SM4500PE	Colorimetric Analysis	A, C
Sediment					
Bifenthrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Cyfluthrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Cypermethrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Deltamethrin: Tralomethrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Esfenvalerate	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Lambda-Cyhalothrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Permethrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Fenpropathrin	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Chlorpyrifos	Sediment	Caltest	GCMS-NCI-SIM	GC/MS/SIM	A[1]
Total Solids	Sediment	Caltest	SM2540B	Gravimetric	A
Total Organic Carbon	Sediment	Caltest[2]	Walkley Black	Oxidation & Titration	A[5]
Grain Size	Sediment	Caltest[2]	ASTM D-422-63[3], ASTM D4464M-85[4]	Dry Sieve[3] & Laser Light Scattering[4]	A[5]

NDIR: Non-dispersive infrared
HPLC: High performance liquid chromatography
ESI: Electrospray ionization
APC: Atmospheric pressure chemical ionization
LC: Liquid chromatography
MS: Mass spectrometry
ICP-MS: Inductively coupled plasma mass spectroscopy
GC: Gas Chromatography
ECD: Electron capture detector
DAI: Direct aqueous injection
PCD: Post column detection
FDe: Fluorescence detection
SPE: Solid phase extraction
SIM: Selective Ion Monitoring

[1] If needed based on criteria described in text above
[2]Subcontracted to PTS Geo Laboratories
[3]For particle sizes 6.351-0.037 mm
[4]For particle sizes 0.4-2000 µm
[5] Simultaneous with sediment toxicity sampling

Special project monitoring will include specific targeted studies for the implementation of a Management Plan that results from more than one exceedance within three years of either Core or Assessment Monitoring. Monitoring for Management Plans may include more extensive monitoring than what is required in the Core Monitoring or Assessment Monitoring schedules. The schedule for Special Project Monitoring will be determined as outlined in the SJCDWQC Management Plan which is updated on a yearly basis. Special project monitoring may also occur in areas where targeted source identification studies must take place or Total Maximum Daily Load (TMDL) studies are required (refer to the Special Project Monitoring section of the MRPP for a list of all 303(d) listed water bodies). Of all 303(d) listed causes of impairment, the Coalition has monitored for all constituents in all portions of the Delta with the exception of the Group A pesticides and diazinon in Zone 4 (which would be representative of the reach of Five Mile Slough from Alexandria Place to Fourteen Mile Slough).

The Coalition will monitor Group A pesticides at four sites: Mokelumne River @ Bruella Road, Duck Creek @ Highway 4, Drain @ Woodbridge Road, and Roberts Island Drain @ Holt Road. Of these four, the Drain @ Woodbridge Road is a new site and will have the full Assessment Monitoring, the other three sites are Core Monitoring sites and will have Group A pesticides added to the suite of constituents. These four sites will be representative of 303(d) listed sites in the four portions of the Delta in the Coalition region. Group A pesticides are considered legacy pesticides and the most recent use of any Group A pesticide was in 2006 (endosulfan). Therefore, if the Coalition does not detect any Group A pesticides during 2008/2009 monitoring, the Coalition will have demonstrated that these pesticides are not negatively affecting water quality and will discontinue monitoring for Group A pesticides in 2010. The status of TMDLs and 303(d) listed water bodies and their associated constituents will be reviewed annually in the Annual Monitoring Report.

Table 3. (Element 6) Additional constituents monitored for CWA 303(d) compliance.

Site Name	Constituent	Matrix	Analyzing Lab	Method	Analysis Type	Assessment (A) and/or Core (C) Monitoring
Mokelumne River @ Bruella Rd Duck Creek @ Highway 4 Drain @ Woodbridge Rd Roberts Island Drain @ Holt Rd	Aldrin	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Chlordane	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Heptachlor	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Heptachlor epoxide	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Hexachlorocyclohexane (alpha-BHC)	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Hexachlorocyclohexane (beta-BHC)	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Hexachlorocyclohexane (gamma-BHC; Lindane)	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Hexachlorocyclohexane (delta-BHC)	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Endosulfan	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies
	Toxaphene	Fresh Water	APPL Inc	EPA 8081A	GC, ECD	As needed to characterize 303d listed waterbodies

6.3 Project schedule

The project will advance with deliverable dates outlined in the table below. The table provides dates for the first year this QAPP is active. Beyond 2009 the year advances but the month and day of each date will remain roughly the same. If in subsequent years the deliverable due date is not a weekday it will change to the first business day after the due date.

Table 4. (Element 6) Project schedule timeline.

Activity	Date (MM/DD/YY)		Deliverable	Deliverable Due Date
	Anticipated Date of Initiation	Anticipated Date of Completion		
Prior Year Monitoring	01/01/09	12/31/09	Annual Monitoring Report	03/01/10
Quarter 1 Monitoring, Monthly	01/01/09	03/31/09	Quarterly Monitoring Data Report	06/01/09
Sediment Monitoring #1	03/01/09	04/30/09	Results included in Quarterly Monitoring Report	Either 06/01/09 or 09/01/09
Quarter 2 Monitoring, Monthly	04/01/09	06/30/09	Quarterly Monitoring Data Report	09/01/09
Quarter 3 Monitoring, Monthly	07/01/09	09/30/09	Quarterly Monitoring Data Report	12/01/09
Sediment Monitoring #2	08/15/09	10/15/09	Results included in Quarterly or Annual Monitoring Report	Either 12/01/09 or 03/01/10

6.4 Geographical setting.

The Coalition region includes parts of San Joaquin, Contra Costa, Alameda and Calaveras counties and comprises approximately 1,057,350 acres of which 548,362 (52%) are considered irrigated agriculture. The County Agricultural Commissioner's offices, for San Joaquin, Contra Costa, Alameda and Calaveras Counties, note that there are 520,172 acres, 22,000 acres, 3,695 acres and 2,495 acres of irrigated farm lands in the Coalition region respectively in their counties (San Joaquin acreage is from the 2002 Agricultural Report). Contra Costa, Alameda and Calaveras County acreages are estimates because not all of the county area is within the Coalition area.

The northern border of the Coalition area corresponds to the county line between San Joaquin and Sacramento Counties. The eastern portion of the Coalition area was expanded in April of 2004 and now includes portions of Calaveras County that are the upper Calaveras River, Bear Creek, and Mokelumne River subwatersheds. These subwatersheds extend from San Joaquin County into Calaveras County. Agricultural land use in this part of the Coalition area is primarily orchards and vineyards and includes a very small amount of irrigated agriculture. The southern border of the Coalition area is the Stanislaus River with the exception of the Del Puerto and West Stanislaus Irrigation Districts at the southern edge of the Coalition area, which are not covered by the Coalition. The Coalition boundary at the southwest corner of San Joaquin County is approximately that of the Delta Mendota Canal and California Aqueduct. The western boundary of the Coalition area has also been expanded and now lies along the western boundary of the CVRWQCB (Region 5) in Contra Costa County and Alameda County. There are several small subwatersheds in this portion of the Coalition region including the Kellogg Creek, Marsh Creek, Sand Creek, and Brushy Creek subwatersheds that drain from Mount Diablo. These water bodies flow east through urban areas on the western edge of the central Delta. Growers from these areas joined the Coalition at its inception and the expansion of the Coalition boundary is a formal recognition of their membership in the Coalition.

Within the Coalition area, the lower reaches of the San Joaquin River drain the California Central Valley (Valley). Drainage water is either exported to the San Francisco Bay through the Delta, or conveyed southward via the State Water Project and the Delta Mendota Canal. There are three major rivers in the Coalition area other than the San Joaquin River: Stanislaus River, Calaveras River, and Mokelumne River. These east side tributaries of the San Joaquin River drain a major portion of the Sierra Nevada Mountain range from east to west. The watershed of the Coalition area is the crest of the Sierra Nevada, and the drainage area is bounded by the San Joaquin River on the west, the Stanislaus River on the south, and the Mokelumne River on the north. Intermediate sized water bodies in the Coalition region (Littlejohns Creek, Duck Creek, Lone Tree Creek, Bear Creek, French Camp Slough, Dry Creek, Marsh Creek, Mormon Slough, Mosher Creek, and Pixley Slough) are tributaries to either one of the major rivers

or discharge to the San Joaquin Delta. Smaller water bodies found in the Coalition area are primarily canals and ditches that convey water to one of the larger rivers or intermediate creeks/sloughs, or are used to drain Delta islands (Figure 1).

The San Joaquin County Delta Water Quality Coalition topography varies greatly from the foothills of the Coast range to the delta islands up to the Sierras. Due to this large diversity in topography and weather, agriculture is only occurring in the flatter, more temperate valley and delta regions. The coastal range is too dry to farm and the Sierras are too cold and rocky, with a short growing season due the snow at higher elevations. The snow melt from the Sierras melts in the early spring to provide water to the Mokelumne and Calaveras Rivers. This snow pack helps provide runoff later into the spring and summer providing water for a longer irrigation season for corps in the valley.

6.5 Photo monitoring

A minimum of four photos of each sampling site will be submitted to the CVRWQCB with the Annual Monitoring Report along with the target GPS coordinates. The photos will depict a general site overview, an upstream view, a downstream view, and the entrance to the location where the samples are collected.

6.6 Constraints

Certain periods of high runoff volume, such as during intense storms, may completely flush contaminants through a water system before they can be captured and measured. Assessment of water quality for the Conditional Waiver is thus a best estimate based on discrete instantaneous measurements.

Water quality parameters may be expressed as instantaneous load (µg constituent/second). This method of expressing load is not always accurate for some reasons and not always possible for other reasons, including that the water body may flow intermittently and so may not be flowing during the sampling visit, or the sampler may be unable to measure discharge safely when a sample is collected.

7. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

7.1. Data quality objectives.

Data quality objectives are listed below and in Tables 5-7.

Measurement or Analyses Type	Applicable Data Quality Objective
Field Measurements	Accuracy, Precision, Completeness
Physical Parameters	Accuracy, Precision, Completeness, Recovery
Toxicity	Precision, Completeness
Pathogens	Precision, Completeness, Contamination
Nutrients	Accuracy, Precision, Completeness, Recovery, Contamination
Metals	Accuracy, Precision, Completeness, Recovery, Contamination
Carbamates	Accuracy, Precision, Completeness, Recovery, Contamination
Organochlorines	Accuracy, Precision, Completeness, Recovery, Contamination
Organophosphates	Accuracy, Precision, Completeness, Recovery, Contamination
Pyrethroids	Accuracy, Precision, Completeness, Recovery, Contamination
Herbicides	Accuracy, Precision, Completeness, Recovery, Contamination

Data quality objectives for accuracy, precision, completeness, recovery, and contamination are determined through a combination of instrument calibration and the analysis of duplicates, blanks, and spikes. Completeness is assessed with each annual monitoring report based on the number of samples successfully obtained and validated for use and the proportion of quality control samples that are within acceptance criteria.

Field measurements are taken with a YSI 556 MPS multi-parameter system and a Marsh McBirney FloMate 2000; accuracy and precision are measured during calibration (if applicable), taking into account the manufacturers specifications. For all other types of analysis accuracy, precision, and recovery are assessed through use of QC samples, including lab spikes and matrix spikes to assess accuracy and recovery, and lab and field duplicates to assess precision.

7.2 Project action limits.

Project action limits, also referred to as WQTLs, are listed in Table 13 and Table 14 (Element 13).

7.3 Acceptance criteria of previously collected information.

All data used by this project must meet the accuracy, precision, and recovery criteria in Tables 5-7 (where applicable). Data that fails to meet the criteria will undergo a review following the guidelines established in Group D, Element 22 of this QAPP before being accepted for use.

Table 5. (Element 7) Data quality objectives for field and laboratory accuracy, precision, and completeness measurements.

Data quality objectives in measurements of accuracy, precision, and completeness.

Constituent	Matrix	Matrix Spike Frequency†	Lab Control Spike Frequency†	Matrix Spike Accuracy/Recovery	Laboratory Control Spike Accuracy/Recovery	Lab Duplicate Frequency†	Precision	Completeness
Physical Parameters								
Flow	Fresh Water	NA	NA	NA	NA	1 per batch	±2%	90%
pH	Fresh Water	NA	NA	NA	NA	1 per batch	±0.5 units	90%
Specific Conductivity	Fresh Water	NA	NA	NA	NA	1 per batch	±5%	90%
Dissolved oxygen	Fresh Water	NA	NA	NA	NA	1 per batch	±0.5 mg/L or ±10%	90%
Temperature	Fresh Water	NA	NA	NA	NA	1 per batch	±0.5°C or 10%	90%
Turbidity	Fresh Water	NA	NA	NA	NA	1 per batch	RPD ≤ 20%	90%
Total Dissolved Solids	Fresh Water	NA	NA	NA	NA	1 per batch	RPD ≤ 20%	90%
Total Suspended Solids	Fresh Water	NA	NA	NA	NA	1 per batch	RPD ≤ 20%	90%
Hardness	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Total Organic Carbon	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Pathogens								
Escherichia coli	Fresh Water	1 per batch	1 per batch	NA	NA	1 per batch	$R_{log} \leq 3.27$*mean R_{log}	90%
Toxicity								
Water Column Toxicity	Fresh Water	1 per batch	1 per batch	NA	NA	1 per batch	RPD ≤ 25%	90%
Sediment Toxicity	Sediment	1 per batch	1 per batch	NA	NA	1 per batch	RPD ≤ 25%	90%
Carbamates								
Aldicarb	Fresh Water	1 per batch	1 per batch	31-133%	31-133%	1 per batch	RPD ≤ 25%	90%
Carbaryl	Fresh Water	1 per batch	1 per batch	44-133%	44-133%	1 per batch	RPD ≤ 25%	90%
Carbofuran	Fresh Water	1 per batch	1 per batch	36-165%	36-165%	1 per batch	RPD ≤ 25%	90%
Methiocarb	Fresh Water	1 per batch	1 per batch	35-142%	35-142%	1 per batch	RPD ≤ 25%	90%
Methomyl	Fresh Water	1 per batch	1 per batch	23-152%	23-152%	1 per batch	RPD ≤ 25%	90%
Oxamyl	Fresh Water	1 per batch	1 per batch	10-117%	10-117%	1 per batch	RPD ≤ 25%	90%
Organochlorines								
DDD	Fresh Water	1 per batch	1 per batch	38-135%	38-135%	1 per batch	RPD ≤ 25%	90%
DDE	Fresh Water	1 per batch	1 per batch	21-134%	21-134%	1 per batch	RPD ≤ 25%	90%
DDT	Fresh Water	1 per batch	1 per batch	18-145%	18-145%	1 per batch	RPD ≤ 25%	90%
Dicofol	Fresh Water	1 per batch	1 per batch	40-135%	40-135%	1 per batch	RPD ≤ 25%	90%
Dieldrin	Fresh Water	1 per batch	1 per batch	48-121%	48-121%	1 per batch	RPD ≤ 25%	90%
Endrin	Fresh Water	1 per batch	1 per batch	24-143%	24-143%	1 per batch	RPD ≤ 25%	90%
Methoxychlor	Fresh Water	1 per batch	1 per batch	30-163%	30-163%	1 per batch	RPD ≤ 25%	90%
Organophosphates								
Azinphos-methyl	Fresh Water	1 per batch	1 per batch	30-172%	30-172%	1 per batch	RPD ≤ 25%	90%
Chlorpyrifos	Fresh Water	1 per batch	1 per batch	40-144%	40-144%	1 per batch	RPD ≤ 25%	90%
Diazinon	Fresh Water	1 per batch	1 per batch	45-130%	45-130%	1 per batch	RPD ≤ 25%	90%
Dichlorvos	Fresh Water	1 per batch	1 per batch	13-161%	13-161%	1 per batch	RPD ≤ 25%	90%
Dimethoate	Fresh Water	1 per batch	1 per batch	40-170%	40-170%	1 per batch	RPD ≤ 25%	90%
Demeton-s	Fresh Water	1 per batch	1 per batch	35-130%	35-130%	1 per batch	RPD ≤ 25%	90%

Constituent	Matrix	Matrix Spike Frequency†	Lab Control Spike Frequency†	Matrix Spike Accuracy/Recovery	Laboratory Control Spike Accuracy/Recovery	Lab Duplicate Frequency†	Precision	Completeness
Disulfoton	Fresh Water	1 per batch	1 per batch	28-131%	28-131%	1 per batch	RPD ≤ 25%	90%
Malathion	Fresh Water	1 per batch	1 per batch	30-137%	30-137%	1 per batch	RPD ≤ 25%	90%
Methamidiphos	Fresh Water	1 per batch	1 per batch	36-124%	36-124%	1 per batch	RPD ≤ 25%	90%
Methidathion	Fresh Water	1 per batch	1 per batch	50-150%	50-150%	1 per batch	RPD ≤ 25%	90%
Parathion, methyl	Fresh Water	1 per batch	1 per batch	55-164%	50-150%	1 per batch	RPD ≤ 25%	90%
Phorate	Fresh Water	1 per batch	1 per batch	42-125%	42-125%	1 per batch	RPD ≤ 25%	90%
Phosmet	Fresh Water	1 per batch	1 per batch	40-153%	40-153%	1 per batch	RPD ≤ 25%	90%
Herbicides								
Atrazine	Fresh Water	1 per batch	1 per batch	39-156%	39-156%	1 per batch	RPD ≤ 25%	90%
Cyanazine	Fresh Water	1 per batch	1 per batch	22-172%	22-172%	1 per batch	RPD ≤ 25%	90%
Diuron	Fresh Water	1 per batch	1 per batch	52-136%	52-136%	1 per batch	RPD ≤ 25%	90%
Glyphosate	Fresh Water	1 per batch	1 per batch	85.7-121%	85.7-121%	1 per batch	RPD ≤ 25%	90%
Linuron	Fresh Water	1 per batch	1 per batch	49-144%	49-144%	1 per batch	RPD ≤ 25%	90%
Paraquat dichloride	Fresh Water	1 per batch	1 per batch	70-130%	70-130%	1 per batch	RPD ≤ 25%	90%
Simazine	Fresh Water	1 per batch	1 per batch	21-179%	21-179%	1 per batch	RPD ≤ 25%	90%
Trifluralin	Fresh Water	1 per batch	1 per batch	40-148%	40-148%	1 per batch	RPD ≤ 25%	90%
Metals								
Arsenic	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Boron	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Cadmium	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Copper	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Lead	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Molybdenum	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Nickel	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Selenium	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Zinc	Fresh Water	1 per batch	1 per batch	80-120%	80-120%	1 per batch	RPD ≤ 20%	90%
Nutrients								
Total Kjeldahl Nitrogen	Fresh Water	1 per batch	1 per batch	90-110%	NA	1 per batch	RPD ≤ 20%	90%
Nitrate (as N) + Nitrite (as N)	Fresh Water	1 per batch	1 per batch	90-110%	NA	1 per batch	RPD ≤ 20%	90%
Total Ammonia	Fresh Water	1 per batch	1 per batch	90-110%	NA	1 per batch	RPD ≤ 20%	90%
Total Phosphorus	Fresh Water	1 per batch	1 per batch	90-110%	NA	1 per batch	RPD ≤ 20%	90%
Soluble Orthophosphate	Fresh Water	1 per batch	1 per batch	90-110%	NA	1 per batch	RPD ≤ 20%	90%
Sediment Sampling								
Bifenthrin	Sediment	1 per batch	1 per batch	31-200%	65-148%	1 per batch	RPD ≤ 25%	90%
Cyfluthrin	Sediment	1 per batch	1 per batch	51-149%	51-149%	1 per batch	RPD ≤ 25%	90%
Cypermethrin	Sediment	1 per batch	1 per batch	70-152%	63-149%	1 per batch	RPD ≤ 25%	90%
Deltamethrin:Tralomethrin	Sediment	1 per batch	1 per batch	31-174%	43-139%	1 per batch	RPD ≤ 25%	90%
Esfenvalerate	Sediment	1 per batch	1 per batch	30-175%	58-157%	1 per batch	RPD ≤ 25%	90%
Lambda-Cyhalothrin	Sediment	1 per batch	1 per batch	27-164%	44-131%	1 per batch	RPD ≤ 25%	90%
Permethrin	Sediment	1 per batch	1 per batch	30-200%	50-184%	1 per batch	RPD ≤ 25%	90%
Fenpropathin	Sediment	1 per batch	1 per batch	48-176%	44-178%	1 per batch	RPD ≤ 25%	90%

Constituent	Matrix	Matrix Spike Frequency†	Lab Control Spike Frequency†	Matrix Spike Accuracy/Recovery	Laboratory Control Spike Accuracy/Recovery	Lab Duplicate Frequency†	Precision	Completeness
Chlorpyrifos	Sediment	1 per batch	1 per batch	8-190%	53-131%	1 per batch	RPD ≤ 25%	90%
Total Solids	Sediment	NA	NA	NA	NA	1 per batch	RPD ≤ 25%	90%
Total Organic Carbon	Sediment	NA	1 per batch	NA	75-125%	1 per batch	RPD ≤ 20%*	90%
Grain Size	Sediment	NA	NA	NA	NA	1 per batch	RPD ≤ 25%	90%

†Either a matrix spike duplicate or a lab control spike duplicate may function as the lab duplicate in any batch. A CRM may be used in place of a lab control spike.
*if result > 10x MDL

Table 6. (Element 7). Data quality objectives for field and laboratory accuracy and precision measurements of additional constituents monitored for CWA 303(d) compliance.

Data quality objectives in measurements of accuracy, precision, and completeness of constituents monitored for CWA 303(d) compliance. Either a Matrix Spike duplicate or a Lab Control Spike duplicate may function as the lab duplicate in any batch.

Site Name	Constituent	Matrix	Matrix Spike/Lab Control Spike Frequency	Accuracy/ Recovery	Lab Duplicate Frequency	Precision	Completeness
Mokelumne River @ Bruella Rd	Aldrin	Fresh Water	1 per batch	11-138%	1 per batch	RPD ≤ 25%	90%
	Chlordane	Fresh Water	1 per batch	44-152%	1 per batch	RPD ≤ 25%	90%
	Heptachlor	Fresh Water	1 per batch	24-124%	1 per batch	RPD ≤ 25%	90%
	Heptachlor epoxide	Fresh Water	1 per batch	58-109%	1 per batch	RPD ≤ 25%	90%
Duck Creek @ Highway 4	Hexachlorocyclohexane (alpha-BHC)	Fresh Water	1 per batch	33-111%	1 per batch	RPD ≤ 25%	90%
	Hexachlorocyclohexane (beta-BHC)	Fresh Water	1 per batch	49-119%	1 per batch	RPD ≤ 25%	90%
Drain @ Woodbridge Rd	Hexachlorocyclohexane (gamma-BHC; Lindane)	Fresh Water	1 per batch	40-114%	1 per batch	RPD ≤ 25%	90%
	Hexachlorocyclohexane (delta-BHC)	Fresh Water	1 per batch	12-97%	1 per batch	RPD ≤ 25%	90%
Roberts Island Drain @ Holt Rd	Endosulfan I	Fresh Water	1 per batch	50-131%	1 per batch	RPD ≤ 25%	90%
	Endosulfan II	Fresh Water	1 per batch	55-128%	1 per batch	RPD ≤ 25%	90%
	Toxaphene	Fresh Water	1 per batch	23-140%	1 per batch	RPD ≤ 25%	90%

Table 7. (Element 7) Data quality objectives for field and laboratory contamination measurements.

Includes additional constituents monitored for CWA 303(d) compliance.

Group	Field/Method Blank Criterion	Field Blank Frequency	Method Blank Frequency
Physical Parameters	FB < RL *or* < sample/5, MB < RL *or* if n≥3 avg ±2 s.d < RL	5%	1 per batch
Toxicity	NA	NA	NA
Pathogens	FB < RL *or* < sample/5, MB < RL *or* if n≥3 avg ±2 s.d < RL	5%	1 per batch
Nutrients	FB < RL *or* < sample/5, MB < RL *or* if n≥3 avg ±2 s.d < RL	5%	1 per batch
Metals	FB < RL *or* < sample/5, MB < RL *or* if n≥3 avg ±2 s.d < RL	5%	1 per batch
Carbamates	FB < RL *or* < environmental sample/5	5%	1 per batch
Organochlorines	FB < RL *or* < environmental sample/5	5%	1 per batch
Organophosphates	FB < RL *or* < environmental sample/5	5%	1 per batch
Pyrethroids	FB < RL *or* < environmental sample/5	5%	1 per batch
Herbicides	FB < RL *or* < environmental sample/5	5%	1 per batch

FB: Field Blank
MB: Method Blank
RL: Reporting Limit

7.4. Precision and accuracy as pertains to this data set.

Data quality will be attained by maximizing the accuracy and precision of the methods used. Any changes in procedures due to equipment changes or to improved precision and accuracy will be documented. All analyses and determinations must be performed by qualified personnel in conformance with all current EPA standards and procedures. All laboratories under contract by MLJ-LLC will employ only methods and techniques which have been determined to produce measurement data of a known and verifiable quality and which are of quality sufficient to meet the overall objectives of the project.

7.5. Representativeness and completeness.

Sampling locations are selected to represent agricultural discharges within a zone. Requirements for selecting sample sites are discussed in more detail in the MRPP. Only approved/documented sample collection methods, sample transport/holding methods, and analytical methods will be used to ensure that the measurement data represents the conditions at the sample site to the extent possible. The water bodies monitored are physically dynamic and may be altered by rate of flow, dredging, aquatic vegetation, rate of discharge/input, and many other factors. Locations and methodology are chosen to maximize representativeness, where possible and applicable; however, the samples collected can only represent the specific time and place where collected.

Completeness is defined as a measure of the amount of valid data obtained from a measurement system as compared to the planned amount. Project completeness is divided into two areas: field and transport completeness and laboratory completeness. The completeness goal of 90% is the combination of these two areas on an annual basis.

Field and transport completeness requires that samplers successfully visit each site, document the visit and collect the field information and samples as outlined in Elements 10-12. In addition, the samples must be successfully transported to the laboratories. A properly documented dry site does not reduce the completeness of the event.

Laboratory completeness refers to the process of sample reception, COC documentation, storage and in-house preservation, extraction, analysis, and laboratory QA/QC.

7.6. Minimizing bias.

Bias in sample timing is minimized by using a predetermined sample schedule that rigidly defines the sample dates for each site months in advance. In this way sampling at any given site will not be subjectively influenced by temporal factors that risk introducing intentional or unintentional sampling bias, such as irrigation events or weather patterns.

Bias in field sampling quality control monitoring is minimized by randomly distributing QC samples among all sites throughout the year. Additionally, the samplers collecting the QC samples are randomly assigned to minimize the chances of a single site or single sampler exerting more influence on overall sample quality than randomness would predict.

Bias in analysis is minimized through the use of professional, private, objective third-party labs. Any potential bias that may be introduced by these labs is assessed with semi-blind QC samples; field QC samples are not overtly identified to the lab.

Sediment sample collection is intentionally biased towards the finest sediments available, which are most likely to have been most recently deposited and are also most likely contain high K_{OC} compounds. These samples may not thoroughly represent the area of sample collection, but are necessary to achieve the goals of the program.

8. SPECIAL TRAINING NEEDS/CERTIFICATION

8.1 Specialized training or certifications.

All personnel performing sampling are trained in proper sampling techniques under the supervision of the QA Officer at MLJ-LLC, Melissa Turner. Training includes a review of all Standard Operating Procedures (SOPs) and detailed information on filling sample bottles for the various types of analysis (some constituents have specific SOPs; see appendices), proper procedures for filling field QC samples, and measuring discharge with a Marsh McBirney FloMate 2000 and Rickly Hydrological wading rod. Other topics covered are sample transport, calibration use and maintenance of YSI meters, GPS use and sample site confirmation. To further safeguard against sampling error, all sampling by recently trained personnel is done under the supervision of more experienced personnel who accompany sampling crews each time they go in the field for reference at any time. The field and laboratory SOPs in the appendices to this document are available for all staff to familiarize themselves. In addition to sampling training all sampling staff attend a field safety course presented by the MLJ-LLC QA Officer, Melissa Turner. Field safety is supplemented by a brief course in office safety and ergonomics.

8.2 Training personnel.

Melissa Turner, MLJ-LLC QA Officer, is responsible for training all sampling personnel in field sampling and safety. Assistance is provided by the MLJ-LLC Sampling Coordinator, Frank Wulff.

Table 8. (Element 8) Specialized personnel training or certification.

Specialized Training Course Title or Description	Training Provider	Personnel Receiving Training/ Organizational Affiliation	Location of Records & Certificates
Field Sampling (4 hours)	Melissa Turner and Frank Wulff, MLJ-LLC	All MLJ-LLC Sampling Personnel	MLJ-LLC Office
Field Safety/Office Safety (4 hours)	Melissa Turner and Frank Wulff, MLJ-LLC	All MLJ-LLC Sampling Personnel	MLJ-LLC Office

8.3 Training and certification documentation.

All training of sampling personnel is done at or near the MLJ-LLC office in Davis, CA. Training courses and refresher courses are presented twice annually, approximately every six months; once before storm season and again before irrigation season. Training generally consists of a lecture and presentation, a variety of supporting literature, a field excursion, and occasionally a quiz. Attendance at each training event is documented with the date and trainer noted.

8.4. Training and certification oversight.

It is the responsibility of the QA officers to ensure that all employees achieve satisfactory training, including any necessary certifications. This includes the sampling QA Officer and the QA Officers of the contract laboratories. Signatures of participants are collected as evidence of attendance and this documentation is kept in the MLJ-LLC office.

8.5. Obtaining training and certification records.

To obtain copies of sampler training materials and documentation contact the MLJ-LLC QA Officer, Melissa Turner. Contract laboratory training and certification records can be obtained from the contract laboratory QA Officer identified in Element 1.6 of this QAPP.

9. DOCUMENTS AND RECORDS

9.1. Report format.

MLJ-LLC maintains field records, sample records, and data records for each sample collected. Many of these records are presented to the CVRWQCB in the Quarterly Monitoring Reports or the Annual Monitoring Report; originals and occasionally copies of all records are kept at the MLJ-LLC office. Any records not available within a Quarterly or Annual Monitoring Report may be requested from MLJ-LLC.

Reports from the laboratories are received both as hard copies and in a SWAMP comparable EDD which is uploaded into a SWAMP comparable ILRP database by the MLJ-LLC QA Officer Melissa Turner.

9.2. Additional documents and records.

All samples collected are accompanied to the lab by a chain of custody (COC) form which identifies continuous sample custody from collection to login at the laboratory. Field data gathered at the time of sample collection is recorded on field sheets, along with positive confirmation of sampling location (latitude/longitude coordinates and photos), and entered into a SWAMP comparable database.

The exceedance reports will be submitted electronically to the CVRWQCB throughout the year following each sampling event as needed. Copies of each exceedance report will be retained at the MLJ-LLC office and incorporated into the Annual Monitoring Report, which is submitted to the CVRWQCB in both hard-copy and digital form.

9.3. Document and record archives.

Melissa Turner, MLJ-LLC QA Officer, will maintain all sample collection, chain of custody, and field analyses forms at the MLJ-LLC office for a minimum of five years. The respective laboratories will maintain all records associated with the receipt and analysis of samples analyzed for pesticides for at least five years. All electronic data entered into a SWAMP comparable database will be permanently stored in the database. CVRWQCB coalition liaison Chris Jimmerson will oversee the actions of these persons and will arbitrate any issues relative to records retention and any decisions to discard records.

Table 9. (Element 9) Document and record retention, archival, and disposition information.

Record Type	Record Needed	Retention	Archival	Disposition
Sample Collection Records	COC forms	Original at lab or at MLJ-LLC Office	Copies at MLJ-LLC Office	Stored at lab or in MLJ-LLC office for at least 5 years
Field Records	Field Sheets	MLJ-LLC Office	MLJ-LLC Office	Stored in MLJ-LLC office for at least 5 years
Analytical Records	Hard Copy Lab Reports	MLJ-LLC Office	MLJ-LLC Office	Stored in MLJ-LLC office for at least 5 years
	Electronic Data Deliverables	MLJ-LLC office	MLJ-LLC Office	Stored in MLJ-LLC office for at least 5 years
Data Records	ILRP SWAMP Comparable Database	UCD AEAL Office	UCD AEAL Office	Permanent Storage at UCD AEAL
Assessment Records	Event Exceedance Reports	MLJ-LLC office	MLJ-LLC Office and CVRWQCB	Permanent Storage at CVRWQCB
	Quarterly Monitoring Reports	MLJ-LLC office	MLJ-LLC Office and CVRWQCB	Permanent Storage at CVRWQCB
	Annual Monitoring Reports	MLJ-LLC office	MLJ-LLC Office and CVRWQCB	Permanent Storage at CVRWQCB

9.4. Electronic record backups.

Melissa Turner, MLJ-LLC QA Officer, will maintain the database; data management procedures including back-up plans for data stored electronically are outlined in Element 19 of this QAPP.

9.5. QAPP distribution.

Copies of this QAPP will be distributed to all parties involved with the project. Hard copies will be sent to all labs for review and reference. Any future amended QAPPs will be held and distributed in the same fashion. All originals and subsequent amended QAPPs will be held at the CVRWQCB. Copies of versions, other than the most current, will be discarded.

GROUP B: DATA GENERATION AND ACQUISITION

10. SAMPLING PROCESS DESIGN

For full sampling process design, see the Monitoring and Reporting Program Plan (MRPP) submitted to the CVRWQCB. The MRPP can be requested from Melissa Turner, QA Officer at MLJ-LLC, or Chris Jimmerson, Coalition liaison at the CVRWQCB. A brief summary of the MRPP description is reproduced below.

The Coalition area has been divided into six zones based on hydrology, crop types, land use, soil types, and rainfall. For a description of each zone in regards to land use, hydrology, precipitation, soil types and crop patterns refer to the Description of Coalition Area section in the MRPP. The zone names are based on the Core site within that area and include: 1) Mokelumne River @ Bruella Zone, 2) French Camp @ Airport Way Zone, 3) Terminous Tract Drain @ Hwy 12 Zone, 4) Roberts Island Drain @ Holt Ave Zone, 5) Lower San Joaquin Zone, and 6) Contra Costa Zone. One Core site in each zone and a single Assessment site will be monitored monthly. The Assessment site will rotate between the Coalition zones yearly (Table 9 of the MRPP submitted on August 25, 2008 and amended October 20, 2010).

Core sites have been selected from water bodies that have a history of monitoring and are suitable to track water and sediment quality trends over extended periods of time. A list of criteria used to select these sites is discussed in more detail in the MRPP. Core sites will undergo Assessment Monitoring every three years in order to evaluate the effects of changes in land-use and management practices and provide information about long-term trends and effectiveness of the management practices. Management plan monitoring may also occur at Core sites. Core Monitoring is not limited to largest volume water bodies, but includes a diversity of water body sizes and flows. Data generated from the Core Monitoring sites will be used to establish trend information about the effectiveness of the Coalition's efforts to reduce or eliminate the impact of irrigated agriculture on surface waters.

Assessment Monitoring will focus on a diversity of monitoring sites that are representative of individual zones. Assessment sites were selected based on the sizes and flows of surface water bodies and land uses (e.g., agricultural activities, crops and pesticide use), and include water bodies that carry agricultural drainage into natural water bodies (see Tables 2 and 3 of the MRPP). Sites with known water quality impairments (such as, but not limited to those on the Clean Water Act 303(d) listing) and sites undergoing compliance monitoring for TMDLs will also be included in this monitoring. Assessment sites are selected in order to adequately characterize water quality for all waters of the State within the Coalition region. In conjunction with Core Monitoring for trends and Special Projects sampling focused on specific problems, Assessment Monitoring will help demonstrate the effectiveness of management practices and identify locations for implementation of new management practices, as needed.

To allow the Coalition to monitor a large number of waterbodies across the six zones, the Assessment site will be rotated every year. If an Assessment site experiences more than one water quality exceedance for the same constituent within the year, it will become part of the SJCDWQC Management Plan monitoring which requires additional monitoring beyond the initial year. For site subwatersheds that are currently under a management plan, the Coalition will continue to monitor at those locations for the constituents within the management plan.

Special project monitoring will occur for the purpose of constituent-specific monitoring or targeted source identification studies as needed. This supplementary monitoring may include, but is not limited to, specific targeted studies to source exceedances or monitoring to provide information about conditions of a water body that predate agricultural inputs that occurred prior to the formation of the Coalition. Pre-existing conditions may include legacy pesticides and metals use by agriculture in the past and which bind to sediments and settled into the bed of the water body. These compounds can result in current water contamination when sediment is mobilized into the water column. Additionally, there are natural background levels of salts and metals in the subwatershed that occur as a result of weathering of local

soils. Special Project Monitoring is considered supplemental to the MRPP's requirements and will occur in specific site subwatersheds based on the actions described in the Coalition's Management Plan.

10.3. Total number of samples.

The total number of samples anticipated to be collected once each month, December-September, is outlined in Table 10 and Table 11 below. Sediment samples will be collected at Assessment sites twice per year during assessment years.

Table 10. (Element 10) Core site names, site IDs, and number of water samples collected each month.

Site Name	Station Code	Lattitude	Longitude	Zone	Analytical Parameter	# Samples	Sampling SOP	Sample Volume	Containers
Mokelumne River @ Bruella Rd	531XMRABR	38.1601	-121.2051	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
French Camp Slough @ Airport Way	531SJC504	37.8817	-121.2493	2	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Terminous Tract Drain @ Hwy 12	544XTTHWT	38.1166	-121.4936	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Roberts Island Drain @ Holt Rd	544RIDAHT	37.9556	-121.4223	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Walthall Slough @ Woodward Ave	544WSAWAV	37.77046	-121.29227	5	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Field Duplicate Samples	Random				All parameters	1 per event	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Field Blank Samples	Random				All parameters except water column toxicity	1 per event	Appendices I-IV	8 L (2.1 gallons)	See Table 12
Matrix Spike Samples	Random				Pesticides, nutrients, metals, TOC	1 per event	Appendices I-IV	15.8 L (4.2 gallons)	See Table 12

Table 11. (Element 10) Assessment site names, site IDs, and number of samples collected each month.

Site Name	Station Code	Latitude	Longitude	Zone	Analytical Parameter	# Samples	Sampling SOP	Sample Volume	Containers
Bear Creek @ North Alpine Rd	531BCANAR	38.0737	-121.2118	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Coyote Creek Drain @ Liberty Rd	531CCDALR	38.2345	-121.1747	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Jahant Slough @ Cherokee Ln	531XJSACL	38.2103	-121.2619	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Mokelumne River Drain @ North Lower Sacramento Rd	531MRDNLS	38.1952	-121.2950	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Mokelumne River Drain 2 @ Cherokee Ln	531MRD2CL	38.2107	-121.2630	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Mosher Creek @ North Alpine Rd	531MCANAR	38.0606	-121.2102	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Pixley Slough @ Fury Rd	531PSAFRXX	38.0824	-121.2425	1	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Duck Creek @ Hwy 4	531XDCAHF	37.9491	-121.1810	2	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	37.8896	-121.1461	2	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	37.8376	-121.1438	2	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Mormon Slough @ Jack Tone Rd	544MSAJTR	37.9647	-121.1488	2	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Unnamed Drain to Lone Tree Cr @ Jack Tone Rd	531UDLTAJ	37.8536	-121.1457	2	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Drain @ Woodbridge Rd	544DAWRXX	38.1525	-121.5022	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Drain to Bishop Cut @ North Rio Blanco Rd	544DBCRBR	38.0505	-121.4176	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Drain to Hog Slough	544DTHSXX	38.1667	-121.4781	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Empire Tract @ 8 Mile Rd	544ETAEMR	38.0596	-121.4849	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Empire Tract Pump	544ETPXXX	38.0418	-121.4891	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Bouldin Island Pump	544BIPXXX	38.1019	-121.5582	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
King Island Drain along 8 Mile Rd	544KIDAEM	38.0591	-121.4576	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
New Hope Tract Drain @ Walnut Grove Ct	544NHTDWG	38.2283	-121.4903	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Ridge Tract Drain	544RTDXXX	38.0455	-121.4705	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Staten Island Drain @ Staten Island Rd	544SIDASI	38.1330	-121.5232	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Venice Island Pump	544VIPXXX	38.0802	-121.5397	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Wright Tract Drain	544WTDXXX	38.0210	-121.3858	3	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
South Webb Tract Drain	544XXSWTD	38.0632	-121.6033	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Bacon Island Pump @ Old River	544BIPAOR	37.9792	-121.5708	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Byron Tract @ Discovery Bay	544BTADBX	37.9174	-121.5866	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Byron Tract Drain @ Old River	544BTDAOR	37.8853	-121.5771	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Drexler Drain	544DDXXXXX	37.8890	-121.4853	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
East Lower Jones Tract Pump	544ELJTPX	37.9640	-121.4738	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
East Palm Tract Drain	544EPTDXX	37.9410	-121.5659	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Holland Drain @ Old River	544HDAORX	37.9879	-121.5842	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Mandeville Island Pump @ Middle River	544MIPAMR	38.0485	-121.5373	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Mandeville Island Pump @ Old River	544MIPAOR	38.0065	-121.5336	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
McDonald Island Pump	544MDIPXX	38.0268	-121.4982	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Medford Island Drain	544MIDXXX	38.0399	-121.5226	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Medford Island Pump @ Middle River	544MDIPMR	38.0399	-121.5226	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
North Lower Jones Tract Pump	544NLJTPX	37.9705	-121.5007	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Orwood Tract Drain @ Old River	544OTDAOR	37.9290	-121.5607	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12

Site Name	Station Code	Latitude	Longitude	Zone	Analytical Parameter	# Samples	Sampling SOP	Sample Volume	Containers
South East Roberts Island Drain @ Howard Rd	544SERIDH	37.8768	-121.3765	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
South East Union Island Pump	544SEUIPX	37.8202	-121.4229	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
South McDonald Island Pump	544SMDIPX	37.9894	-121.4642	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
South West Roberts Island Drain @ Howard Rd	544SWRIDH	37.8770	-121.3738	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Union Island Drain @ Bonetti Rd	544UIDABR	37.8715	-121.5273	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Union Island Drain @ Klein Rd	544UIDAKR	37.8843	-121.4974	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Unnamed Drain along West Mahilla Rd	544UDAWMR	37.8516	-121.3212	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Upper Roberts Island Drain	544URIDXX	37.8189	-121.3593	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Victoria Drain along Hwy 4	544VDAHFX	37.8904	-121.5685	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Victoria Island Drain	544VIDXXX	37.9118	-121.5406	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
West McDonald Island Pump	544WMDIPX	37.9720	-121.4925	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
West Orwood Tract Drain	544WOTDXX	37.9294	-121.6075	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
West Palm Tract Drain	544WPTDXX	37.9481	-121.6080	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
West Victoria Island Drain	544WVIDXX	37.8758	-121.5765	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Grant Line Canal @ Clifton Court Rd	544XGLCAA	37.8414	-121.5288	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Grant Line Canal near Calpack Rd	544XGLCCR	37.8205	-121.4999	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Roberts Island Drain along House Rd	544RIDAHR	37.9702	-121.4074	4	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Walthall Slough Drain @ Woodward Ave	544WSAWAV	37.77046	-121.2927	5	See Table 5	1	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Field Duplicate Samples	Random				All parameters	5% of total #	Appendices I-IV	28 L (7.4 gallons)	See Table 12
Field Blank Samples	Random				All parameters except water column toxicity	5% of total #	Appendices I-IV	8 L (2.1 gallons)	See Table 12
Matrix Spike Samples	Random				Pesticides, nutrients, metals, TOC	5% of total #	Appendices I-IV	15.8 L (4.2 gallons)	See Table 12

It is the sampler's responsibility to positively locate each sampling site even when unfamiliar with the site. To facilitate a positive location, latitude/longitude coordinates, photographs and detailed notes are taken when the sites are initially scouted. A description that includes suggested driving directions, local landmarks, the latitude and longitude of the site, and photos for verification is provided to the samplers. Samplers should refer to the MLJ-LLC SOP presented in Appendix VIII. The sample should be collected from the location at the site identified in the description.

If a site becomes inaccessible for any reason, including personal danger due to high water, a failing bank, or aerial pesticide application, it is up to the discretion of the samplers whether a sample can be collected. The samplers may choose to leave and return later to collect samples and should notify the QA Officer Melissa Turner. The reason for not sampling a site must be documented in writing on the field sheet and if possible by photo; if it is determined that no sample can be collected samplers must notify the project QA Officer Melissa Turner.

Samples are collected according to a defined once-per-month schedule discussed in Element 6.1. After samples are collected the proper holding requirements of each sample, listed in Table 12, are met by employing separate couriers to deliver samples to each laboratory. The sample with the shortest holding time defines the time-frame within which all samples to a given lab are delivered. A general schedule for sampling that begins at time 00:00 is:

- 00:00-14:00 — sampling for all sites scheduled
- 14:00-15:00 — courier delivers samples to APPL
- 15:00-22:00 — samples are transferred to secure facility for overnight storage
- 22:00-23:00 — courier delivers samples to Caltest, 24-hr holding period pathogen tests are initiated
- 23:00-26:00 — samples remain in secure facility for storage
- 26:00-27:00 — courier delivers samples to AQUA-Science, 36 hr holding period toxicity tests are initiated
- 27:00 — samples to NCL packed and shipped via overnight UPS or FedEx

Because the SJCDWQC has planned to implement a long term monitoring program, data that are not successfully collected for a specific sample event or site can typically be recollected at a later sampling event. Therefore, no one specific measurement made is deemed critical (e.g., required to achieve project objectives). Each measurement will undergo close 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 other sections of this QAPP) shall be included as part of the data review process.

Steps taken to minimize bias in sample collection and analysis are reviewed in Element 7.5 of this QAPP.

11. SAMPLING METHODS

All samples are collected according to detailed SOPs for collection of samples for trace metals analysis, pathogen analysis, water toxicity analysis, general chemistry analysis, or sediment toxicity analysis found in Appendices I-X to this QAPP. The SOPs contain instructions for collecting samples and cleaning equipment between samples. These methods are summarized below.

All bottles collected from a site are considered a single sample, so all bottles share a common site ID and sample time. All bottles are certified pre-cleaned and, with the exception of the bottle for trace metals analysis, are collected by one sampler who dons clean nitrile gloves, wades to mid-channel if it is safe to do so, uncaps the bottle and fills it approximately 0.1 m below the water surface. For trace metals analysis samples are collected using "clean hand-dirty hand" technique that minimizes sampler induced contamination. This method involves two samplers. One sampler opens the bottle wearing new clean gloves; this sampler touches nothing but the bottle cap with clean gloves. The other sampler fills the bottle wearing gloves which are immersed in native water during the filling process, taking care not to touch the bottle near the open mouth. Trace metals samples are preserved with HNO_3 to less than pH 2 and chilled to $\leq$6°C. Toxicity samples are collected in new certified pre-cleaned 1-gallon amber glass bottles which are triple rinsed with native water before being filled with sample water. All other samples for general chemistry analysis are collected into analysis-specific containers, both glass and plastic. Where appropriate bottles are amber or brown to block light and prevent UV decay of analytes. Samples collected in pre-preserved bottles are filled to within 1 cm of the top to avoid preservative loss; all other samples are collected into a bottle with zero headspace.

After each bottle is full the sampler returns it to the bank. Another sampler immediately rinses the outside of the bottle with deionized water and places it into a cooler of ice away from direct sunlight. Field parameters are measured simultaneous to sample collection. After all bottles have been placed on ice, discharge is measured using a Marsh McBirney FloMate 2000. Samples are kept away from sunlight at $\leq$6°C until extraction or analysis. Although all bottles are considered a single sample, to prevent unnecessary contamination of the sample no volumes are homogenized. All are potentially subject to rare minor inter-bottle variations as a result.

Field duplicates and samples for matrix spike analysis are collected by both samplers donning nitrile gloves and filling bottles as simultaneously as possible. Field blanks are collected in an identical bottle to the environmental sample using an identical process, but bottles are filled with DI water and capped. Field QC samples are stored at $\leq$6°C alongside environmental samples until extraction or analysis.

Sediment samples are collected by a sampler wearing clean nitrile gloves using clean and acetone rinsed stainless steel scoops. Sediment from the topmost 2 cm of bed substrate is scooped from the bed, some natant liquid is carefully decanted, and the sample is placed into the appropriate containers for toxicity testing, grain size and TOC analyses, and any chemistry that may be necessary in case of toxicity. Containers are rinsed with DI water and stored away from sunlight and chilled to $\leq$6°C. Sediments collected for chemistry analyses must be extracted within 14 days or frozen within 48 hours for future analyses for up to 12 months. Sediments collected for TOC analysis must be frozen within 28 days; after samples are frozen within that time period, samples must be analyzed within 12 months. Sediment samples are stored at $\leq$6°C (not frozen) until received by the laboratory.

An acceptable water sample will meet the following criteria:

- Water samples in correct container and correct volume
- Water samples free of sampler induced contamination (no touching the inside of cap or open bottle, collected upstream of sampler)
- Water samples without sediments stirred up from water body bed
- Water samples collected below water surface
- Water samples representative of greater sample area (from a segment where water is well mixed)
- Water samples in multiple bottles apparently identical

- Water samples without headspace (unless in an acid-preserved bottle)
- Water samples in acid preserved bottles reduced to pH<2 (no preservative lost)
- Water samples immediately moved to a cooler with ice to prevent target constituent breakdown
- Water samples clearly identifiable with proper/unique sample ID noted on bottle, COC, and field sheet
- Water samples delivered to laboratories with sufficient time for analysis or extraction within hold time
- Water samples collected along with complete field data consisting of ambient environmental notes, water parameters, photo documentation, and latitude and longitude recorded.

An acceptable sediment sample will meet the following criteria:

- Sediment sampled from beneath overlying water or at the minimum moist sediment
- Sediment samples in correct containers and correct volume
- Sediment samples free of sampler induced contamination (no touching the inside of cap or open bottle, samples collected as sampler moves downstream to upstream)
- Sediment samples consisting of top 2 cm of recently deposited silt/clay, not gravel or sand
- Sediment samples representative of greater sample area (from multiple areas around sampling location)
- Sediment samples in multiple bottles apparently identical
- Sediment samples immediately moved to a cooler with ice to prevent target constituent breakdown
- Sediment samples clearly identifiable with proper/unique sample ID noted on bottle, COC, and field sheet
- Sediment samples properly frozen within hold time, if required
- Sediment samples delivered to laboratories with sufficient time for analysis or extraction within hold time and hold temperature
- Sediment samples collected along with complete field data consisting of ambient environmental notes, water parameters, photo documentation, and latitude and longitude.

Any samples that do not meet the above criteria are considered unacceptable and will not be analyzed. Samples collected in multiple bottles are not homogenized by the samplers and are only homogenized by the lab if the method specifically requires it. Samples are unfiltered unless the method specifically requires it.

Any deviation from the written SOP requires notification of the project QA Officer Melissa Turner. All deviation or problems will be noted both on the field sheet and subsequently in the SWAMP comparable database. Corrective action will be determined by the project QA Officer Melissa Turner.

12. SAMPLE HANDLING AND CUSTODY

All sample bottles are labeled with indelible marker clearly stating sample ID (composed of region code, hydrologic unit code and site ID), collection date and time, and collector. Immediately after collection, sample bottle caps are checked for tightness and bottles are placed into padded sleeves (if necessary) and packed in wet ice within an insulated cooler and kept out of direct sunlight. All samples are kept in wet ice to maintain a temperature of $\leq$6°C until delivered into lab custody. Transfer of custody by MLJ-LLC staff is outlined in an SOP located in Appendix V of this QAPP. Samples are delivered to labs or shipped by currier on wet ice within insulated coolers; if the sample is shipped, the COC is placed in a plastic bag taped to the inside of the lid and the ice chest is sealed with tape. A custodian at the receiving laboratory examines the samples for correct documentation and proper preservation while adhering to proper holding times. Method of preservation and duration of holding time varies by target analyte; these details are provided in Table 12 below. Contract laboratories follow sample custody procedures outlined in their QA plans; contract laboratory QA plans are on file with the respective laboratories. 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 remaining after successful completion of analyses.

Custody of all samples is documented and traceable from collection time to submittal for analysis on a COC form. A COC form is provided as Figure 2. The COC accompanies the samples at all times. Samples are considered under custody if:

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

All transfer of custody will proceed according to the appropriate SOP located in Appendix V of this QAPP.

All samples and accompanying COCs are submitted to analyzing laboratories by the samplers, by private overnight courier, or by overnight common parcel service. Once in the lab's possession it is the responsibility of the analyzing laboratory to maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times.

Field crews are required to fill out standardized field sheets for each sampling event. A standardized field sheet is provided as Figure 3.

Table 12. (Element 12). Sample handling and custody.

Analytical Parameter	Sample Volume	Containers # size type	Initial Preservation/Holding Requirements	Maximum Holding Time:
Total Dissolved Solids	500 mL	1x 2000 mL Polyethylene	Store at ≤6°C	7 Days
Total Suspended Solids	500 mL			7 Days
Turbidity	150 mL			48 Hours
Soluble Orthophosphate	1 L			
TKN, Ammonia, Total Phosphorus, Nitrate-Nitrite as N	500 mL	1x 500 mL Polyethylene	Preserve to ≤pH 2 with H_2SO_4, store at ≤6°C	28 Days
Metals/Trace Elements, Hardness	500 mL	1x 500 mL Polyethylene	Filter as necessary; preserve to ≤pH 2 with HNO_3, store at ≤6°C	180 Days
E. coli (pathogens)	150 mL	1x 100 mL Polyethylene	Store at 8°C	24 Hours
Fecal coliform (pathogens)	100 mL	1x 100 mL Polyethylene	Store at ≤6°C	24 Hours
Total Organic Carbon	120 mL	3x 40 mL Glass VOA with PTFE-lined cap	Preserve with HCl, store at ≤6°C	28 Days
Carbamates	1 L	4x 1 L Amber Glass	Store at ≤6°C; extract within 7 days	40 Days
Organochlorines	1 L			
Organophosphates	1 L			
Herbicides (general)	1 L			
Herbicides (paraquat dichloride)	1 L	1x 1 L brown Polyethylene	Store at ≤6°C; extract within 7 days	21 days
Herbicides (glyphosate)	80 mL	2x 40 mL Glass VOA	Store at ≤6°C; freeze (-20°C) within 2 weeks	6 Months
Aquatic Toxicity	5 Gallons	5x 1 Gallon Amber Glass	Store at ≤6°C	36 Hours
Sediment Toxicity	2 L	2x 1 L Glass	Store at ≤6°C, do not freeze	14 Days
Sediment Grain Size	250 mL	1x 250 mL Glass	Store at ≤6°C, do not freeze	28 days
Sediment Total Organic Carbon	250 mL	1x 250 mL Glass	Store at ≤6°C (not frozen), analyzed or freeze (-20ºC) within 28 days	28 days (not frozen) or 12 Months (frozen)
Sediment Chemistry	1 L	4x 250 mL Amber Glass	Store at ≤6°C, freeze (-20°C) within 48 hours	12 Months
Sediment Total Solids	250 mL	1x 250 mL Glass	Store at ≤6°C	7 Days

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ECOSYSTEMS CONSULTING
1490 Drew Ave., Suite 175, Davis, CA 95618
Office: (530) 756-5200 Fax: (530) 756-5225

APPL CHAIN-OF-CUSTODY RECORD

Client Name:	MLJ-LLC
Address:	1490 Drew Ave. Suite 175, Davis, CA 95618
Sampled By:	
Phone:	(530) 756-5200
Fax:	(530) 756-5225
Project Manager:	Michael Johnson
Project Name:	San Joaquin County & Delta Water Quality Coalition

	Sample Identification	Sample Date	Sample Time	Sample Matrix	Number	Type	Preservative	Carbamate pesticides by EPA 8321 or EPA 632*	Organochlorine pesticides by EPA 8081A or EPA 608*	Herbicides by EPA 619, EPA 8321, EPA 8141A*	Organophosphorus pesticides by EPA 8141A or EPA 614*	Paraquat diflonik by EPA 549.1	SAMPLE COMMENTS
1	531SJC504-GR			FW	4	1-L Amber Glass	Ice	X	X	X	X		
2					1	1-L Brown Poly	Ice					X	
3	531BCANAR-GR			FW	4	1-L Amber Glass	Ice	X	X	X	X		
4					1	1-L Brown Poly	Ice					X	
5	531XMRABR-GR			FW	4	1-L Amber Glass	Ice	X	X	X	X		
6					1	1-L Brown Poly	Ice					X	
7	544MSAJTR-GR			FW	4	1-liter Amber Glass	Ice	X	X	X	X		
8					1	1-L Brown Poly	Ice					X	
9	531XDCAHF-GR			FW	4	1-L Amber Glass	Ice	X	X	X	X		
10					1	1-L Brown Poly	Ice					X	
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													

Comments:

Please fax signed and completed COC to MLJ LLC:
(530) 756-5225, or email to jkatz@mlj-llc.com
* See project-specific guidelines for exact analyte list

Temperature at Log In: (°C)

Relinquished By		Relinquished By	
Signature		Signature	
Print Name		Print Name	
Organization		Organization	
Date	Time	Date	Time
Received By		**Received By**	
Signature		Signature	
Print Name		Print Name	
Organization		Organization	
Date	Time	Date	Time

Matrix codes: SED = sediment, **FW** = freshwater, **WW** = wastewater, **STRMW** = stormwater

Figure 2. Sample COC form

Figure 3. Sample Field Sheet

SJCDWQC Field Data Sheet: Water Sampling (EventType = WQ) | Entered in d-base (initial/date) | double checker: | Pg of Pgs

Station Name: French Camp Slough @ Airport Way
StationID: 531SJC504
Funding: 04SJ5001 | **Arrival Time:** | **DATE (mm/dd/yyyy):** | **SAMPLE TIME:** | **Departure Time:**
Project ID: ILRP_SJCDWQC
Group: Irrigation 4 2009 | **Purpose (Circle all that apply):** WaterChem WaterTox Habitat FieldMeasure | **Purpose Failure:**
Personnel:

Agency: MLJ-LLC
Protocol: MLJ-LLC FieldSOP 09/17/07

OCCUPATION METHOD: Walk-in, Bridge, Other
COLLECTION EQUIPMENT: Indiv bottle by hand, By pole, UCD 3L PTFE, Other
SAMPLE TYPE: Grab, Integrated
SAMPLE LOCATION: Bank, Near Bank, Thalweg, Midchannel, Open Water
HYDRO-MODIFICATION: None, Bridge, Pipes, Concrete Channel, Grade Control, Culvert, Other
HYDROMODLOC: US / DS / NA
STARTING BANK: LB / RB / NA

GPS/DGPS	Lat (dd.ddddd)	Long (ddd.ddddd)
Target:	37.8817	-121.2493
*Actual:		-
Difference:		
GPS Model:	MLJ-LLC Garmin eTrex	Datum: NAD 83
		Accuracy (ft / m):

Field Observations (Sample Type: Habitat)

PRECIPITATION: None, Foggy, Drizzle, Rain, Snow | **PICTURE NUMBER:**
PRECIPITATION (last 24 hrs): Unknown, <1", >1", None | **PICTURE NAME:**
OBSERVED FLOW: NA, Dry Waterbody Bed, No Observed Flow, Isolated Pool, 0.1 - 1cfs, 1 - 5 cfs, 5 - 20 cfs, 20 - 50 cfs, 50 - 200 cfs, >200cfs
WIND: Calm, Light Breeze, Gusty
WIND DIRECTION (from): circle direction in compass at right → N / W / E / S
WATERCOLOR: Colorless, Green, Yellow, Brown, Other
WATER CLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)
WATER ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other
WADEABLE: YES / NO
OTHER PRESENCE: Vascular, Nonvascular, OilySheen, Foam, Trash, None, Other
SKY CODE: Clear, Partly Cloudy, Overcast, Fog, Hazy
SITE ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other
DOMINANT SUBSTRATE: Concrete, Cobble, Gravel, Sand, Mud, Unk., Other

Field Measurements
SampleType=FieldMeasure; Method=Field

Air Temp (Celsius)	
Water Temp (Celsius)	
EC (uS/cm)	
DO (mg/L)	
pH	
TDS	
ORP	
YSI Meter ID	
Midchannel depth (ft / m)	
Wet Channel Width (ft / m)	
Stage	
Calculated Site Discharge	

Samples Taken (# of Containers Filled) Method = Water_Grab | Field Dup: Yes / No | Position Water Column: Subsurface (Depth = 0.1 m, Field/Water); Not Applicable (Depth = 2 cm, Sediment)

	Samples Collected	Analyte	Container	Number	Notes
	531SJC504-GR	Tox tests: Acute FH Minnow & Ceriodaphnia, Chronic Selenastrum	1-Gal Amber Glass	5	
	531SJC504-GR	Total Kjeldahl Nitrogen, Total Ammonia, Total Phosphorus (as P)	500-mL Plastic (w/H2SO4)	1	
	531SJC504-GR	TOC	40-mL Glass Amber vial, set of 3	1	
	531SJC504-GR	Carbamates, OCs, Pyrethroids, OPs, Herbicides	1-L Amber Glass	5	
	531SJC504-GR	Paraquat	1-L Plastic	1	
	531SJC504-GR	Metals, hardness (as CaCO3)	500-mL Plastic (w/HNO3)	1	
	531SJC504-GR	Glyphosate	40-mL Glass Amber vial	2	
	531SJC504-GR	E. coli	100-mL Polyethylene	1	
	531SJC504-GR	Turbidity, TDS, TSS, Nitrate + Nitrite (as N), Soluble Orthophosphate (as P)	[illegible]	1	

13. ANALYTICAL METHODS

Field and laboratory analyses will require the equipment listed in Table 17 and Table 18; analytical methods are listed in Table 13 below. In the event of equipment failure, the laboratory QA officer or Project manager should notify the project QA Officer Melissa Turner as soon as possible and appropriate documentation and corrective action can be initiated. This documentation will include shall be appended to the appropriate report from MLJ-LLC to the CVRWQCB. Corrective action must be determined on a case-by-case basis but may include re-extraction, re-analysis, resampling or data rejection if the sample cannot be salvaged. If the failure necessitates a qualifier or flag in the database it is the project QA Officer's responsibility to ensure that the correct qualifier or flag is applied.

A laboratory may store surplus volume for as long as it sees fit for re-extraction if necessary. The laboratory shall dispose of all samples in accordance with state and federal regulations.

Table 13. (Element 13) Field and laboratory analytical methods.

See Table 2 for a description of measurement principles for each analysis. Requirements of field measurements include, but are not limited to clean/calibrated sensors which are not buried in the bed of the river.

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/Appendix	Modified for Method
Physical Parameters								
Flow	Fresh Water	Field Measure	NA[1]	1 cfs	NA	USGS R2Cross streamflow Method	Appendix IV	Yes
pH	Fresh Water	Field Measure	6.5-8.5	0.1 pH units	NA	EPA 150.1	Appendix IX	No
Electrical Conductivity	Fresh Water	Field Measure	700 µmhos/cm	100 µmhos/cm	NA	EPA 120.1	Appendix IX	No
Dissolved oxygen	Fresh Water	Field Measure	7 mg/L	0.1 mg/L	NA	SM 4500-O	Appendix IX	No
Temperature	Fresh Water	Field Measure	NA[1]	0.1 °C	NA	SM 2550	Appendix IX	No
Turbidity	Fresh Water	Caltest	variable	0.05 NTU	0.020 NTU	EPA 180.1	SOPW-TURB-rev7, Appendix XXIX	No
Total Dissolved Solids	Fresh Water	Caltest	450 mg/L	10 mg/L	4.0 mg/L	SM 2540C	SOP W-TDS-rev8, Appendix XXVI	No
Total Suspended Solids	Fresh Water	Caltest	NA[2]	3 mg/L	2.0 mg/L	SM2540D	SOP B-TSS-rev7, Appendix XXX	No
Hardness	Fresh Water	Caltest	NA[1]	5 mg/L	3.0 mg/L	SM2340C	SOP W-HARD-rev8, Appendix XXII	No
Total Organic Carbon	Fresh Water	Caltest	NA[1]	0.5 mg/L	0.30 mg/L	SM5310B	SOP W-TOC/DOC-rev10, Appendix XXVIII	No
Pathogens								
Escherichia coli	Fresh Water	Caltest	235 MPN/100 mL	1 MPN/100 mL	1.0 MPN/100 mL	SM 9223	SOP B-MMOMUG-REV11, Appendix XXI	No
Toxicity								
Water Column Toxicity	Fresh Water	AQUA-Science	No Toxicity	NA	NA	EPA 821-R-02-012	SOP 6.1A-5/Appendix XV, SOP 6.2A-5/Appendix XVI	No
	Fresh Water	AQUA-Science	No Toxicity	NA	NA	EPA 821-R-02-013	SOP 6.3C-4/ Appendix XVII	No
Sediment Toxicity	Sediment	AQUA-Science	No Toxicity	NA	NA	EPA 600/R-99-064	Appendix XVIII	No
Carbamates								
Aldicarb	Fresh Water	APPL Inc	3 µg/L	0.4 µg/L	0.20 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Carbaryl	Fresh Water	APPL Inc	2.53 µg/L	0.07 µg/L	0.050 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Carbofuran	Fresh Water	APPL Inc	ND	0.07 µg/L	0.050 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Methiocarb	Fresh Water	APPL Inc	0.5 µg/L	0.4 µg/L	0.20 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Methomyl	Fresh Water	APPL Inc	0.52 µg/L	0.07 µg/L	0.050 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Oxamyl	Fresh Water	APPL Inc	50 µg/L	0.4 µg/L	0.20 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Organochlorines								
DDD	Fresh Water	APPL Inc	0.00083 µg/L	0.01 µg/L	0.003 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
DDE	Fresh Water	APPL Inc	0.00059 µg/L	0.01 µg/L	0.004 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
DDT	Fresh Water	APPL Inc	0.00059 µg/L	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Dicofol	Fresh Water	APPL Inc	NA[1]	0.1 µg/L	0.01 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Dieldrin	Fresh Water	APPL Inc	0.00014 µg/L	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Endrin	Fresh Water	APPL Inc	0.036 µg/L	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Methoxychlor	Fresh Water	APPL Inc	0.03 µg/L	0.01 µg/L	0.008 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
Organophosphates								
Azinphos-methyl	Fresh Water	APPL Inc	0.01 µg/L	0.1 µg/L	0.02 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/Appendix	Modified for Method
Chlorpyrifos	Fresh Water	APPL Inc	0.015 µg/L	0.015 µg/L	0.003 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Diazinon	Fresh Water	APPL Inc	0.1 µg/L	0.02 µg/L	0.004 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Dichlorvos	Fresh Water	APPL Inc	0.085 µg/L	0.1 µg/L	0.02 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Dimethoate	Fresh Water	APPL Inc	1.0 µg/L	0.1 µg/L	0.08 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Demeton-s	Fresh Water	APPL Inc	NA[2]	0.1 µg/L	0.01 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Disulfoton	Fresh Water	APPL Inc	0.05 µg/L	0.05 µg/L	0.02 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Malathion	Fresh Water	APPL Inc	ND	0.1 µg/L	0.05 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Methamidiphos	Fresh Water	APPL Inc	0.35 µg/L	0.2 µg/L	0.08 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Methidathion	Fresh Water	APPL Inc	0.7 µg/L	0.1 µg/L	0.04 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Parathion, methyl	Fresh Water	APPL Inc	ND	0.1 µg/L	0.075 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Phorate	Fresh Water	APPL Inc	0.7 µg/L	0.1 µg/L	0.07 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Phosmet	Fresh Water	APPL Inc	140 µg/L	0.2 µg/L	0.06 µg/L	EPA 8141A	SOP ANA8141A/Appendix XIII	No
Herbicides								
Atrazine	Fresh Water	APPL Inc	1.0 µg/L	0.5 µg/L	0.07 µg/L	EPA 8141A	SOP ANA619/Appendix XI	No
Cyanazine	Fresh Water	APPL Inc	1.0 µg/L	0.5 µg/L	0.09 µg/L	EPA 8141A	SOP ANA619/Appendix XI	No
Diuron	Fresh Water	APPL Inc	2 µg/L	0.4 µg/L	0.2 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Glyphosate	Fresh Water	NCL Ltd	700 µg/L	5 µg/L	2.77 µg/L	EPA 547	SOP ME075v08/Appendix XIX	No
Linuron	Fresh Water	APPL Inc	1.4 µg/L	0.4 µg/L	0.2 µg/L	EPA 8321	SOP HPL8321A/ Appendix XIV	No
Paraquat dichloride	Fresh Water	APPL Inc	3.2 µg/L	0.5 µg/L	0.08 µg/L	EPA 549.1	SOP ME019v10/Appendix XX	No
Simazine	Fresh Water	APPL Inc	4.0 µg/L	0.5 µg/L	0.08 µg/L	EPA 8141A	SOP ANA619/Appendix XI	No
Trifluralin	Fresh Water	APPL Inc	5 µg/L	0.05 µg/L	0.036 µg/L	EPA 8141	SOP ANA8141A/Appendix XIII	No
Metals								
Arsenic	Fresh Water	Caltest	10 µg/L	0.5 µg/L	0.01 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Boron	Fresh Water	Caltest	700 µg/L	10 µg/L	0.47 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Cadmium	Fresh Water	Caltest	Variable[3] (MUN=2.0 µg/L)	0.1 µg/L	0.011 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Copper	Fresh Water	Caltest	Variable[3] (MUN=170 µg/L)	0.5 µg/L	0.06 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Lead	Fresh Water	Caltest	Variable[3] (MUN=2.0 µg/L)	0.25 µg/L	0.071 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Molybdenum	Fresh Water	Caltest	10 µg/L	0.25 µg/L	0.016 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Nickel	Fresh Water	Caltest	Variable[3] (MUN=12 µg/L)	0.5 µg/L	0.01 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Selenium	Fresh Water	Caltest	50 µg/L (5 µg/L 4 day average)	1 µg/L	0.06 µg/L	EPA 200.8 (ICPMS Reaction Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No
Zinc	Fresh Water	Caltest	Variable[3] (MUN=5000 µg/L)	1 µg/L	0.8 µg/L	EPA 200.8 (ICPMS Collision Cell)	SOP M-2008-3MODErev2, Appendix XXIII	No

Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
						Method	SOP/Appendix	Modified for Method
Nutrients								
Total Kjeldahl Nitrogen	Fresh Water	Caltest	NA[1]	0.1 mg/L	0.07 mg/L	SM4500NH3 C	SOP W-NH3-TKN-rev10, Appendix XXVII	No
Nitrate (as N)+ Nitrite (as N)	Fresh Water	Caltest	10,000 µg/L	0.05 mg/L	0.05 mg/L	EPA 353.2	SOP W-NNO3-rev2, Appendix XXIV	No
Total Ammonia	Fresh Water	Caltest	1.5 mg/L or variable[4]	0.1 mg/L	0.060 mg/L	SM4500NH3 C	SOP W-NH3-TKN-rev10, Appendix XXVII	No
Total Phosphorus	Fresh Water	Caltest	NA[1]	0.01 mg/L	0.040 mg/L	SM4500P E	SOP W-PHOS-rev8, Appendix XXV	No
Soluble Orthophosphate	Fresh Water	Caltest	NA[1]	0.01 mg/L	0.010 mg/L	SM4500P E	SOP W-PHOS-rev8, Appendix XXV	No
Sediment								
Bifenthrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.1 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Cyfluthrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.11 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Cypermethrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.1 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Deltamethrin: Tralomethrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.12 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Esfenvalerate	Sediment	Caltest	NA[5]	0.33 µg/kg	0.13 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Lambda-Cyhalothrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.06 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Permethrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.11 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Fenpropathrin	Sediment	Caltest	NA[5]	0.33 µg/kg	0.07 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Chlorpyrifos	Sediment	Caltest	NA[5]	0.33 µg/kg	0.12 µg/kg	GCMS-NCI-SIM	SOP O-Pyrethroidsncirev1, APPENDIX XXXII	No
Total Solids	Sediment	Caltest	NA	0.1%	0.1%	SM2540B	SOP W-RESIDUE-rev7, APPENDIX XXXI	No
Total Organic Carbon	Sediment	Caltest[6]	NA[1]	200 mg/kg	100 mg/kg	Walkley Black	PTS SOP #4, Appendix XXXIV	No
Grain Size	Sediment	Caltest[6]	NA[1]	1% sand, silt, clay, gravel	0.4 µm	ASTM D-422-63, ASTM D4464M-85	PTS SOP #3, Appendix XXXIII	No

[1] Not available until completion of evaluation studies or no Water Quality Trigger Limit applicable.
[2]Currently these constituents do not have a WQTL designated by the Regional Board however this may change in the future.
[3] Variable WQTLs based on hardness. Municipal and domestic supply WQTLs in parenthesis are regardless of hardness.
[4] Variable WQTLs based on pH and temperature. Municipal and domestic supply WQTLs in parenthesis are regardless of pH and temperature.
[5] Sediment chemistry result reported if positive sediment toxicity is measured.
[6] Subcontracted to PTS Laboratories.

Table 14. (Element 13). Laboratory analytical methods of constituents monitored for CWA 303(d) compliance.

Site Name	Constituent	Matrix	Analyzing Lab	WQTL	RL	MDL	Analytical Method		
							Method	SOP/Appendix	Modified for Method
Mokelumne River @ Bruella Rd Duck Creek @ Highway 4 Drain @ Woodbridge Rd Roberts Island Drain @ Holt Rd	Aldrin	Fresh Water	APPL Inc	0.00013 µg/L[1] 3 µg/L[2]	0.01 µg/L	0.009 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Chlordane	Fresh Water	APPL Inc	0.00057 µg/L[1] 0.0043 µg/L[2]	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Heptachlor	Fresh Water	APPL Inc	0.00021 µg/L[1] 0.0038 µg/L[2]	0.01 µg/L	0.008 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Heptachlor epoxide	Fresh Water	APPL Inc	0.0001 µg/L[1] 0.0038 µg/L[2]	0.01 µg/L	0.007 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Hexachlorocyclohexane (alpha-BHC)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Hexachlorocyclohexane (beta-BHC)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.008 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Hexachlorocyclohexane (gamma-BHC; Lindane)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Hexachlorocyclohexane (delta-BHC)	Fresh Water	APPL Inc	0.0039 µg/L[1,3] 0.95 µg/L[2,3]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Endosulfan I	Fresh Water	APPL Inc	110 µg/L[1,4] 0.056 µg/L[2,4]	0.01 µg/L	0.005 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Endosulfan II	Fresh Water	APPL Inc	110 µg/L[1,4] 0.056 µg/L[2,4]	0.01 µg/L	0.004 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No
	Toxaphene	Fresh Water	APPL Inc	0.00073 µg/L[1] 0.0002 µg/L[2]	0.5 µg/L	0.380 µg/L	EPA 8081A	SOP ANA8081A/Appendix XII	No

[1] Municipal and domestic supply
[2] Cold freshwater habitat, spawning
[3] WQTL is total Hexachlorocyclohexane
[4] WQTL is total Endosulfan

14. QUALITY CONTROL

This project will comply with all current SWAMP QC guidelines to maintain comparability of data quality throughout the ILRP SWAMP Comparable database. Field QC frequencies are calculated to ensure that a minimum of 5% all analyses are for QC purposes. All analytical QCs must be analyzed at a frequency of 5% and 1 per batch. QC activities for this project are listed in the tables below.

Table 15. (Element 14) Field Sampling QC.

Sample Type	Frequency	Acceptable Limits	Corrective Action	Sampling SOP	Analytical SOP & Method
Water Column Toxicity					
Field Duplicate	5% annual total, minimum 5% per event	RPD ≤25%	Determine cause, take appropriate corrective action.	Appendix I	Appendix XV; EPA821-R02-12
Organic and Inorganic Chemistry Parameters					
Field Blank	5% annual total	Detectable substance contamination <RL or < sample/5	Determine cause of problem, remove sources of contamination.	Appendix II	See Table 16
Field Duplicate	5% annual total	RPD ≤25%	Determine cause, take appropriate corrective action.		
Sediment Toxicity					
Field Duplicate	5% annual total, minimum 5% per event	RPD ≤25%	Determine cause, take appropriate corrective action.	Appendix IV	Appendix XVIII, EPA 600/R-99-064
Sediment Chemistry					
Field Blank	5% annual total	Detectable substance contamination <MDL or <30% of lowest sample	Determine cause of problem, remove sources of contamination.	Appendix IV	Appendix XXXII; GCMS-NCI-SIM
Field Duplicate	5% annual total	RPD ≤25%	Determine cause, take appropriate corrective action.		
Sediment TOC					
Field Duplicate	5% annual total	RSD ≤20%	Determine cause, take appropriate corrective action.	Appendix IV	Appendix XXXIV; Walkley Black Method
Sediment Grain Size					
Field Duplicate	5% annual total	RSD ≤20%	Determine cause, take appropriate corrective action.	Appendix IV	Appendix XXXIII; ASTM D422-63

Table 16. (Element 14) Analytical QC.

Sample Type	Frequency	Acceptable Limits	Corrective Action	Sampling SOP	Analytical SOP & Method
Water Column Toxicity					
Lab Control Sample, *Ceriodaphnia dubia*	1 per 20 samples, minimum 1 per batch	Survival in control samples ≥90%; all performance criteria outlined in SOP are met.	Determine cause, take appropriate corrective action. Reanalyze all suspect samples.	Appendix I	Appendix XV; EPA821-R02-12
Lab Control Sample, *Pimephales promelas*	1 per 20 samples, minimum 1 per batch	Survival in control samples ≥80%, all performance criteria outlined in SOP are met.	Determine cause, take appropriate corrective action. Reanalyze all suspect samples.		
Lab Control Sample, *Selenastrum capricornutum*	1 per 20 samples, minimum 1 per batch	> 200,000 cells/mL, variability of controls <20%, all performance criteria outlines in SOP are met.	Determine cause, take appropriate corrective action. Reanalyze all suspect samples.	Appendix I	Appendix XVII; EPA821-R02-13
Organic Parameters: Organophosphates, Organochlorines, Carbamates, and Additional Herbicides					
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.	Appendix II	Appendices XI-XIV, XIX, XX; ANA 619, EPA 8081A, EPA 8141A, EPA 8321A, EPA 547, EPA 549.2
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Matrix Spike*	1 per 20 samples, minimum 1 per batch	% Recovery =50-150% or control limits based on 3x the standard deviation of the labs actual method recoveries	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data. Zero percent recovery requires rejection of all suspect data.		
Matrix Spike Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	Measured value <95% confidence intervals, if certified. Otherwise % recovery =50-150%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Surrogates	In every calibration standard, sample, and blank analyzed for organics by GC or isotope dilution GC-MS; added to samples prior to extraction	Based on 3x the standard deviation of the lab's actual method recoveries	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Inorganic Parameters: Nutrients, Metals, Total Organic Carbon					

Sample Type	Frequency	Acceptable Limits	Corrective Action	Sampling SOP	Analytical SOP & Method
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.	Appendix II, Appendix III	Appendices XXVII, XXIII, XXVIII; EPA 353.2, EPA 200.8, EPA 415.1
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Matrix Spike*	1 per 20 samples, minimum 1 per batch	% Recovery =75-125%	If SRMs are in control then proceed. If not, determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Matrix Spike Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	% Recovery =75-125%	Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Internal Standards	EPA 200.8 - Must be present on all samples. Standards and blanks at identical levels	EPA 200.8 – Absolute response of any one internal standard must not deviate outside of 70-125% of the original response in the calibration blank	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Inorganic Parameters: Turbidity, Total Dissolved Solids, Total Suspended Solids					
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Determine cause of problem, remove sources of contamination, reanalyze suspect samples or flag all suspect data.	Appendix II	Appendices XXVI , XXIX, XXX; SM 2540C/EPA 160.1, EPA 180.1/SM 2130B, EPA 160.2/SM 2540D
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	Measured value <95% confidence intervals, if certified. Otherwise % recovery =80-120%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Pathogens					

Sample Type	Frequency	Acceptable Limits	Corrective Action	Sampling SOP	Analytical SOP & Method
Lab Blanks (method)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <RL	Identify contamination source. Clean equipment and prepare new media, check reagents, reanalyze samples.	Appendix II	Appendix XXI; SM 9223
Lab Negative Control	1 per culture medium or reagent lot	Detectable substance contamination <RL	Identify contamination source. Clean equipment and prepare new media, reanalyze samples.		
Lab Positive Control	1 per culture medium or reagent lot	Detectable substance contamination <RL	Identify and correct problem. Re-examine positive control.		
Lab Duplicates	1 per 10 samples, minimum 1 per batch	R_{log} ≤3.27 x mean R_{log}	Recalibrate and reanalyze.		
Sediment Toxicity					
Lab Control Sample, *Hyalella azteca*	1 per 20 samples, minimum 1 per batch	Survival in control samples ≥80%; measurable growth in the controls, all performance criteria outlined in SOP are met.	Determine cause, take appropriate corrective action. Reanalyze all suspect samples.	Appendix IV	Appendix XVIII, EPA 600/R-99-064
Sediment Organics					
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <MDL	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.	Appendix IV	Appendix XXXII; GCMS-NCI-SIM
Lab Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Matrix Spike*	1 per 20 samples, minimum 1 per batch	% Recovery =50-150% or control limits based on 3x the standard deviation of the labs actual method recoveries	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data. Zero percent recovery requires rejection of all suspect data.		
Matrix Spike Duplicate*	1 per 20 samples, minimum 1 per batch	RPD ≤25%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Lab Control Spike, CRM, or SRM	1 per 20 samples, minimum 1 per batch	Measured value 70-130% of the 95% confidence intervals, if certified. Otherwise %Recovery =50-150%	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		

Sample Type	Frequency	Acceptable Limits	Corrective Action	Sampling SOP	Analytical SOP & Method
Surrogates	In every calibration standard, sample, and blank analyzed for organics by GC or isotope dilution GC-MS; added to samples prior to extraction	Determined by Lab Manager	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Internal Standards	According to frequency in lab SOP	Linear regression, r>0.995	Determine cause, take appropriate corrective action. Recalibrate and reanalyze all suspect samples or flag all suspect data.		
Sediment TOC					
Lab Blanks (method, reagent, instrument)	1 per 20 samples, minimum 1 per batch	Detectable substance contamination <MDL or <30% of lowest sample	Identify and eliminate contamination source. Reanalyze all samples in batch. Qualify data as needed.	Appendix IV	Appendix XXXIV; Walkley Black Method
Lab Control Spike, CRM, or SRM	1 per 15 samples,	Within 95% confidence interval of the certified value; if not certified within 20-25% consensus value	Review raw data quantification reports. Check instrument response using calibration standard. Recalibrate and reanalyze CRM and samples. Repeat until control limits are met.		
Lab Duplicates	1 per 20 samples, minimum 1 per batch	RSD ≤20%	Check calculations and instruments. Recalibrate and reanalyze. If problem persists, then identify and eliminate source of imprecision and reanalyze.		
Sediment Grain Size					
Lab Duplicates	1 per 12 samples,	RSD ≤20%	Check calculations and instruments. Recalibrate and reanalyze. If problem persists, then identify and eliminate source of imprecision and reanalyze.	Appendix IV	Appendix XXXIII; ASTM D422-63

*For the purposes of this project it is acceptable for the matrix spike duplicate or the laboratory control duplicate to stand in for the lab duplicate as a measure of the precision of the analytical method.

When control limits are exceeded the lab QA officer and Project QA Officer must agree on a potential cause and develop a response that ensures it will not happen again. Detections in blanks must be sourced and field, analytical, or cleaning practices must be modified to reduce the risk of further contamination. Excessive RPD values or recovery rates outside of criteria may also require a change of field or laboratory practices. Exceedances of analytical control limits must be reported in the appropriate lab report. Precision in this project is assessed through a combination of field duplicate samples and laboratory duplicate samples. Precision of a pair of samples is measured as the relative percent difference (RPD) between a sample and its duplicate—a laboratory control sample (LCS) and its duplicate (LCSD), a matrix spike (MS) and matrix spike duplicate (MSD), an environmental sample (E) and field duplicate (FD), or an environmental sample and its associated lab duplicate. It is calculated as follows:

$$RPD(\%) = \left| \frac{2(V_i - V_D)}{V_i + V_D} \right| x\ 100$$

V_i = The measured concentration of the initial sample
V_D = The measured concentration of the sample duplicate

This same calculation is done for field duplicates and the associated environmental sample.

For precision assessment purposes any lab duplicate, including a matrix spike duplicate or a lab control spike duplicate, may function as the lab duplicate in any batch.

For sediment grain size samples, individual grain size classes are reported as a percentage based on the composition of the entire sample and therefore are not values that can be evaluated individually (they are not independent variables). Precision for sediment grain size is evaluated by the relative percent difference between grain size standard deviations of the environmental sample and the duplicate. The grain size standard deviation (SD) for all classes of a single sample is calculated using the following Folk and Ward 1957 Logarithmic equation:

$$SD = \sigma_1 = \frac{\Phi_{84} - \Phi_{16}}{4} + \frac{\Phi_{95} - \Phi_5}{6.6}$$

Where Φ_{84} = phi value of the 84th percentile sediment grain size category
Φ_{16} = phi value of the 16th percentile sediment grain size category
Φ_{95} = phi value of the 95th percentile sediment grain size category
Φ_5 = phi value of the 5th percentile sediment grain size category

Precision is calculated based on the relative percent difference between the standard deviation of the environmental sample and the standard deviation of a duplicate sample using the following formula:

$$RPD_{SD} = \left| \frac{2(SD_i - SD_D)}{(SD_i + SD_D)} \right| 100$$

SD_i= standard deviation of the initial or environmental sample based on the Folk and War Logarithmic equation
SD_D= standard deviation of the field or laboratory duplicate sample based on the Folk and War Logarithmic equation

Accuracy in this project is assessed using either an LCS or MS. For an LCS lab water is spiked with a known concentration of a target analyte and the percent recovery (PR) is reported. PR in an LCS is calculated as follows:

$$\%\ Recovery = \left(\frac{V_{LCS}}{V_{Spike}} \right) x\ 100$$

V_{LCS} = The measured concentration of the spiked control sample

V_{Spike} = The expected spike concentration

A MS can also be used to assess accuracy. For a MS, environmental water is spiked with a known concentration of a target analyte and the PR is reported. PR in and MS is calculated as follows:

$$\%\ Recovery = \left(\frac{V_{MS} - V_E}{V_{Spike}} \right) x\ 100$$

V_{MS} = The measured concentration of the spiked matrix sample
V_{Spike} = The concentration of the spike added
V_E = The measured concentration of the original (unspiked) matrix sample

The MS should not be used solely to assess accuracy due the likelihood of matrix interference however if an LCS does not fall within acceptance criteria an MS may be used to validate a batch if the MS is within acceptance criteria. Some constituents are difficult to spike (e.g. turbidity) and therefore a laboratory may chose to analyze a certified reference material (CRM). A CRM analysis may be used in place of an LCS analysis.

If results for any precision or accuracy samples do not meet the data quality objectives provided in this QAPP, the laboratory must implement corrective measures as outlined in Table 16. If corrective measures require reanalysis of the sample, and the results repeatedly fail to meet the objectives, then the lab is obligated to halt the analysis of samples, identify the source of the imprecision, and make corrections where appropriate before proceeding. If results for any field duplicates and associated environmental samples do not meet the data quality objectives listed in the above tables then the samplers must assess sampling practices and make corrections to their field procedures which will ensure homogeneity in the samples before proceeding.

15. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Laboratory equipment is maintained by a qualified technician at the frequency listed in Table 17. MLJ-LLC field meters are maintained according to the owner's manual specifications at the frequency listed in Table 18. Laboratories are responsible for maintaining all laboratory equipment according to manufacturer specifications or SWAMP requirements, whichever are more stringent. Frequency and procedures for maintenance of analytical equipment used by each laboratory are documented in the Quality Assurance Manual for each laboratory, which is available from the laboratory on request. Laboratories are responsible for testing, inspecting, and maintaining all analytical equipment. In the event of equipment failure, the source of the failure must be identified and rectified, the equipment must be recalibrated, and any samples analyzed outside of calibration limits must be reanalyzed.

Table 17. (Element 15) Testing, inspection, maintenance of field and analytical instruments.

Due to the complexity and sensitivity of most laboratory instruments the testing, inspection, and maintenance procedures are difficult to summarize. A brief and general summary for each instrument follows; however, this table is not intended to describe all testing, inspection, and maintenance procedures for all tests, nor will this QAPP attempt to report SOPs for all such procedures. It is expected that laboratories will employ knowledgeable staff capable of testing, inspecting, and maintaining analytical instruments to ensure a level of data quality that matches or exceeds that demanded in this QAPP.

Equipment / Instrument	Maintenance Activity, Testing Activity or Inspection Activity	Responsible Person	Frequency	SOP Reference
YSI 556MPS with Glass Electrode pH	Clean glass bulb and visually inspect	F. Wulff (MLJ-LLC)	<24 hours before sampling	Appendix IX
YSI 556MPS with Steady State Polarographic DO Sensor	Change membrane and KCl solution	F. Wulff (MLJ-LLC)	Every 30 days	Appendix IX
YSI 556MPS with Electrode Cell EC and Thermistor Temperature Probe	Clean electrodes	F. Wulff (MLJ-LLC)	<24 hours before sampling	Appendix IX
Tecator auto analyzer (Model 2400)	Clean manifold	Sonya Babcock (Caltest)	According to manufacturers specifications	Retained in laboratory
Turbidimeter	Periodic meter zero, calibration in each range	Sonya Babcock (Caltest)	When switching ranges	W-TURB-rev4 Appendix XXXI
ICP-MS	Check and replace water filter, replace pump gaskets, check source filament, check multiplier gain, clean ion source, replace lamp	Sonya Babcock (Caltest)	According to manufacturers specifications	Retained in laboratory
Shimadzu TOC-Vcsh Analyzer Shimadzu 68 place auto analyzer Model ASI-V	Change: catalyst, sample pump tubing, permcation tube, halide scrubber, acid reagent bottle,rinse bottle, humidifier water	Sonya Babcock (Caltest)	According to manufacturers specifications	W-TOC/DOC-rev9 Appendix XXX

Equipment / Instrument	Maintenance Activity, Testing Activity or Inspection Activity	Responsible Person	Frequency	SOP Reference
Ion Chromatograph (DX 320)	Inspect pump and injector seals for leaks, inspect tubing for clogs, inspect or replace precolumn filter, inspect detector for leaks and air bubbles, replace old lamps	Sonya Babcock (Caltest)	According to manufacturers specifications	Retained in laboratory
Spectrophotometer	Check/replace lamp	Sonya Babcock (Caltest)	According to manufacturers specifications	Retained in laboratory
Hewlett Packard 1090L HPLC; Agilent 100 Liquid Chromatograph	Inspect pump and injector seals for leaks, inspect tubing for clogs, inspect or replace precolumn filter, inspect detector for leaks and air bubbles, replace old lamps	Leonard Fong (APPL)	According to manufacturers specifications	Retained in laboratory
Finnigan LCQ Ion Trap Mass Spectrometer; Agilent 1100 G1946D SL Mass Spectrometer	Check and replace water filter, replace pump gaskets, check source filament, check multiplier gain, clean ion source, replace lamp	Leonard Fong (APPL)	According to manufacturers specifications	Retained in laboratory
Hewlett Packard 6890 Gas Chromatograph, Agilent Technologies 6890 Gas Chromatograph, Hewlett Packard 5890 Gas Chromatograph	Check and clean detector and injector, check syringe and column for integrity and installation, rinse column with solvent, check column for leaks,	Leonard Fong (APPL)	According to manufacturers specifications	Retained in laboratory
Perkin Elmer Series 200 Pump, post column pump, and Perkin Elmer LC 240 Fluorescence Detector	Inspect pump and injector seals for leaks, inspect tubing for clogs, inspect or replace precolumn filter, inspect detector for leaks and air bubbles, replace old lamps	Theresa Sherman (NCL)	Every analytical analysis	Retained in laboratory

16. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

MLJ-LLC field meters are calibrated according to the owner's manual specifications at the frequency listed in Table 18. Laboratories are responsible for calibrating all laboratory equipment according to manufacturer specifications or SWAMP requirements, whichever are more stringent. Frequency and procedures for calibration of analytical equipment used by each laboratory are documented in the Quality Assurance Manual for each laboratory, which is available from the laboratory on request. All equipment capable of being calibrated must be successfully calibrated before analysis. If calibration fails, all affected samples must be re-analyzed or the data flagged and the equipment must be repaired before further analysis.

Table 18. (Element 16) Calibration of field and analytical equipment.

Equipment / Instrument	SOP Reference	Calibration Description and Criteria	Frequency of Calibration	Responsible Person
YSI 556MPS with Glass Electrode pH	Appendix IX	3 Point calibration at pH 4, 7, and 10; calibration must be accepted by YSI meter	<24 hours before sampling	F. Wulff (MLJ-LLC)
YSI 556MPS with Steady State Polarographic DO Sensor	Appendix IX	H_20 Saturated air calibration ($\%O_2$) at default 760mm Hg	Before every measurement	F. Wulff (MLJ-LLC)
YSI 556MPS with Electrode Cell EC and Thermistor Temperature Probe	Appendix IX	Calibration to 1413 µS/cm; calibration must be accepted by YSI meter. Temperature calibration is factory set and does not require user calibration	<24 hours before sampling	F. Wulff (MLJ-LLC)
Tecator auto analyzer (Model 2400)	W-TKN-rev9 Appendix XXIX	For TKN calibrate with TKN digestion tablet. For NH_3 standardize with 100mL sample with 5mL borate buffer all adjusted to pH 9.5 with NaOH	Every analytical analysis	Sonya Babcock (Caltest)
Turbidimeter	W-TURB-rev6 Appendix XXXI	Periodic meter zero,calibration in each range	When switching ranges	Sonya Babcock (Caltest)
ICP-MS	M-200.8-rev5E Appendix XXIV	Three calibration standards per linear range, MDL determination, ICV, CCV	When analyst observes calibration is necessary, MDL determined annually, ICV immediately after calibration, CCV after every 10 samples and at end of sample run	Sonya Babcock (Caltest)
Shimadzu TOC-Vcsh Analyzer Shimadzu 68 place auto analyzer Model ASI-V	W-TOC/DOC-rev9 Appendix XXX	a. 2 calibration curves: curve 10 – 6 points, curve 200 – 5 points. $r^2 = 0.995$ b. Analyze blank & LCS, ICV for every 20 samples, CCV, spike and spike duplicate, every 10 samples	a. Every month b. Every 20 or 10 samples respectively	Sonya Babcock (Caltest)
Ion Chromatograph (DX 320)	W-DIONEXrev5 Appendix XXVI	Mixed-standard curve calibration	Every analytical analysis	Sonya Babcock (Caltest)

Equipment / Instrument	SOP Reference	Calibration Description and Criteria	Frequency of Calibration	Responsible Person
Spectrophotometer	W-NO2-rev5 Appendix XXV	Four standard calibration curve, reagent blank, QC blanks, spikes, control samples, and duplicates	Every batch of every analytical analysis	Sonya Babcock (Caltest)
Hewlett Packard 1090L HPLC	HPL8321A Appendix XIV	Calibration with minimum of five stock standard concentrations	Every analytical sequence	Leonard Fong (APPL)
Agilent 100 Liquid Chromatograph	HPL8321A Appendix XIV	Calibration with minimum of five stock standard concentrations. Calibration check after every 20 samples.	Every analytical sequence	Leonard Fong (APPL)
Finnigan LCQ Ion Trap Mass Spectrometer	HPL8321A Appendix XIV	Calibration with minimum of five stock standard concentrations. Calibration check after every 20 samples.	Every analytical sequence	Leonard Fong (APPL)
Agilent 1100 G1946D SL Mass Spectrometer	HPL8321A Appendix XIV	Calibration with minimum of five stock standard concentrations. Calibration check after every 20 samples.	Every analytical sequence	Leonard Fong (APPL)
Hewlett Packard 6890 Gas Chromatograph, Agilent Technologies 6890 Gas Chromatograph	ANA8081A ANA8141B Appendix XII Appendix XIII	Calibration with minimum of five stock standard concentrations. Calibration check after every 20 samples.	Every analytical sequence	Leonard Fong (APPL)
Hewlett Packard 5890 Gas Chromatograph, Hewlett Packard 6890 Gas Chromatograph	ANA619 Appendix XI	Three point calibration. Calibration verification check standard analyzed after every 20 samples	Every analytical sequence	Leonard Fong (APPL)
Perkin Elmer Series 200 Pump, post column pump, and Perkin Elmer LC 240 Fluorescence Detector	NCL ME 075 Appendix XIX	Five calibration standard levels. Calibration verification check standard analyzed after every 20 samples	Every analytical analysis	Theresa Sherman (NCL)

17. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

MLJ-LLC project consumables are listed in Table 19. Consumables are rejected for use if obvious signs of contamination or tampering exist. Calibrating standard solution acceptance records are maintained alongside calibration records. Bottle integrity records are maintained alongside receiving records. All records are available upon request at the MLJ-LLC office. All laboratories are responsible for inspecting and testing all consumables against a laboratory-specific acceptance criteria and maintaining adequate records.

Table 19. (Element 17) Inspection/acceptance testing requirements for consumables and supplies.

Project-Related Supplies (source)	Inspection / Testing Specifications	Acceptance Criteria	Frequency	Responsible Individual
pH standard calibrating solutions (Fisher Scientific)	Solution bottles are inspected to verify factory seal; initial measurements are compared to prior standard measurement	Manufacturer's seal intact, measurements within ±0.2	Upon opening a fresh standard solution	F. Wulff (MLJ-LLC)
EC standard calibrating solutions (Fisher Scientific)	Solution bottles are inspected to verify factory seal; initial measurements are compared to prior standard measurement	Manufacturer's seal intact, measurements within ±0.5% or 1µS/cm	Upon opening a fresh standard solution	F. Wulff (MLJ-LLC)
Certified pre-cleaned glass bottles for toxicity (I-Chem/Fisher Scientific)	Carton custody seal is inspected	Carton custody seal intact	At receipt date of shipment	F. Wulff (MLJ-LLC)
Certified pre-cleaned bottles (from laboratory)	Individual bottles are inspected for physical integrity	Bottles and caps intact	At receipt date of shipment	F. Wulff (MLJ-LLC)
Pre-preserved containers (from laboratory)	Preservative volume is visually verified, individual bottles are inspected for physical integrity	Proper preservative volume present, bottles and caps intact	At receipt date of shipment	F. Wulff (MLJ-LLC)
Deionized water	Analysis for target constituent contamination	Detectable substance contamination < RL	Once annually	M. Turner (MLJ-LLC)
Nitrile Gloves (Fisher Scientific)	Carton seal is visually inspected for damage or tampering	Carton is intact and gloves within are clean and intact	At receipt date of shipment	F. Wulff (MLJ-LLC)

18. NON-DIRECT MEASUREMENTS (EXISTING DATA)

It may also be necessary to use preexisting data residing in the ILRP SWAMP Comparable Database housed at the Central Valley Regional Data Center (RDC), to which MLJ-LLC has access. Since this database receives data from a number of sources including MLJ-LLC, it is possible that relevant data may be produced by another project working within the Coalition region. It is assumed that all data within this database has passed SWAMP Comparability QA/QC requirements; however, all third party data considered for use will be reviewed against the data quality objectives stated in Element 7 and only those data meeting all criteria will be used in this project. Third party data may be used to extend the monitoring history of specific locations or more completely characterize zones within the Coalition region.

19. DATA MANAGEMENT

As established in Element 9 above, MLJ-LLC will maintain an inventory of data and will periodically check the inventory against the records in their possession.

All field data is entered into the ILRP SWAMP comparable database after being reviewed and qualified. All data transcribed or transformed, electronically and otherwise, is double checked for accuracy by MLJ-LLC staff and records of this double-checking are maintained at the MLJ-LLC office. After entry into the database, field sheets are scanned and an electronic copy is filed on the MLJ-LLC server. An additional hard copy is printed and archived in the MLJ-LLC office in a separate location from the original. All completed COCs are archived in the same manner.

Transfer of data from laboratories to MLJ-LLC is accomplished by a combination of overnight mail, hand delivery, and electronic submittal. Lab reports are received as electronic PDFs and in SWAMP comparable EDD format, both of which are filed on the MLJ-LLC server and simultaneously copied to CD-ROM format. Hard copies of the reports are filed in the MLJ-LLC office. EDDs are uploaded according to the procedures outlined in Appendices XXXV, XXXVI, and XXVII.

All data residing on the MLJ-LLC server is automatically backed up onto magnetic tape media. Complete backup takes place once per week, with incremental backups every night. Digital tape backups are kept for seven days before being completely written over by the next complete backup. MLJ-LLC adds data to a replica of the ILRP SWAMP Comparable Microsoft Access database housed at the Central Valley Regional Data Center; the MLJ-LLC replica is periodically synchronized with the Design Master. The Design Master is automatically backed up to magnetic tape according to the same schedule as the MLJ-LLC server. The MLJ-LLC Database Management Team (DMT), consisting of Melissa Turner, project QA Officer and the MLJ-LLC database manager, is responsible for database maintenance, synchronization and backup. In the event of hardware failure MLJ-LLC server data is restored from the tape backup and the ILRP Design Master is restored from the Central Valley RDC tape backup.

A copy of the database is delivered to the CVRWQCB staff quarterly. Monitoring reports which summarize the monitoring data are submitted to the CVRWQCB following the schedule outlined in section 21.

GROUP C: ASSESSMENT AND OVERSIGHT

20. ASSESSMENTS & RESPONSE ACTIONS

All reviews of QA data will be made by the MLJ-LLC QA Officer and may include the CVRWQCB QA Officer. Reviews of the sampling procedures will be made bimonthly. Reviews involve comparing observed sampling procedures against those established in the MLJ-LLC SOPs. Additional reviews will be made as SOPs are updated and refined. Contract laboratories are responsible for self assessment and oversight, although each data report is audited for compliance with MLJ-LLC's QA/QC program. The MLJ-LLC QA Officer Melissa Turner is responsible for flagging all data that does not meet established QA/QC criteria.

If a review discovers any discrepancy, MLJ-LLC's QA Officer Melissa Turner will discuss the observed discrepancy with the personnel responsible for the activity. The discussion will include the accuracy of the information, potential cause(s) leading to the deviation, how the deviation might impact data quality and the corrective actions that might be considered.

The MLJ-LLC QA Officer Melissa Turner has the power to halt all sampling and analytical work by both MLJ-LLC and the contract laboratories if the deviation(s) noted are considered detrimental to data quality.

Assessments will be oral; if no discrepancies are noted and corrective action is not required additional records are neither maintained nor reported. If discrepancies are observed the details of the discrepancy and any corrective action will be reported in the quarterly and annual monitoring report.

Corrective action will be determined from Monitoring and Reporting Program Order No. R5-2008-0005 Appendix F Attachment C based on analysis of the type of discrepancy. Corrective action may correct an unauthorized deviation from the QA/QC procedures or SOPs, or it may remedy a systematic failure in the established QA/QC procedures or SOPs. The MLJ-LLC QA Officer will be responsible for addressing all corrective action. All correspondence will be documented in print, and all correspondence will be filed at the MLJ-LLC office which is available upon request.

21. REPORTS TO MANAGEMENT

Data summary and other reports will be written by MLJ-LLC according to the following table. The table provides dates for the first year this QAPP is active. In subsequent years if the deliverable due date is not a weekday, the deliverable will be provided on the first business day following the due date.

Table 20. (Element 21) QA management reports.

Type of Report	Frequency	Projected Delivery Dates(s)	Person(s) Responsible for Report Preparation	Report Recipients
Monitoring Report	Quarterly	June 1, 2009 September 1, 2009 December 1, 2009	Michael Johnson	Chris Jimmerson Mike Wackman John Brodie
Monitoring Report	Annually	March 1, 2009	Michael Johnson	Chris Jimmerson Mike Wackman John Brodie
Management Plan Report	Annually	April 1, 2009	Michael Johnson	Chris Jimmerson Mike Wackman John Brodie

GROUP D: DATA VALIDATION AND USABILITY

22. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

Data generated by project activities will be reviewed against the data quality objectives cited in Element 7 and the QA/QC practices cited in Elements 14, 15, 16, and 17. The MLJ-LLC QA Officer will review any data that fails any stated quality objectives to decide whether to accept or reject the data. The decision to accept or reject the data will be based on an assessment of the impact of the data quality failure and will be made according to the following process.

Data will be separated into three categories: data meeting all data quality objectives, data failing to meet precision or recovery criteria, and data failing to meet accuracy criteria. Data meeting all data quality objectives, but with failures of quality assurance/quality control practices will be set aside until the impact of the failure on data quality is determined. Once determined, the data will be moved into either the first category or the last category.

Data falling in the first category is considered usable by the project. Data falling in the last category is considered not usable. Data falling in the second category will have all aspects assessed. If sufficient evidence is found supporting data quality for use in this project, the data will be moved to the first category, but will be flagged with the appropriate SWAMP data qualifier code by the MLJ-LLC QA Officer.

23. VERIFICATION AND VALIDATION METHODS

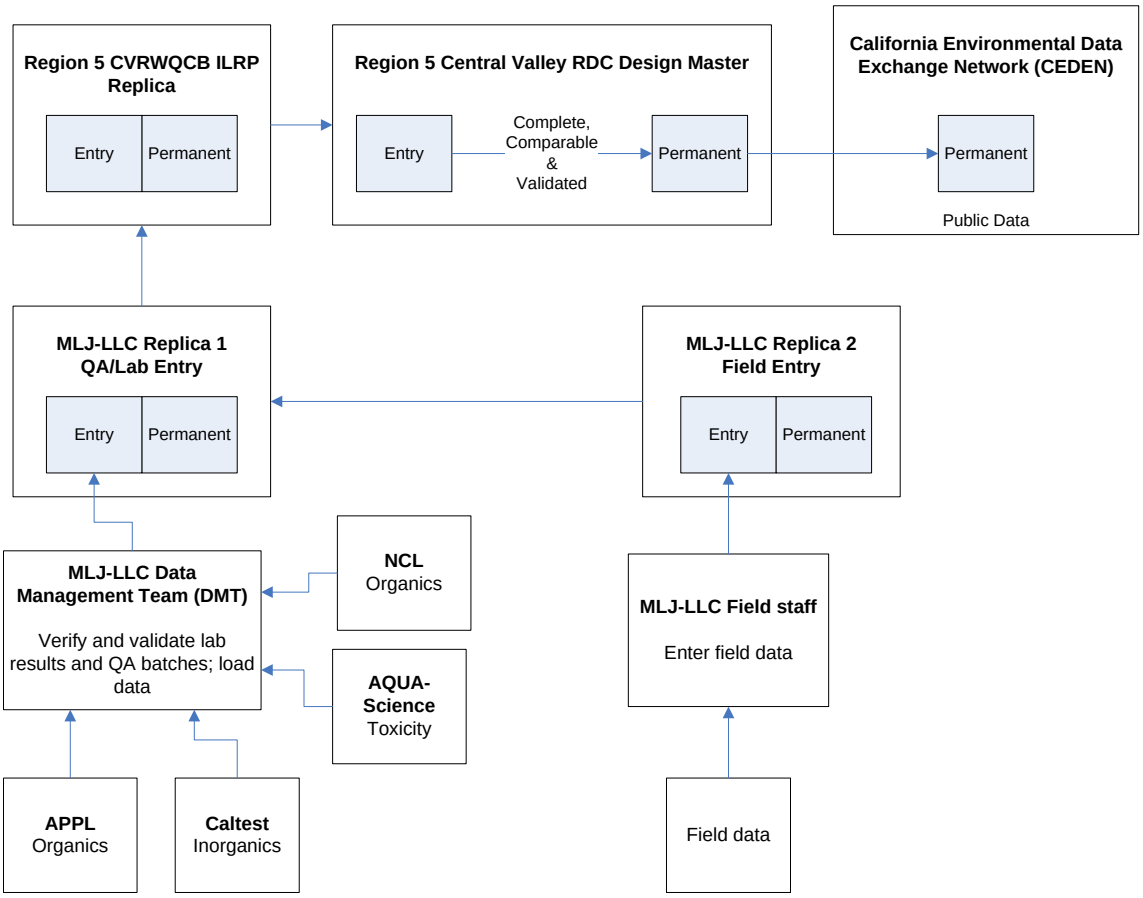
Data will be QC'd visually and recorded as checked by initials and dates directly on the record or on a specialized record tracking document. MLJ-LLC's QA Officer or a delegate of the QA Officer will do all reviews of 100% of the reports. Each contract laboratory's QA Officer will perform checks of all of its records at a frequency that the lab determines sufficient.

The contract laboratories will be responsible for the reduction of the raw data generated at the laboratory bench to a format determined by agreement between the laboratory and the MLJ-LLC QA Officer. The analytical process includes verification or a quality assurance review of the data, which includes:

- Verifying the calibration samples for compliance with the laboratory and project criteria;
- Verifying that the batch QCs were analyzed at a proper frequency and the results were within specifications;
- Comparing the raw data (e.g. chromatogram) with reported concentration for accuracy and consistency;
- Verifying that the holding times were met and that the reporting units and quantitation limits are correct;
- Determining whether corrective action was performed and control was re-established and documented prior to reanalysis of QC or project samples;
- Verifying that all project and QC sample results were properly reported and flagged; and
- Preparing batch narratives that adequately identify and discuss any problems encountered.

All QA issues will be noted. Reconciliation and correction of these issues will be done by a committee composed of MLJ-LLC's QA Officer, Field Supervisor, and Project Manager, and the contracting laboratory's QA Officer and Laboratory Director. Any corrections require a unanimous agreement that the correction is appropriate. Contract laboratories submit in their data report the batch narrative that identifies and discusses any problems encountered. If the report is accepted with or without correction pertinent portions of this narrative will be transferred to the ILRP SWAMP Comparable database as the MLJ-LLC QA Officer deems necessary.

Figure 4. Flowchart of MLJ-LLC Data Progression



24. Reconciliation with User Requirements

Procedures to review, verify and validate data are included in Appendix XXXV (SOP for Data Verification, Validation and Loading to the ILRP SWAMP Comparable Database) and Appendix XXXVII (SOP for Toxicity Data Verification, Validation and Loading to the ILRP SWAMP Comparable Database). This process ensures that all data uploaded into the ILRP SWAMP Comparable database has been qualified on a result, batch and project level with each deviation being coded and comments provided.

Data is reported to the CVRWQCB in a variety of formats including raw data, narrative data summaries including data compiled into tables and charts, and data contained within the ILRP SWAMP Comparable database. Limitations in data use will be reported to the CVRWQCB in the Annual Monitoring Report as well as through codes and comments in the database. Non-primary data users beyond the CVRWQCB will be able to access the data generated by this project deposited in the ILRP SWAMP Comparable database and should heed the qualifier flags applied to the data by the MLJ-LLC QA Officer to alert them of limitations to the data. Non-primary data users will be able to access the narrative reports by request to the CVRWQCB, the Coalition, or MLJ-LLC.