

AUGUST 3, 2006
[Revision 1]

VENTURA COUNTY AGRICULTURAL IRRIGATED
LANDS GROUP (VCAILG)

Quality Assurance Project Plan (QAPP)

submitted to

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

prepared by

LARRY WALKER ASSOCIATES

on behalf of the

VENTURA COUNTY AGRICULTURAL IRRIGATED LANDS GROUP (VCAILG)



A. PROJECT MANAGEMENT

1. Title and Approval Sheets

Ventura County Agriculture Irrigated Lands Group (VCAILG) Quality Assurance Project Plan (QAPP)

VCAILG Contract Manager	<hr/> Rex Laird, Farm Bureau of Ventura County	<hr/> Date
Project Manager	<hr/> Shelli St.Clair, Larry Walker Associates	<hr/> Date
Project QA Manager	<hr/> Michael Trouchon, Larry Walker Associates	<hr/> Date
Lab QA Officer	<hr/> Stephen Clark, Pacific EcoRisk (Toxicity Lab)	<hr/> Date
Lab QA Officer	<hr/> David Terz, FGL Environmental, Inc. (Chemistry Lab)	<hr/> Date
Lab QA Officer	<hr/> Rich Gossett, CRG Marine Labs, Inc. (Chemistry Lab)	<hr/> Date
LARWQCB Project Manager	<hr/> Sam Unger	<hr/> Date
LARWQCB QA Officer	<hr/> Yanjie Chu	<hr/> Date

2. Table of Contents

A. PROJECT MANAGEMENT	1
1. Title and Approval Sheets.....	1
2. Table of Contents	2
3. Distribution List	4
4. Project Organization	5
5. Problem Definition/Background	8
6. Project Description	11
7. Quality Objectives and Criteria for Measurement Data.....	12
8. Training and Certification.....	13
9. Documents and Records	13
B. DATA GENERATION AND ACQUISITION	15
10. Sampling Process Design.....	15
11. Sampling Methods	23
12. Sample Handling and Custody	26
13. Analytical Methods	31
14. Quality Control.....	36
15. Instrument/Equipment Testing, Inspection and Maintenance	41
16. Instrument/Equipment Calibration and Frequency.....	42
17. Inspection/Acceptance of Supplies and Consumables	45
18. Non-Direct Measurements.....	45
19. Data Management	45
C. ASSESSMENT AND OVERSIGHT	46
20. Assessments and Response Actions	46
21. Reports to Management	47
D. DATA VALIDATION AND USABILITY	49
22. Data Review, Verification and Validation Requirements.....	49
23. Data Verification	49
24. Data Validation	50
E. AMENDMENTS TO QAPP	50

TABLES

Table 1. Constituents and Monitoring Frequency for the VCAILGMP	11
Table 2. Project Schedule for the VCAILGMP.....	12
Table 3. Data Quality Objectives.....	13
Table 4. VCAILGMP Monitoring Locations and Annual Monitoring Frequency (Phase I / II).....	17
Table 5. VCAILGMP Monitoring Schedule: Phase I – Year 1 (2007)	21
Table 6. VCAILGMP Monitoring Schedule: Phase I – Year 2 (2008)	22
Table 7. Sample Container, Volume, Initial Preservation, and Holding Time Requirements.....	29
Table 8. Analytical Methods and Project Reporting Limits for Field Measurements.....	31
Table 9. Analytical Methods and Project Method Detection Limits / Project Reporting Limits for Laboratory Analyses	32
Table 10. Quality Control Requirements – Field and Laboratory.....	37
Table 11. Required Data Completeness	38
Table 12. Calibration of Field Measurement Equipment	43
Table 13. Schedule of Report Submittals to Management	49

FIGURES

Figure 1. VCAILG Monitoring Program Management Structure	7
Figure 2. Ventura County Watersheds	10
Figure 3. VCAILGMP Monitoring Sites in the Calleguas Creek/Oxnard Coastal Watersheds	18
Figure 4. VCAILGMP Monitoring Sites Located in the Santa Clara River Watershed	19
Figure 5. VCAILGMP Monitoring Sites Located in the Ventura River Watershed	20
Figure 6. Example Field Measurement Equipment Calibration Log Sheet	44
Figure 7. Example Field Measurement Equipment Calibration Verification Log Sheet.....	45

APPENDICES

Appendix A: References
Appendix B: Water Quality Benchmarks
Appendix C: Supporting Documents for Field Procedures
Appendix D: Supporting Documents for Toxicity Testing
Appendix E: Supporting Documents for Chemical Analysis
Appendix F: Example Field Log Sheet and Chain-of-Custody Form
Appendix G: Calculations for Data Quality Assessments
Appendix H: Caltrans Stormwater Monitoring Protocols, Chapter 13

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4. Project Organization

The Ventura County Agricultural Irrigated Lands Group (VCAILG) was formed in 2006 to act as one unified "Discharger Group" in Ventura County for the purpose of compliance with the *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands* (Order No. R4-2005-0080), which was adopted by the Los Angeles Regional Water Quality Control Board on November 3, 2005. VCAILG oversight is provided by a 21-member Steering Committee and an 8-member Executive Committee (also members of the Steering Committee). Steering Committee membership consists of agricultural organizational representatives, agricultural water district representatives, and landowners and growers from the three primary watersheds in Ventura County (Calleguas Creek, Santa Clara River and Ventura River). Steering Committee membership also represents the major agricultural commodities grown in Ventura County (strawberries, nursery stock, citrus, vegetables, and avocados).

Group management and decision-making for administrative and technical issues occur through monthly (or more frequent) Executive Committee meetings and quarterly Steering Committee meetings. The Steering Committee advises and provides input to the Executive Committee and VCAILG consultants on a number of issues pertaining to VCAILG membership and development of reports required by the *Conditional Ag Waiver*. The Steering Committee also reviews fee assessments and consultant selections as recommended by the Executive Committee. The VCAILG Steering Committee/Executive Committee member roster is included in Section 3 of the Notice of Intent.

Because the VCAILG is an unincorporated organization, the Farm Bureau of Ventura County acts as the responsible entity for the collection of funds, contracting with consultants, and other fiscal and/or business matters that require an organization with some form of tax status; the Farm Bureau is a non-profit 501(c)(5) organization.

Larry Walker Associates (LWA) and Fruit Growers Laboratory, Inc. (FGL) have been selected to assist the VCAILG with development and implementation of a program that meets the requirements of the *Conditional Ag Waiver* for a Discharger group. Program responsibilities are as follows:

- VCAILG Contract Manager: Rex Laird (Farm Bureau of Ventura County)
- Project Manager: Shelli St.Clair (LWA)
- Project Quality Assurance Manager: Michael Troughon (LWA). Michael will conduct quality assurance oversight for the project independent of both project management and the project's monitoring program.
- Laboratory Quality Assurance Officer, Toxicity Testing: Stephen Clark (Pacific EcoRisk)
- Laboratory Quality Assurance Officer, Chemistry Testing: David Terz (FGL)
- Laboratory Quality Assurance Officer, Chemistry Testing: Rich Gossett (CRG Marine Labs, Inc.)
- Sample Collection: FGL and LWA field personnel
- QAPP changes / updates: Project Manager. Changes to the QAPP may be made upon concurrent approval of necessary changes by the Project Manager, Project Quality Assurance Manager and the Regional Board's Quality Assurance Officer. The Project

Manager will be responsible for making the changes, submitting drafts for review, preparing a final copy, and submitting the final revision for signature and distribution.

This Quality Assurance Project Plan (QAPP) describes the quality assurance requirements for the VCAILG Monitoring Program (VCAILGMP) developed to comply with the Los Angeles Regional Board's *Conditional Ag Waiver*. All contractors selected to perform the sampling and laboratory analyses must meet the quality control criteria necessary to satisfy the data quality objectives of this program, including those for precision, accuracy, detection and reporting. This QAPP is based on the State's Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Management Plan (Pucket 2002) and was prepared in accordance with the State Water Resources Control Board's SWAMP QAPP Template (SWRCB, 2004a) and the SWAMP QA Checklist (SWRCB, 2004b). A general organizational structure for the VCAILGMP is illustrated in Figure 1.

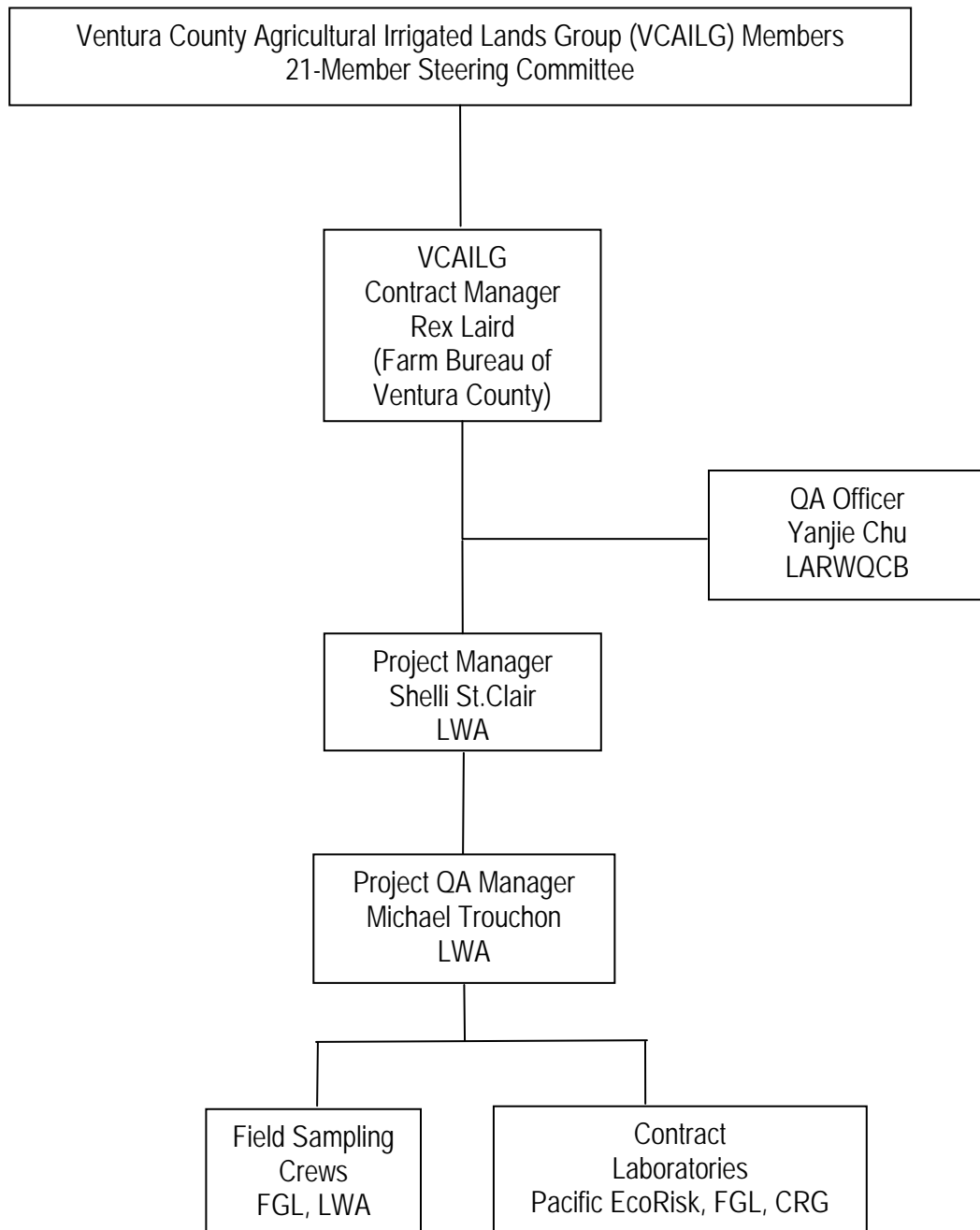


Figure 1. VCAILG Monitoring Program Management Structure

5. Problem Definition/Background

On November 3, 2005, the Los Angeles Regional Water Quality Control Board adopted the *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands* (Order No. R4-2005-0080). The Order states that the intent of the *Conditional Ag Waiver* is to attain water quality objectives in receiving waters by regulating discharges from irrigated lands to ensure that such discharges are not causing or contributing to exceedances of applicable water quality standards. In order to comply with the *Conditional Ag Waiver*, water quality monitoring must be conducted and the monitoring results compared to water quality benchmarks. Exceedances of these benchmarks indicate that management practices are in need of implementation or improvement to better protect water quality, triggering the requirement to develop a Water Quality Management Plan (WQMP). The WQMP outlines specific steps that will be taken to reduce pollutant loading to receiving waters and ultimately attain water quality objectives through the use of best management practices.

The VCAILG was formed to comply with the *Conditional Ag Waiver* as a county-wide Discharger Group. Group members represent irrigated acreage located throughout Ventura County watersheds, including the Calleguas Creek, Santa Clara River, Ventura River and coastal watersheds. A map of the main Ventura County watersheds is presented in Figure 2.

Ventura County Agriculture

Ventura County covers 1,843 square miles (approximately 1.2 million acres) with 43 miles of coastline. The Pacific Ocean forms its southwestern boundary, with Los Angeles County to the southeast, Kern County to the north and Santa Barbara County to the west. The Los Padres National Forest accounts for the northern half of the county, with residential, agricultural and business uses in the southern portion. Of the estimated 330,000 acres of agricultural land in the county, there are approximately 125,000 acres of irrigated land. The Calleguas Creek Watershed contains the highest number of irrigated acres (roughly 60,000), followed by the Santa Clara River Watershed (approximately 50,000) and Ventura River watershed (approximately 15,000).

Agriculture is a major industry in Ventura County, generating \$1.4 billion in gross sales in 2004, placing the county 9th in a statewide ranking of California's 58 counties and 10th in a nationwide ranking of all U.S. counties. Ventura County was ranked as one of the top five counties in California for thirteen agricultural commodities in 2004.

A disproportionate number of waterbodies in Ventura County appear on the federal 303(d) list of impaired waterbodies. Impairments listed include constituents that are commonly associated with irrigated agriculture, including suspended sediment, nutrients and pesticides; the 2002 303(d) list identifies agriculture as a potential source of the constituents listed. Accordingly, the Los Angeles Regional Water Quality Control Board adopted the *Conditional Ag Waiver* to address these impairments.

Monitoring Program Objectives

The objectives of the monitoring program required under the *Conditional Ag Waiver* include the following:

- Assess the impact on waters of the State from wastes discharged from irrigated lands;
- Determine concentration and loading (where practicable) of pollutants present in surface waterbodies influenced primarily by the irrigated agriculture land use;
- Evaluate compliance with applicable water quality benchmarks to determine whether modifying management practices is necessary to improve surface water quality;
- Attempt to identify pollutant sources, if necessary;
- Provide feedback to growers in areas where benchmarks are exceeded to facilitate implementation and monitoring of management practices employed for controlling pollutant loads, if necessary;
- Report results and other required information as specified in the Monitoring and Reporting Program (CI-8836);
- Monitor trends in ambient water quality over time (long term objective);
- Coordinate monitoring efforts with existing and future monitoring programs so that data generated are complementary and not duplicative (*e.g.*, coordinate monitoring sites and sampling events with the Calleguas Creek Watershed TMDL Monitoring Program).

Water samples will be collected from surface waterbodies influenced primarily by irrigated agriculture throughout Ventura County and analyzed for constituents typically associated with agricultural activities, including suspended sediment, nutrients, and pesticides. Data collected at each site will be compared with water quality benchmarks to determine whether these benchmarks are being met. A benchmark exceedance will trigger development of a Water Quality Management Plan (WQMP), which will outline specific steps that will be taken to reduce pollutant loading to receiving waters and ultimately attain water quality objectives through the use of best management practices. VCAILGMP data will be used to determine monitoring program effectiveness at meeting program objectives.

VCAILGMP data also may be used to assist CCWTMP in determining pollutant loads from irrigated agriculture. Conversely, receiving water data collected concurrently in the Calleguas Creek Watershed (CCW) through the CCW TMDL Monitoring Program (CCWTMP, monitoring scheduled for Spring 2007) or other regulatory programs (NPDES, Stormwater), may be evaluated to determine whether agricultural drainages may be contributing to receiving water impairments. Data collected through the CCWTMP may also inform BMP implementation and effectiveness.

Water Quality Benchmarks

Water quality objectives contained in the Basin Plan for the Los Angeles Region, as well as TMDL load allocations and water quality criteria contained in the California Toxics Rule (CTR), form the basis for the water quality benchmarks that will be used to assess water quality data collected through the VCAILGMP. Water quality benchmarks applicable to receiving waters in Ventura County watersheds are summarized in Appendix B of this QAPP.

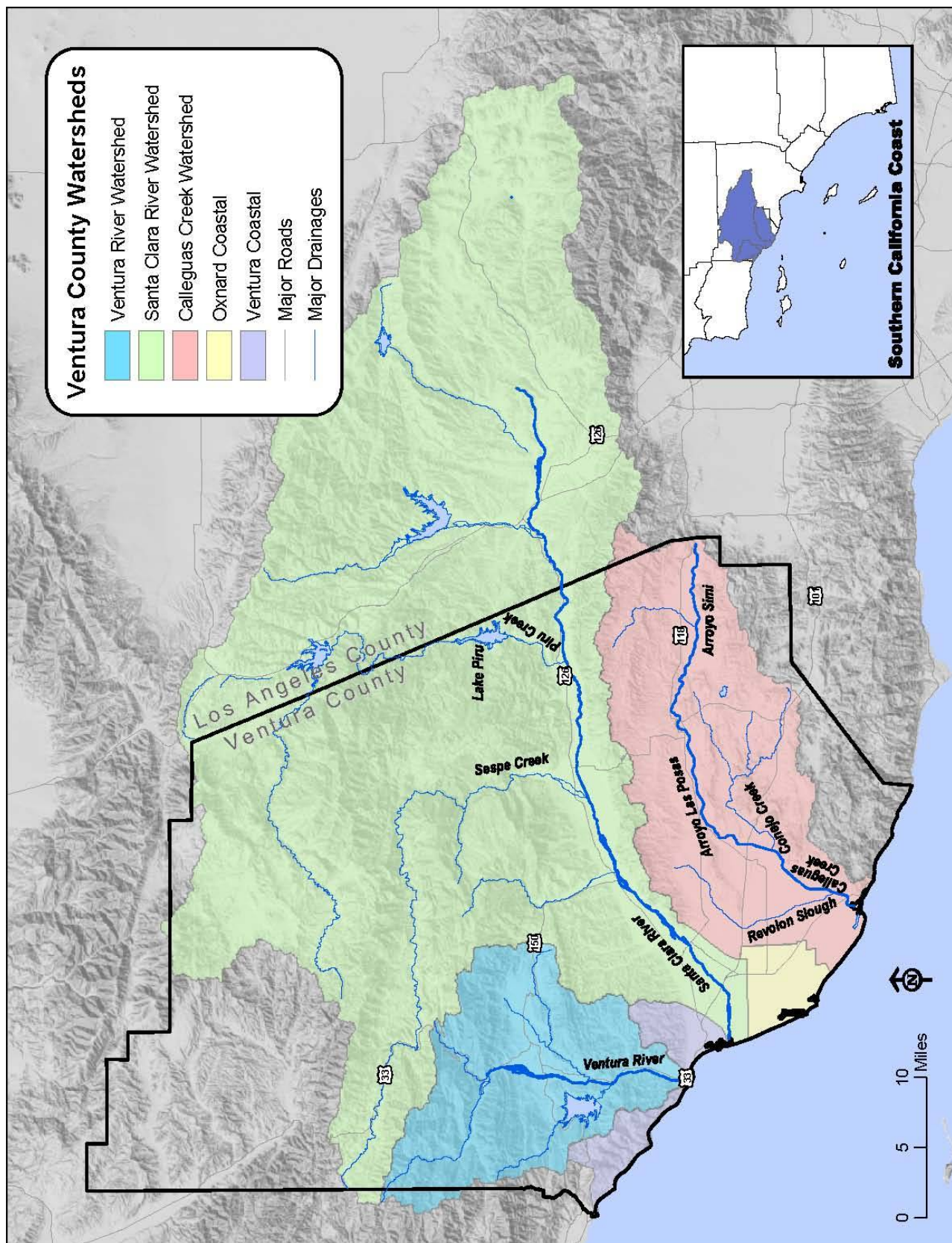


Figure 2. Ventura County Watersheds

6. Project Description

The VCAILGMP will collect water quality data at up to 23 monitoring sites: 21 sites located on surface waterbodies influenced primarily by irrigated agriculture, and two potential background sites used to account for inputs from other land uses (i.e., landscape irrigation).

Monitoring Elements

The following surface water monitoring elements are included in the VCAILGMP:

- General water quality constituents;
- Nitrogen and phosphorus compounds (nutrients);
- Pesticides;
- Aquatic chronic toxicity.

Table 1 lists the constituents for which samples will be analyzed. Element 10 (Sampling Process Design) contains monitoring site descriptions and maps of site locations. Element 11 (Sampling Methods) and Element 13 (Analytical Methods) outline the measurement processes and techniques that will be used to generate data.

Table 1. Constituents and Monitoring Frequency for the VCAILGMP

Constituent	Phase I Frequency ^[1]	Phase II Frequency ^[1]
<i>General Water Quality Constituents (GWQC)</i>	Quarterly (2 dry events; 2 wet events)	Semiannually (1 dry event; 1 wet event)
Flow, pH, Temperature, Dissolved Oxygen, Turbidity, Conductivity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chloride, Sulfate		
<i>Nutrients</i>		
Total Ammonia-N, Nitrate-N, Phosphate		
<i>Pesticides</i>	Semiannually (1 dry event; 1 wet event) ^[2]	Annually (1 dry event) ^[2]
Organochlorine Pesticides ^[3] , Organophosphorus Pesticides ^[4] , Pyrethroids ^[5]		
<i>Aquatic Chronic Toxicity</i>		

[1] The Phase I monitoring period covers the first two monitoring years of the *Conditional Ag Waiver*, and the Phase II monitoring period covers the remaining two monitoring years.

[2] For toxicity testing, the "dry" season is defined as May 16 through October 14; the "wet" season is defined as October 15 through May 15.

[3] Organochlorine Pesticides include aldrin, alpha-BHC, beta-BHC, gamma-BHC (Lindane), delta-BHC, chlordane-alpha, chlordane-gamma, 2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, endrin ketone, toxaphene.

[4] Organophosphorus Pesticides include bolstar, chlorpyrifos, demeton, diazinon, dichlorovos, dimethoate, disulfoton, ethoprop, fenclorophos, fensulfothion, fenthion, malathion, merphos, methyl parathion, mevinphos, phorate, tetrachlorvinphos, tokuthion, trichloronate.

[5] Pyrethroids include bifenthrin, cyfluthrin, cyhalothrin, cypermethrin, deltamethrin/tralomethrin, esfenvalerate/fenvalerate, fenpropathrin, fluvalinate, permethrin, resmethrin.

Project Schedule

The project schedule is outlined in Table 2 and is based on a projected monitoring start date of January/February 2007. This start date is based on the assumption that the Notice of Applicability will be issued to the VCAILG by the end of 2006.

Table 2. Project Schedule for the VCAILGMP

Deliverable	Anticipated Date of Initiation	Anticipated Date of Completion
Initiate Phase I Monitoring	January/February 2007	December 2007
Complete Review of Year 1 Data	April 2007	February 2008
Complete Year 1 Annual Report ^[1]	April 2007	March 2008
Complete Year 1 WQMP (if necessary) ^[2]	April 2007	September 2008
Phase I (Year 2) Monitoring	January-March 2008	December 2008
Complete Review of Year 2 Data	April 2008	February 2009
Complete Year 2 Annual Report ^[1]	April 2008	March 2009
Complete Year 2 WQMP (if necessary) ^[2]	April 2008	September 2009
Initiate Phase II Monitoring	January-March 2009	December 2009
Complete Review of Year 3 Data	April 2009	February 2010
Complete Year 3 Annual Report ^[1]	April 2009	March 2010
Complete Year 3 WQMP (if necessary) ^[2]	April 2009	September 2010
Phase II (Year 4) Monitoring	January-March 2010	December 2010
Complete Review of Year 4 Data	April 2010	February 2011
Complete Year 4 Annual Report ^[1]	April 2010	March 2011
Complete Year 4 WQMP (if necessary) ^[2]	April 2010	September 2011

[1] Annual Monitoring Report is due annually beginning one year after issuance of the NOA. Because meeting this due date will not allow inclusion of a full year of monitoring data in at least the first annual report, the first annual report will be submitted by March 1, 2008 and subsequent reports will be submitted annually thereafter.

[2] WQMP = Water Quality Management Plan, due annually 6 months after the first Annual Monitoring Report containing "benchmark" exceedances.

7. Quality Objectives and Criteria for Measurement Data

The objective of the monitoring program, in terms of data quality, is to produce data that represent as closely as possible, *in situ* conditions of waterbodies from which samples are collected. This objective will be achieved by using accepted, standard methods for sample collection and laboratory analysis. Assessing the program's ability to meet this objective will be accomplished by evaluating the resulting laboratory measurements in terms of detection limits, precision, accuracy, representativeness, comparability, and completeness, as discussed in Element 14 (Quality Control).

Table 3 lists data quality objectives for the constituents that will be measured through this monitoring program.

Table 3. Data Quality Objectives

Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Field Measurements					
Water Velocity (for Flow calc.)	± 2%	NA	NA	0.05 ft/sec	See Element 14
pH	± 0.2 pH units	± 0.5 pH units	NA	NA	See Element 14
Temperature	± 0.5 °C	± 5%	NA	NA	See Element 14
Dissolved Oxygen	± 0.5 mg/L	± 10%	NA	0.5 mg/L	See Element 14
Turbidity	± 10%	± 10%	NA	0.2 NTU	See Element 14
Conductivity	± 5%	± 5%	NA	2.5 umhos/cm	See Element 14
Laboratory Analyses					
Aquatic Chronic Toxicity	[1]	[2]	NA	NA	See Element 14
Total Suspended Solids (TSS)	80-120%	25%	80-120%	5 mg/L	See Element 14
Total Dissolved Solids (TDS)	80-120%	25%	80-120%	20 mg/L	See Element 14
Chloride	80-120%	25%	80-120%	1 mg/L	See Element 14
Sulfate	80-120%	25%	80-120%	1 mg/L	See Element 14
Ammonia-Nitrogen	80-120%	25%	80-120%	0.2 mg/L	See Element 14
Nitrate-Nitrogen	80-120%	25%	80-120%	0.1 mg/L	See Element 14
Orthophosphate	80-120%	25%	80-120%	0.05 mg/L	See Element 14
Organochlorine Pesticides	80-120%	25% [3]	50-150% [3]	See Element 14	See Element 14
Organophosphorus Pesticides	80-120%	25% [3]	50-150% [3]	See Element 14	See Element 14
Pyrethroid Pesticides	80-120%	25% [3]	50-150% [3]	See Element 14	See Element 14

NA: Not Applicable

[1] Must meet all method performance criteria relative to the reference toxicant test.

[2] Must meet all method performance criteria relative to sample replicates.

[3] Or control limits established as the mean ± 3 standard deviations based on laboratory precision and recovery data.

8. Training and Certification

The Project Manager or designee will ensure that all field personnel, including field crews from FGL, receive refresher training prior to initiation of sampling and will document staff training events. LWA staff responsible for field sampling receive annual refresher training to ensure that samples are collected properly and safely. Documentation will consist of a sign-in sheet listing attendees, course time and date, instructor, and any handouts. Training documentation will be maintained in the Project Manager's project files. All sampling shall be performed under the supervision of experienced staff. No volunteers will be used for sampling.

At minimum, laboratories selected to perform analysis for this program must maintain current certification through the California Department of Health Services – Environmental Laboratory Accreditation Program (ELAP). Pacific EcoRisk (toxicity testing laboratory) and FGL (chemistry laboratory) are both certified by the National Environmental Laboratory Accreditation Program (NELAP); their certificate numbers are 04225CA and 01110CA, respectively. CRG is certified by ELAP (certificate number 2261). Toxicity and chemistry laboratories are required to maintain records of analyst training and will make these records available upon request.

9. Documents and Records

Documents and records generated and maintained for the VCAILGMP include the following: the Monitoring and Reporting Program (MRP) Plan, this QAPP, Event Summary Reports, Analytical Data Reports, Annual Monitoring Reports, and Water Quality Management Plans (WQMP). Annual Monitoring Report and WQMP content is discussed in detail in Element 21 (Reports to

Management).

Event Summary Reports

Event Summary Reports will be created by the field crew and submitted to the Project Manager and Project QA Manager within one week of the completion of each sampling event, and will consist of the following:

1. A brief (one- to two-page) narrative summary of samples successfully collected;
2. A summary of any deviations from the QAPP;
3. A discussion of any problems encountered during the sampling event; and,
4. A copy of the field logbook and chain-of-custody (COC) forms.

The field logbook and COCs will be scanned into PDF files and stored electronically by the Project Manager and in hard copy format by the field crew lead. The field logbook and COC forms are discussed in more detail in Element 12 (Sample Handling and Custody).

Analytical Data Reports

Results of chemical analyses, toxicity testing, and any Toxicity Identification Evaluations (TIEs) performed will be provided to the Project QA Manager in the laboratory's standard hardcopy report format and an electronic data format approved by the Project Manager within 30 calendar days of sample receipt by the laboratory. All final data reports will include results for environmental samples and associated quality control samples, and a narrative summary of quality control data. All results meeting data quality objectives and results having satisfactory explanations for deviations from data quality objectives shall be reported in tabular format on electronic media. For each sample analyzed, hard copy and electronic reports will contain the following information:

- Name of the analyzing laboratory;
- Client sample ID;
- Laboratory sample ID;
- Date of sample receipt;
- Date and time of sample collection;
- Date of sample preparation (if applicable);
- Batch ID;
- Method of sample preparation (if applicable);
- Date(s) of analysis;
- Matrix analyzed;
- Analytical method(s);
- Analyte or parameter measured;
- Units of measure;
- Dilution factor;
- Method detection limit (MDL), if applicable;
- Reporting limit (RL), if applicable;
- Measured value of the analyte or parameter;
- Relative percent difference (RPD) and percent recovery statistics for quality control (QC) samples, if applicable, as well as applicable acceptance ranges for QC statistics and appropriate qualifiers for results that fail to meet QC criteria.

Information contained in hard copy and electronic reports must allow Project staff to easily determine whether sample preparation and analytical holding times were met. The analyzing laboratory will provide results for all laboratory QC samples (blanks, duplicates, spikes, reference materials, etc.) and the sample IDs associated with each sample batch at the same time environmental sample results are submitted. Data reports will be compiled in a Microsoft™ Access database as described in Element 19 (Data Management).

Quality Assurance Project Plan (QAPP)

The Project Manager or designee is responsible for the development, management and distribution of the QAPP to those individuals listed in Element 3 (Distribution List).

Monitoring and Reporting Program (MRP) Plan

The Project Manager or designee is responsible for the development, distribution and management of the MRP Plan. The MRP Plan is intended to be a working field guide that contains specifics regarding the monitoring schedule, monitoring sites, field and sample collection and handling protocols, and required analytical methods and detection limits.

Distribution and Management of Documents

The Project Manager or designee is responsible for the development, management and distribution of the approved QAPP and MRP Plan.

All hard copy and electronic data will be stored by the Project Manager or designee. Data will be maintained for the length of the program and will be available for review. A backup copy of each data report will be placed on an external storage device (*i.e.*, compact disc). Upon completion of the VCAILGMP, the hard copy and electronic data will be retained for an additional five years.

B. DATA GENERATION AND ACQUISITION

10. Sampling Process Design

The VCAILGMP will monitor water quality at up to 23 monitoring sites located throughout Ventura County. Monitoring will occur in two Phases: Phase I monitoring will occur during the first two monitoring years, with toxicity testing performed semiannually and the remaining constituents analyzed quarterly. Phase II monitoring will occur during the remaining two years of the program, with toxicity testing performed once during the dry season and the remaining constituents analyzed semiannually. Wet season sampling will be conducted during or shortly after storm events producing runoff, preferably including the first storm event that results in significant flow increases. Toxicity identification evaluations (TIEs) will be conducted on samples as outlined in Element 13 (Analytical Methods).

Monitoring Sites

The process for selection of appropriate sites for monitoring is based on land uses, subwatershed characteristics, VCAILG landowner representation, and access considerations. The specific criteria for selection of monitoring sites are as follows:

1. Land use (primarily agricultural drainages);
2. Subwatershed representation;

3. Acres of agricultural irrigated lands represented;
4. Drainage into waterbodies included on the 303(d) list of impaired waterbodies;
5. Safe access during dry and wet weather.

Monitoring sites were selected to best characterize agricultural inputs to receiving waters and are generally located at the lower ends of mainstem tributaries or agricultural drainages in areas associated with agricultural activity. In some cases, "background" sites are also located to aide in distinguishing agricultural inputs from other sources (i.e., landscape irrigation runoff). Background sites will be sampled only for chemical parameters when flow is present.

Monitoring site selection in the Calleguas Creek Watershed was coordinated with the Calleguas Creek Watershed TMDL Monitoring Program (CCWTMP). Data collected at these sites are designed to augment TMDL implementation monitoring by establishing loadings from agricultural inputs. Monitoring sites in the Santa Clara River and Ventura River Watersheds were selected to collect baseline data to determine whether agricultural discharges may be causing or contributing to water quality impairments in receiving waters in those watersheds.

Table 4 lists monitoring sites selected in each watershed and the annual monitoring frequency for Phases I and II. Monitoring sites located in the Calleguas Creek/Oxnard Coastal, Santa Clara River and Ventura River watersheds are presented in Figure 3, Figure 4, and Figure 5, respectively.

The VCAILG Monitoring and Reporting Program (MRP) Plan contains detailed descriptions of each monitoring site, including GPS coordinates and driving directions to each site.

Table 4. VCAILGMP Monitoring Locations and Annual Monitoring Frequency (Phase I / II)

Watershed / Subwatershed	Station ID ^[1]	Reach	Water-body Type ^[2]	Station Location	Monitoring Frequency (Phase I / Phase II) ^[3]			
					Chronic Toxicity ^[4]	Pesticides	Nutrients	General WQ Constituents
Calleguas Creek / Mugu Lagoon	01T_ODD2_DCH	1	T	Duck Pond/Oxnard Drain #2/Mugu Drain S. of Hueneme Rd.	2 / 1	4 / 2	4 / 2	4 / 2
	01T_ODD3_ARN	1	T	Rio de Santa Clara/Oxnard Drain #3 at Arnold Rd.	2 / 1	4 / 2	4 / 2	4 / 2
Calleguas Creek / Calleguas Creek	02D_BROOM	2	D	Discharge to Calleguas Creek at Broome Ranch Rd.	None	4 / 2	4 / 2	4 / 2
	02D_CSUCI	2	B	Potential Background Site for 02D_BROOM	None	As Req'd	As Req'd	As Req'd
Calleguas Creek / Revolon Slough	04D_ETTG	4	D	Discharge to Revolon Slough at Etting Rd.	None	4 / 2	4 / 2	4 / 2
	04D_LAS	4	D	Discharge to Revolon Slough at S. Las Posas Rd.	None	4 / 2	4 / 2	4 / 2
	05D_SANT_VCWPD	5	D	Santa Clara Drain at VCWPD Gage #781	None	4 / 2	4 / 2	4 / 2
Calleguas Creek / Beardsley Channel	05D_SANT_BKGD	5	B	Potential Background Site for 05_D_SANT_VCWPD (to be determined)	None	As Req'd	As Req'd	As Req'd
	05D_LAVD	5	T	La Vista Drain at La Vista Ave.	2 / 1	4 / 2	4 / 2	4 / 2
	05T_HONDA	5	T	Honda Barranca at Hwy. 118	2 / 1	4 / 2	4 / 2	4 / 2
Calleguas Creek / Arroyo Las Posas	06T_FC_BR	6	T	Fox Canyon at Bradley Rd.	2 / 1	4 / 2	4 / 2	4 / 2
	06T_LONG	6	T	Long Canyon at Hwy. 118	2 / 1	4 / 2	4 / 2	4 / 2
Calleguas Creek / Conejo Creek	9BD_GERRY	9B	D	Drain Crossing Santa Rosa Rd. at Gerry Rd.	None	4 / 2	4 / 2	4 / 2
Oxnard Coastal	OXD_CENTR	--	D	Central Ditch at Harbor Blvd.	None	4 / 2	4 / 2	4 / 2
	S02T_ELLS	2	T	Ellsworth Barranca at Telegraph Rd.	2 / 1	4 / 2	4 / 2	4 / 2
	S02T_TODD	2	T	Todd Barranca at Hwy. 126	2 / 1	4 / 2	4 / 2	4 / 2
	S03T_TIMB	3	T	Timber Canyon at Hwy. 126	2 / 1	4 / 2	4 / 2	4 / 2
Santa Clara River	S03T_BOULD	3	T	Boulder Creek at Hwy. 126	2 / 1	4 / 2	4 / 2	4 / 2
	S03T_BARDS	3	T	Discharge Along Bardsdale Ave. at Santa Clara River	2 / 1	4 / 2	4 / 2	4 / 2
	S04T_HOPP	4	T	Hopper Creek at Hwy. 126	2 / 1	4 / 2	4 / 2	4 / 2
	S04T_TAPO	4	T	Tapo Canyon Creek	2 / 1	4 / 2	4 / 2	4 / 2
Ventura River	VRT_THACH	--	T	Thacher Creek at Ojai Avenue	2 / 1	4 / 2	4 / 2	4 / 2
	VRT_SANTO	--	T	San Antonio Creek at Grand Avenue	2 / 1	4 / 2	4 / 2	4 / 2

Notes to Table 4:

[1] Station IDs indicated in **bold type** represent sites that overlap with the Calleguas Creek TMDL Monitoring Program. Monitoring results from these sites will be included in VCAILG Annual Monitoring Reports and used to assess attainment of water quality benchmarks.

[2] Waterbody Type: B = Potential Background Site; D = Agricultural Drain; T = Tributary to Receiving Water.

[3] Phase I monitoring denotes the first two monitoring years of the *Conditional Ag Waiver*; Phase II monitoring denotes the remaining two years. Refer to Table 1 for the list of constituents included in each constituent class.

[4] The Chronic Toxicity testing frequency denotes one dry season sample (May 16 – October 14) and one wet season sample (October 15 – May 15) collected during each of the Phase I monitoring years, and one dry season sample collected during each of the Phase II monitoring years. Toxicity tests will be conducted on receiving water samples only.

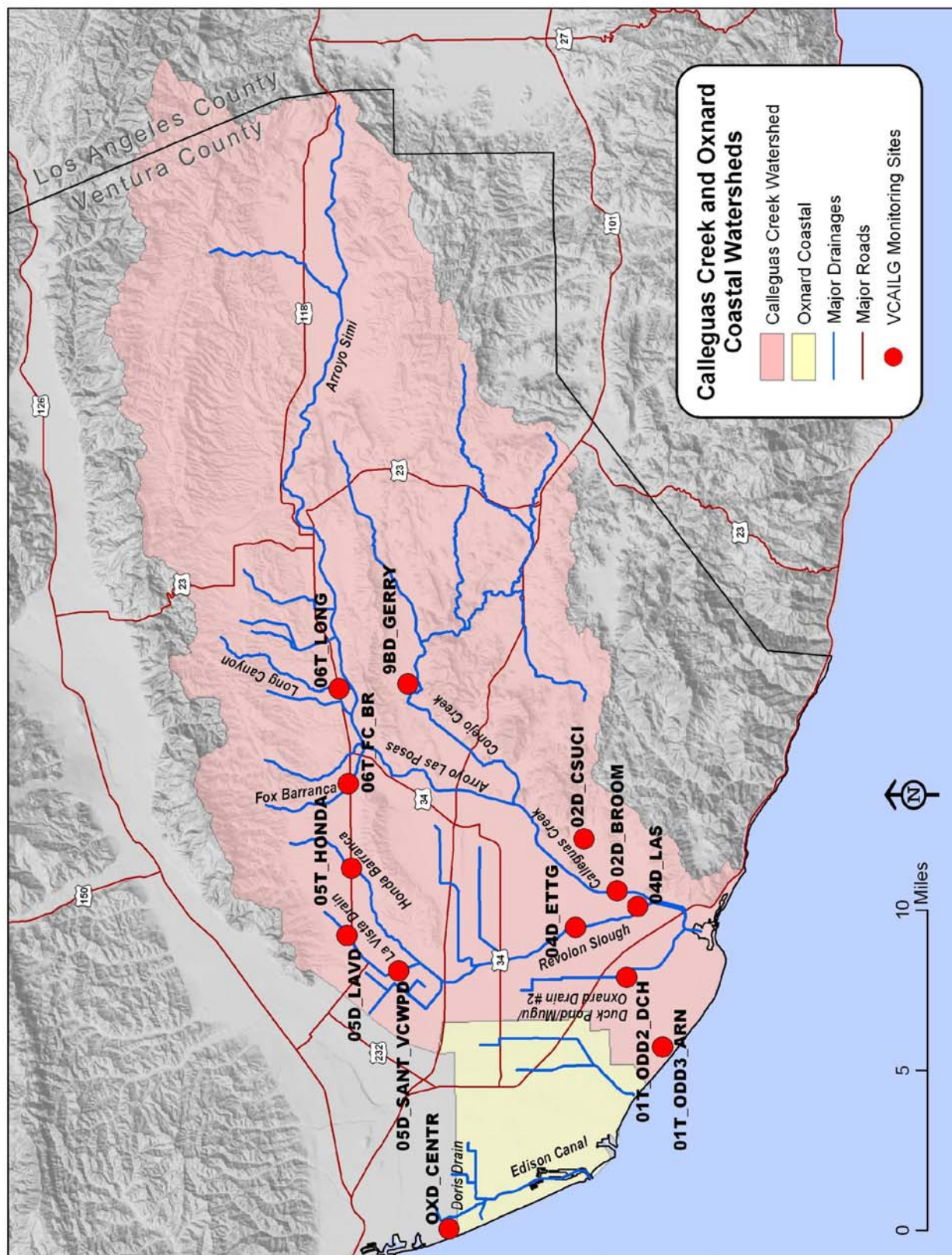


Figure 3. VCAILGMP Monitoring Sites in the Calleguas Creek/Oxnard Coastal Watersheds

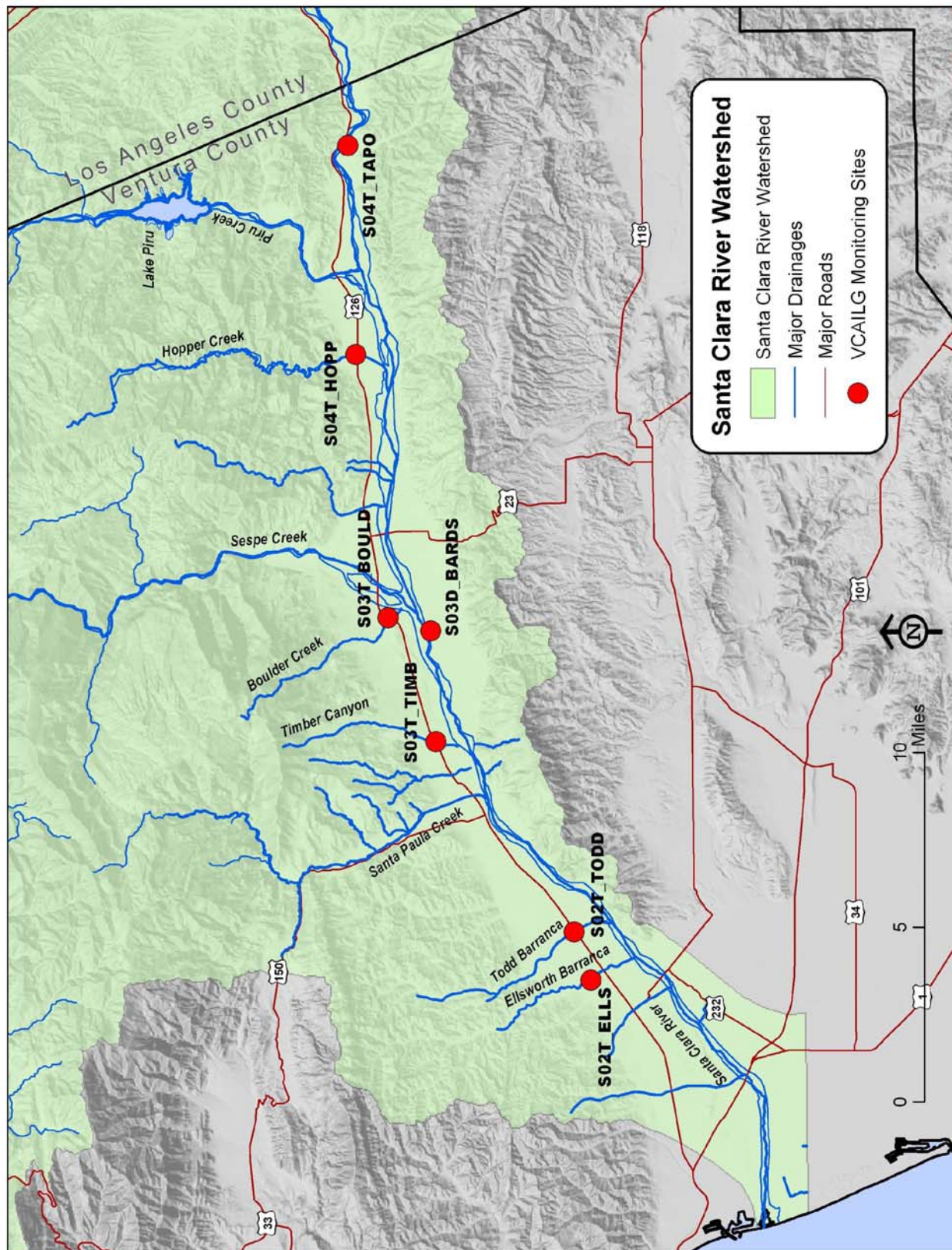


Figure 4. VCAILGMP Monitoring Sites Located in the Santa Clara River Watershed

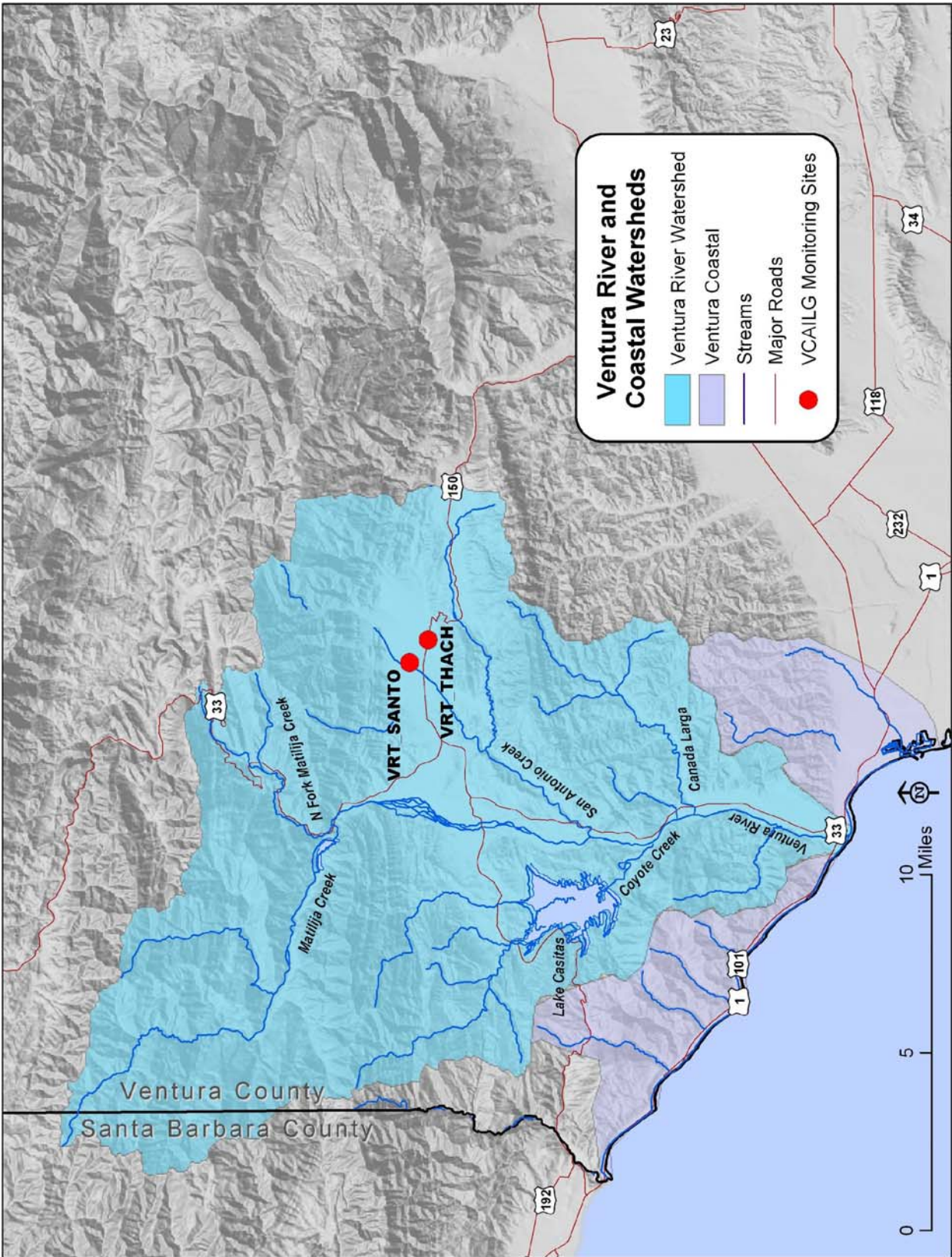


Figure 5. VCAILGMP Monitoring Sites Located in the Ventura River Watershed

Sampling Schedule

Monitoring will be conducted quarterly during Phase I (semiannually for toxicity testing only) and semiannually during Phase II (annually for toxicity testing only). Table 5 and Table 6 present a tentative VCAILGMP sampling schedule for Phase I (the first two monitoring years). Dates will be finalized during coordination with other monitoring efforts, particularly the CCWTMP, in order to minimize duplication of effort and to develop a representative data set. Toxicity testing will be conducted on VCAILGMP receiving water monitoring sites only. Toxicity testing will be conducted concurrently by the CCWTMP on TMDL receiving water sites to provide an indication of whether agricultural drainages are causing or contributing to toxicity in the receiving water. The schedule for Phase II monitoring will be developed based on results of Phase I monitoring and in consultation with Regional Board staff. Phase I monitoring is expected to begin in January or February of 2007.

Table 5. VCAILGMP Monitoring Schedule: Phase I – Year 1 (2007)

Watershed / Subwatershed	Station ID	Reach	Quarter ^[1]			
			Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Calleguas Creek / Mugu Lagoon	01T_ODD2_DCH	1	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	01T_ODD3_ARN	1	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
Calleguas Creek / Calleguas Creek	02D_BROOM	2	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	02D_CSUCI	2	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Calleguas Creek / Revolon Slough	04D_ETTG	4	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	04D_LAS	4	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Calleguas Creek / Beardsley Channel	05D_SANT_VCWPD	5	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	05D_SANT_BKGD	5	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	05D_LAVD	5	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	05T_HONDA	5	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
Calleguas Creek / Arroyo Las Posas	06T_FC_BR	6	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	06T_LONG	6	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
Calleguas Creek / Conejo Creek	9BD_GERRY	9B	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Oxnard Coastal	OXD_CENTR	--	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Santa Clara River	S02T_ELLS	2	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	S02T_TODD	2	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	S03T_TIMB	3	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	S03T_BOULD	3	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	S03T_BARDS	3	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	S04T_HOPP	4	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	S04T_TAPO	4	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
Ventura River	VRT_THACH	--	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P
	VRT_SANTO	--	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P	WQ,N,P

TOX = Toxicity WQ = General Water Quality Constituents N = Nutrients P = Pesticides

[1] Frequency indicated is for the first year of Phase I monitoring.

Table 6. VCAILGMP Monitoring Schedule: Phase I – Year 2 (2008)

Watershed / Subwatershed	Station ID	Reach	Month ^[1]			
			Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Calleguas Creek / Mugu Lagoon	01T_ODD2_DCH	1	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	01T_ODD3_ARN	1	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
Calleguas Creek / Calleguas Creek	02D_BROOM	2	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	02D_CSUCI	2	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Calleguas Creek / Revolon Slough	04D_ETTG	4	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	04D_LAS	4	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	05D_SANT_VCWPD	5	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Calleguas Creek / Beardsley Channel	05D_SANT_BKGD	5	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	05D_LAVD	5	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	05T_HONDA	5	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
Calleguas Creek / Arroyo Las Posas	06T_FC_BR	6	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	06T_LONG	6	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
Calleguas Creek / Conejo Creek	9BD_GERRY	9B	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
Oxnard Coastal	OXD_CENTR	--	WQ,N,P	WQ,N,P	WQ,N,P	WQ,N,P
	S02T_ELLS	2	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	S02T_TODD	2	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	S03T_TIMB	3	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
Santa Clara River	S03T_BOULD	3	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	S03T_BARDS	3	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	S04T_HOPP	4	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	S04T_TAPO	4	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
Ventura River	VRT_THACH	--	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P
	VRT_SANTO	--	WQ,N,P	TOX,WQ,N,P	WQ,N,P	TOX,WQ,N,P

TOX = Toxicity WQ = General Water Quality Constituents N = Nutrients P = Pesticides

[1] Frequency indicated is for the second year of Phase I monitoring.

Should measurable precipitation occur during the seven days prior to a scheduled dry weather event, data from stream gages within each watershed will be evaluated to determine if flow rates have returned to pre-storm levels. If flow rates have returned to pre-storm levels, the sampling event may be conducted as scheduled. If flow rates have not returned to pre-storm levels, the sampling event will be rescheduled either to allow for flow rates to return to pre-storm levels, or for at least seven days without measurable precipitation prior to sampling, whichever period is shorter. Dry weather monitoring will be scheduled to occur after the majority of growers have applied pesticides and/or fertilizers and during the period when irrigation is required, where practicable.

All efforts will be made to conduct two wet weather events during the wet season (October 15 through May 15). Sufficient precipitation is needed to produce runoff, mobilize constituents of interest, and increase drainage/stream flow. Although the *Conditional Ag Waiver* Monitoring and Reporting Program (MRP, CI-8836) requires that the first wet season sample be collected “within the first 24 hours of the first storm of the year with greater than 0.25 inches of rain as measured by the nearest National Weather Service rain gage”, field crews with extensive wet weather monitoring experience in Ventura County, including Ventura County Watershed Protection District and United Water Conservation District personnel, have identified the targeted rainfall amount of 0.5 inches to produce runoff and trigger a wet season monitoring event. However, even a storm of that magnitude will not necessarily produce runoff from agricultural lands if it occurs early in the wet season. It is therefore recognized that a flexible approach to establishing a wet season event

trigger is required to achieve the goals of the *Conditional Ag Waiver* MRP. Therefore, the VCAILGMP defines the targeted storm for wet weather sampling as a storm of at least 0.5 inches of rainfall, but ultimately, the decision to conduct a wet weather event will be made in consultation with weather forecasting information services and after a quantity of precipitation forecast (QPF) has been determined, in conjunction with information obtained from sampling personnel out surveying the watershed to determine whether rainfall is producing runoff from irrigated agricultural lands. The timing of sample collection will be targeted toward the first 24 hours of discharge, to the extent practicable. Regional Board staff will be notified by email and/or phone when a wet weather monitoring event is initiated.

Classification of Measurements

Because the VCAILGMP is intended to be a long term monitoring program, data that are not successfully collected for a specific monitoring event will not be collected at a later date. Rather, subsequent events conducted over the course of the program will provide a data set of sufficient size to appropriately characterize conditions at individual sampling sites. Moreover, some monitoring sites will often be dry during the dry season, which is relevant information, identifying areas where discharge from irrigated agricultural lands is not occurring. For these reasons, most of the data planned for collection cannot be considered absolutely critical. All information collected as outlined in the QAPP will be reported.

Validation of Non-Standard Methods

For non-standard sampling and analytical methods or other unusual situations, appropriate method validation study information will be documented to confirm the performance of the method for the particular need. The purpose of this validation is to assess the potential impact on the representativeness of the data generated. Such validation studies may include the initial demonstration of capability, split samples sent to another laboratory for analysis by a standard method, or round-robin studies performed by USEPA or other organizations. If previous validation studies are not available, some level of validation study will be performed during the project and included as part of the project's final report.

11. Sampling Methods

All samples will be collected in a manner appropriate for the specific analytical methods to be used. Proper sampling techniques must be used to ensure that samples are representative of environmental conditions. Field personnel will adhere to established sample collection protocols in order to ensure the collection of representative, uncontaminated (*i.e.*, contaminants not introduced by the sample handling process itself) water samples for laboratory analyses. If protocols are revised or altered, the deviations from the standard protocols must be documented. Standard operating procedures (SOPs) for collection of samples are provided in Appendix C of this QAPP. Summary descriptions of specific sampling methods and requirements are provided below.

Surface water samples will be collected for analysis of the constituents listed in Table 1, as appropriate for the monitoring Phase in effect. Surface water samples will be collected for chemical analyses and toxicity testing. Monitoring of additional constituents may be required in the future, depending on the results of Toxicity Identification Evaluations (TIEs), through source identification efforts as prescribed in Water Quality Management Plans (WQMPs), or other unforeseen reasons. In this case, the QAPP will be amended to provide adequate sampling and

analytical guidance, as necessary.

Field Protocols

Briefly, the key aspects of quality control associated with sample collection for eventual chemical and toxicological analyses are as follows:

- Field personnel will be thoroughly trained in the proper use of sample collection gear and will be able to distinguish acceptable versus unacceptable water samples in accordance with pre-established criteria;
- Field personnel will be thoroughly trained to recognize and avoid potential sources of sample contamination (*e.g.*, engine exhaust, ice used for cooling);
- Sampling gear and utensils which come in direct contact with the sample will be made of non-contaminating materials (*e.g.*, borosilicate glass, high-quality stainless steel and/or Teflon™, according to protocol) and will be thoroughly cleaned between sampling stations according to appropriate cleaning protocol (rinsing thoroughly with laboratory reagent water at minimum);
- Sample containers will be of the recommended type and will be free of contaminants (*i.e.*, pre-cleaned);
- Conditions for sample collection, preservation and holding times will be followed.

Field crews (2 persons per crew, minimum) will be mobilized for sampling only when weather conditions and flow conditions are considered to be safe. For safety reasons, sampling will be scheduled to occur during daylight hours. Sampling events will proceed in the following manner:

1. Before leaving the base of operations, confirm number and type of sample bottles as well as the complete equipment list.
2. Proceed to the first monitoring site.
3. Record the general information on the field log sheet.
4. Collect the samples indicated on the event summary sheet in the manner described in this QAPP. Collect additional volume and blank samples for field-initiated Quality Control (QC) samples as necessary. Place filled sample containers in coolers and carefully pack and ice samples as described in this QAPP. Using the log sheet, confirm that all appropriate bottles were filled.
5. Collect field measurements and observations, and record these on the field log sheet.
6. Repeat the procedures in steps 3, 4, and 5 for each of the remaining monitoring sites.
7. Complete the chain of custody forms using the field log sheets.
8. After sample collection is completed at all monitoring sites, deliver and/or ship samples to the appropriate laboratory.

Water Sample Collection

Grab samples will be collected at approximately mid-stream, mid-depth at the location of greatest flow (where feasible) by direct submersion of the sample bottle. This is the preferred method for grab sample collection; however, due to monitoring site configurations and safety concerns, direct filling of sample bottles may not always be feasible, especially during wet events. Monitoring site configuration will dictate grab sample collection technique. Grab samples will be collected directly into the appropriate bottles whenever feasible (containing the required preservatives as outlined in Table 7). Clean, powder-free nitrile gloves will be worn while collecting samples. In the event that a peristaltic pump and priority-cleaned silicone and Teflon™ tubing are used as a last resort to

collect samples (*i.e.*, due to unsafe conditions during wet events), the sample collection tubing and the sample bottle and lid shall come into contact only with surfaces known to be clean, or with the water sample. Standard operating procedures (SOPs) for collection of surface water samples are provided in Appendix C of this QAPP.

The potential exists for monitoring sites to lack discernable flow. The lack of discernable flow may generate unrepresentative data as standing puddles will not appropriately characterize agricultural discharges. To address the potential confounding interference that can occur under such conditions, sites monitored under the guidance of this QAPP should be assessed for the following conditions and sampled (or not sampled) accordingly:

- Pools of water with no flow or visible connection to another surface water body should **NOT** be sampled. The field log should be completed for non-water quality data (including date and time of site visit), and the site condition should be photo-documented.
- Flowing water (*i.e.*, determined by visual observations, flow meter data, and a photo-documented assessment of conditions immediately upstream and downstream of the sampling site) should be sampled.

It is the combined responsibility of all members of the sampling crew to determine if the performance requirements of the specific sampling method have been met, and to collect additional samples if required. If the performance requirements outlined above or documented in sampling protocols are not met, the sample will be re-collected. If contamination of the sample container is suspected, a fresh sample container will be used. The Project Manager will be contacted if at any time the sampling crew has questions about procedures or issues based on site-specific conditions.

Quality Control Sample Collection

Quality control (QC) samples will be collected in conjunction with environmental samples to verify data quality. QC samples collected in the field include field blanks and field duplicates. The frequency of QC sample collection is presented in Element 14 (Quality Control).

Field Measurements and Observations

Field measurements (listed in Table 1) will be collected and observations will be made at each monitoring site after all samples associated with the site are collected. Field measurements will include flow, pH, temperature, dissolved oxygen, turbidity, and conductivity. Measurements (except for flow) will be collected at approximately mid-stream, mid-depth at the location of greatest flow (if feasible) with a portable field meter that meets data quality objectives listed in Table 3. All portable monitoring equipment must meet the requirements outlined in Table 3. All field measurement results and comments regarding site observations will be recorded in a field log sheet similar to the example presented in Appendix F.

Flow will be estimated using a velocity meter and channel cross-sectional area measurements, or will be estimated by other means at each sampling station after all samples are collected. Appendix C contains the flow measurement SOP. When a velocity meter is unavailable or flow is not sufficiently deep to use a velocity meter, depth, width, and velocity will be estimated to provide an estimate of flow. Depth will be estimated using the average of several depth measurements

taken across the width of the channel. Width will be measured by extending a tape measure from one bank to the other. Velocity will be estimated by measuring the time it takes a floating object (*e.g.*, stick, orange peel) to travel a known distance. Regardless of the measurement technique used, if a staff gage is present, gage height will be noted on the field log sheet. Flow at the time of sampling will also be obtained from the nearest Ventura County stream gage, if one exists on the channel in question and if channel depth is sufficient to produce an accurate measurement.

If at any time the collection of field measurements by wading appears to be unsafe, field crews will not attempt to collect mid-stream, mid-depth measurements. Rather, field measurements will be made either directly from a stable, unobstructed area at the channel edge, or by using a telescoping pole and intermediate container to obtain a sample for field measurements and for filling sample containers. Use of sample collection methods other than the mid-stream, mid-depth method will be documented on the field log sheet. Field crews may not be able to measure flow at several sites during wet weather because of inaccessibility of the site. If this is the case, site inaccessibility will be documented on the field log sheet.

The field sampling crew has the primary responsibility for responding to failures in the sampling or measurement systems. Deviations from established monitoring protocols and this QAPP will be documented in the comment section of the field log sheet. If monitoring equipment fails, monitoring personnel will report the problem in the notes section of the field log sheet and will not record data values for the variables in question. Broken equipment will be replaced or repaired prior to the next field use. Data collected using faulty equipment will not be used for the VCAILGMP.

In addition to field measurements, observations will be made at each sampling station and noted on the field log sheet. Observations will include water color, water odor, floating materials, and observations of contact and non-contact recreation, to name just a few.

12. Sample Handling and Custody

Documentation Procedures

The Project Manager is responsible for ensuring that each field sampling team adheres to proper custody and documentation procedures. Field log sheets documenting sample collection and other monitoring activities for each site will be bound in a separate master logbook for each event. Field personnel have the following responsibilities:

- Keep an accurate written record of sample collection activities on the field log sheets.
- Ensure that all field log sheet entries are legible and contain accurate and inclusive documentation of all field activities.
- Note errors or changes using a single line to cross out the entry and date and initial the change.
- Ensure that a label is affixed to each sample collected and that the labels uniquely identify samples with the sample ID, site ID, date and time of sample collection and the sampling crew initials.
- Complete the chain of custody forms accurately and legibly.

Field Documentation/Field Log

Field crews will keep a field log book for each sampling event. The field log book will contain a calibration log sheet, a field log sheet for each site, and appropriate contact information. The

following items should be recorded on the field log sheet for each sampling event:

- Monitoring station location (Site ID)
- Date and time(s) of sample collection
- Name(s) of sampling personnel
- Sampling depth
- Sample ID numbers and unique IDs for any replicate or blank samples.
- QC sample type (if appropriate)
- Requested analyses (specific parameters or method references)
- Sample type, (*i.e.*, grab)
- The results of any field measurements (*i.e.*, flow, pH, temperature, dissolved oxygen, turbidity, conductivity) and the time field measurements were made.
- Qualitative descriptions of relevant water conditions (*e.g.*, water color, flow level, clarity) or weather (*e.g.*, wind, rain) at the time of sample collection.
- A description of any unusual occurrences associated with the sampling event, particularly those that may affect water quality or data quality.

The field log will be scanned into a PDF and transmitted along with the Event Summary Report to the Project Manager within one week of the conclusion of each sampling event. Appendix F contains an example of the field log sheet.

Container Labeling and Sample Identification Scheme

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

- *VCAILGMP* indicates that the sample was collected as part of the VCAILGMP.
- ###.# identifies the sequentially numbered sample event, and .# is an optional indicator for re-samples collected for the same event. Sample events are numbered from 001 to 999 and will not be repeated.
- AAAA indicates the unique site identification code assigned to each site. Site identification codes are provided in Table 4.
- XXX identifies the sample number unique to a sample bottle collected for a single event. Sample bottles are numbered sequentially from 001 to 999 and will not be repeated within a single event.

All sample containers will be pre-labeled before each sampling event to the extent practicable. Pre-labeling sample containers simplifies field activities, leaving only sample collection time and date and field crew initials to be filled out in the field. Custom labels will be produced using blank water-proof labels. This approach will allow the site and analytical constituent information to be entered in advance and printed as needed prior to each sampling event. Labels will be applied to the appropriate sample containers in a dry environment as labels usually do not adhere to wet bottles. The labels will not be applied to container caps. Container labels will contain the following information:

- Program Name
- Station ID
- Sample ID
- Date
- Collection Time
- Sampling Personnel
- Analytical Requirements
- Preservative Requirements
- Analytical Laboratory

Sample Containers, Volume, Storage, Preservation, and Holding Time

Sample containers must be pre-cleaned and certified free of contamination according to the USEPA specification for the appropriate methods. Sample container, required sample volume, storage and preservation, and holding time requirements are provided in Table 7. The analytical laboratories will supply sample containers that contain preservative (also identified in Table 7), including ultra pure acids, where applicable. After collection, samples will be stored at 4°C until arrival at the contract laboratory.

Table 7. Sample Container, Volume, Initial Preservation, and Holding Time Requirements

Parameter	Sample Container	Sample Volume ^[1]	Immediate Processing And Storage	Holding Time
<i>Aquatic Chronic Toxicity</i>				
Freshwater Sites (EC<3000 uS/cm): for 3-Species Screening, Routine Testing and Targeted Phase I TIE	FLPE-lined jerrican	1 x 20-L	Store at 4°C	36 hours ^[2]
Non-Freshwater Sites (EC>3000 uS/cm): for 3-Species Screening, Routine Testing and Targeted Phase I TIE	FLPE-lined jerrican	2 x 20-L	Store at 4°C	36 hours ^[2]
<i>Field Measurements</i>				
Flow, pH, Temperature, Dissolved Oxygen, Turbidity, Conductivity	Field Meter	N/A	N/A	N/A
<i>General Water Quality Constituents (GWQC)</i>				
Total Suspended Solids (TSS)	Polyethylene	1 L	Store at 4°C	7 days
Total Dissolved Solids (TDS)	Polyethylene	1 L	Store at 4°C	7 days
Chloride				28 days
Sulfate				28 days
Phosphate				48 hours
Nitrate-N				48 hours
Total Ammonia-N	Polyethylene	250 mL	H ₂ SO ₄ ; Store at 4°C	28 days
<i>Organics – Pesticides</i>				
Organochlorine Pesticides	Amber Glass	2 x 1-L	Store at 4°C	7/40 days ^[3]
Organophosphorus Pesticides				3/40 days ^[4]
Pyrethroids				3/40 days ^[4]

NA = Not Applicable

[1] Additional sample volume may be required for quality control analyses.

[2] Tests should be initiated within 36 hours after sample collection. The 36-hour hold time does not apply to subsequent analyses for TIEs. For interpretation of toxicity results, samples may be split from toxicity samples in the laboratory and analyzed for specific chemical parameters. All other sampling requirements (sample containers, preservation, holding times) for these samples are as specified in this document for the specific analytical method. Results of these analyses are qualified for any other use (*e.g.*, characterization of ambient conditions) because of potential holding time exceedances and variance from sampling requirements.

[3] 7/40 days = 7 days to extraction and 40 days from extraction to analysis.

[4] 3/40 days = 3 days to extraction and 40 days from extraction to analysis.

Sample Handling and Shipment

The field crews will have custody of samples during each monitoring event. Chain-of-custody (COC) forms will accompany all samples during shipment to contract laboratories to identify the shipment contents. All water quality samples will be transported to the analytical laboratory by the field crew or by overnight courier. The original COC form will accompany the shipment, and a signed copy of the COC form will be sent, typically via fax, by the laboratory to the field crew to be

retained in the project file.

While in the field, samples will be stored on ice in an insulated container (*i.e.*, ice chest), so that sample temperature will be maintained at approximately 4°C. Samples that must be shipped to the laboratory must be examined to ensure that container lids are tight and that containers don't leak. The ice packed with samples must be double-bagged in re-sealable bags, be approximately 2 inches deep at the top and bottom of the cooler, and must contact each sample to maintain temperature. Ice chests containing jerricans must be packed with as much loose ice as possible. The original COC form(s) will be double-bagged in re-sealable plastic bags and either taped to the outside of the cooler or to the inside lid. Samples must be shipped to the contract laboratory according to Department of Transportation standards. The method(s) of shipment, courier name, and other pertinent information should be entered in the "Received By" or "Remarks" section of the COC form.

Coolers must be sealed with packing tape before shipping and must not leak. It is assumed that samples in tape-sealed ice chests are secure whether being transported by field staff vehicle, by common carrier, or by commercial package delivery. The laboratory's sample receiving department will examine the shipment of samples for correct documentation, proper preservation, and compliance with holding times.

The following procedures are used to prevent bottle breakage and cross-contamination:

- Bubble wrap or foam pouches are used to keep glass bottles from contacting one another to prevent breakage.
- All samples are transported inside hard plastic coolers or other contamination-free shipping containers.
- The coolers are taped shut to prevent accidental opening.
- Arrangements must be made in advance to notify the laboratory's sample receiving department prior to sample shipment.

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals.

Chain-of-Custody Form

Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. Sample custody must be traceable from the time of sample collection until results are reported. A sample is considered under custody if it is:

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

A chain-of-custody (COC) form must be completed after sample collection and prior to sample shipment or release. The COC form, sample labels, and field documentation will be cross-checked by the field crew prior to shipment or delivery to the laboratory to verify sample identification, types of analyses, number of containers, sample volume, preservatives, and types of containers. A

completed COC form is to accompany the samples to the analyzing laboratory. A typical COC form is illustrated in Appendix F.

Laboratory Custody Procedures

Contract laboratories will follow sample custody procedures as outlined in the laboratory's Quality Assurance (QA) Manual. A copy of each contract laboratory's QA Manual is retained in the project file. Laboratories shall maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times. The following sample control activities must be conducted at the laboratory:

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

Laboratories shall maintain records to document that the above procedures are followed. Once samples have been analyzed, samples will be stored at the laboratory for at least 30 days. After this period, samples may be disposed of properly.

13. Analytical Methods

Portable field meters used for the VCAILGMP must meet specifications outlined in Table 8. Analytical methods, method detection limits (MDLs), and reporting limits (RLs) required for samples analyzed in the laboratory are summarized in Table 8 MDLs and RLs are discussed in more detail in this Element.

Prior to the analysis of any environmental samples, the laboratory must have demonstrated the ability to meet the minimum performance requirements for each analytical method presented in Table 9. The initial demonstration of capability includes the ability to meet the project-specified Method Detection Limits and Reporting Limits, the ability to generate acceptable precision and accuracy, and other analytical and quality control parameters documented in this QAPP. Data quality objectives for precision and accuracy are summarized in Table 3. Laboratory SOPs for analytical methods listed below are included in Appendix E of this QAPP.

Table 8. Analytical Methods and Project Reporting Limits for Field Measurements

Parameter	Method	Range	Project Reporting Limit
Flow	Electromagnetic	-0.5 to +20 ft/s	0.05 ft/s
pH	Electrometric	0 – 14 pH units	NA
Temperature	High stability thermistor	-5 – 50 °C	NA
Dissolved oxygen	Membrane	0 – 50 mg/L	0.5 mg/L
Turbidity	Nephelometric	0 – 3000 NTU	0.2 NTU
Conductivity	Graphite electrodes	0 – 10 mmhos/cm	2.5 umhos/cm

NA = Not Applicable

Table 9. Analytical Methods and Project Method Detection Limits / Project Reporting Limits for Laboratory Analyses

Parameter	Analytical Method ^[1]	Units	Project Method Detection Limits	Project Reporting Limits
<i>General Water Quality Constituents</i>				
Total Dissolved Solids (TDS)	SM 2540C	mg/L	4	20
Total Suspended Solids (TSS)	SM 2540D	mg/L	2	5
Chloride	EPA 300.0	mg/L	0.2	1
Sulfate	EPA 300.0	mg/L	0.03	1
Total Ammonia-N	SM 4500NH3G	mg/L	0.04	0.2
Nitrate-N	EPA 300.0	mg/L	0.008	0.1
Phosphate	SM 4500PE	mg/L	0.01	0.05
<i>Organochlorine Pesticides ^[2]</i>				
Aldrin	EPA 625(m)/8270C(m)	ng/L	1	5
alpha-BHC	EPA 625(m)/8270C(m)	ng/L	1	5
beta-BHC	EPA 625(m)/8270C(m)	ng/L	1	5
gamma-BHC (Lindane)	EPA 625(m)/8270C(m)	ng/L	1	5
Delta-BHC	EPA 625(m)/8270C(m)	ng/L	1	5
Chlordane-alpha	EPA 625(m)/8270C(m)	ng/L	1	5
Chlordane-gamma	EPA 625(m)/8270C(m)	ng/L	1	5
2,4'-DDD	EPA 625(m)/8270C(m)	ng/L	1	5
2,4'-DDE	EPA 625(m)/8270C(m)	ng/L	1	5
2,4'-DDT	EPA 625(m)/8270C(m)	ng/L	1	5
4,4'-DDD	EPA 625(m)/8270C(m)	ng/L	1	5
4,4'-DDE	EPA 625(m)/8270C(m)	ng/L	1	5
4,4'-DDT	EPA 625(m)/8270C(m)	ng/L	1	5
Dieldrin	EPA 625(m)/8270C(m)	ng/L	1	5
Endosulfan I	EPA 625(m)/8270C(m)	ng/L	1	5
Endosulfan II	EPA 625(m)/8270C(m)	ng/L	1	5
Endosulfan Sulfate	EPA 625(m)/8270C(m)	ng/L	1	5
Endrin	EPA 625(m)/8270C(m)	ng/L	1	5
Endrin Aldehyde	EPA 625(m)/8270C(m)	ng/L	1	5
Endrin Ketone	EPA 625(m)/8270C(m)	ng/L	1	5
Toxaphene	EPA 625(m)/8270C(m)	ng/L	10	50
<i>Pyrethroid Pesticides</i>				
Bifenthrin	EPA 625(m)/8270C(m)	ng/L	5	5
Cyfluthrin	EPA 625(m)/8270C(m)	ng/L	4	5
Cyhalothrin	EPA 625(m)/8270C(m)	ng/L	4	5
Cypermethrin	EPA 625(m)/8270C(m)	ng/L	3	5
Deltamethrin/Tralomethrin	EPA 625(m)/8270C(m)	ng/L	3	10
Esfenvalerate/Fenvalerate	EPA 625(m)/8270C(m)	ng/L	4	5
Fenpropathrin	EPA 625(m)/8270C(m)	ng/L	3	5
Fluvalinate	EPA 625(m)/8270C(m)	ng/L	3	5
Permethrin	EPA 625(m)/8270C(m)	ng/L	3	5
Resmethrin	EPA 625(m)/8270C(m)	ng/L	6	10

[1] Standard Methods (SM) or EPA Method number.

[2] The MDLs and/or RLs listed for several organochlorine pesticides (aldrin, alpha-BHC, chlordane, DDTs, dieldrin and toxaphene) are higher than water quality "benchmarks" specified for the monitoring program. However, the MDLs and/or RLs listed herein are significantly lower than levels currently attainable by commercial laboratories using standard analytical test methods and are consistent with the lowest detection limits reported for NPDES monitoring programs.

Table 9 (continued from previous page). Analytical Methods and Project Method Detection Limits / Project Reporting Limits for Laboratory Analyses

Parameter	Method ^[1]	Units	Project Method Detection Limits	Project Reporting Limits
<i>Organophosphorus Pesticides</i>				
Bolstar	EPA 625(m)/8270C(m)	ng/L	2	4
Chlorpyrifos	EPA 625(m)/8270C(m)	ng/L	1	2
Demeton	EPA 625(m)/8270C(m)	ng/L	1	2
Diazinon	EPA 625(m)/8270C(m)	ng/L	2	4
Dichlorovos	EPA 625(m)/8270C(m)	ng/L	3	6
Dimethoate	EPA 625(m)/8270C(m)	ng/L	3	6
Disulfoton	EPA 625(m)/8270C(m)	ng/L	1	2
Ethoprop	EPA 625(m)/8270C(m)	ng/L	1	2
Fenchlorophos	EPA 625(m)/8270C(m)	ng/L	2	4
Fensulfothion	EPA 625(m)/8270C(m)	ng/L	1	2
Fenthion	EPA 625(m)/8270C(m)	ng/L	2	4
Malathion	EPA 625(m)/8270C(m)	ng/L	3	6
Merphos	EPA 625(m)/8270C(m)	ng/L	1	2
Methyl Parathion	EPA 625(m)/8270C(m)	ng/L	1	2
Mevinphos	EPA 625(m)/8270C(m)	ng/L	8	16
Phorate	EPA 625(m)/8270C(m)	ng/L	6	12
Tetrachlorvinphos	EPA 625(m)/8270C(m)	ng/L	2	4
Tokuthion	EPA 625(m)/8270C(m)	ng/L	3	6
Trichloronate	EPA 625(m)/8270C(m)	ng/L	1	2

[1] Standard Methods (SM) or EPA Method number.

Toxicity Testing and Toxicity Identification Evaluations (TIEs)

Water quality samples will be analyzed for chronic toxicity to *Ceriodaphnia dubia*, *Pimephales promelas*, and *Selenastrum capricornutum* for the first monitoring event. The most sensitive species determined at each toxicity site will be used for subsequent monitoring events.

Determination of chronic toxicity to *C. dubia*, *P. promelas* and *Selenastrum* will be performed generally as described in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition (USEPA 2002). Toxicity tests will be conducted on 100% sample.

One toxicological protocol has been modified in this QAPP. The chronic fathead minnow test is susceptible to Pathogen Related Mortality (PRM), a phenomenon that is not uncommon in toxicity tests of ambient waters. PRM is characterized by high inter-replicate variability in mortality and pathogenic "coronas" around the fish, resulting in fish mortality related to a pathogen infestation and not due to toxicant exposure. The US EPA recognized this test interference in the 2002 edition of the freshwater chronic toxicity testing manual (EPA-821-R-02-013), and suggests the use of a modified exposure method that increases the number of replicates while decreasing the number of fish in each replicate as an approach to reduce pathogen infestation among the fish in a replicate. The toxicity testing laboratory (Pacific EcoRisk) has demonstrated success with other large monitoring programs in the application of this modified protocol. The chronic fathead minnow SOP in Attachment 4 of Appendix D has been updated to include this PRM exposure protocol.

The results of toxicity testing will be used to trigger further investigation to determine the cause of

observed laboratory toxicity. If testing indicates the presence of significant toxicity in the sample, TIE procedures may be initiated to investigate the cause of toxicity. For the purpose of triggering TIE procedures, significant toxicity is defined as at least 50% mortality (*P. promelas* and *C. dubia*) or a 50% reduction in growth (*Selenastrum*). The 50% threshold is consistent with the approach recommended in guidance published by U.S. EPA for conducting TIEs (USEPA 1996b), which recommends a minimum threshold of 50% mortality because the probability of completing a successful TIE decreases rapidly for samples with less than this level of toxicity. A targeted Phase I TIE will be conducted to determine the general class of constituents (*e.g.*, non-polar organics) causing toxicity. The targeted TIE will focus on classes of constituents anticipated to be observed in drainages dominated by urban and agricultural discharges and those previously observed to cause toxicity. These classes of constituents have been determined to be primarily non-polar organics. TIE methods will generally adhere to EPA procedures documented in conducting TIEs (USEPA 1991, 1992, 1993a-b). For samples exhibiting toxic effects consistent with carbofuran, diazinon, or chlorpyrifos, TIE procedures will follow those documented in Bailey *et al.* (1996).

Adequate sample volume will be collected so that TIE procedures can be initiated as soon as possible after toxicity is observed. This will reduce the potential for loss of toxicity due to extended sample storage and will therefore increase the likelihood that the toxicant will be identified.

The decision to initiate TIE procedures on any sample, including samples exceeding the mortality threshold, as well as the focus and scope of TIE procedures, will be determined through consultation between the Project Manager, the toxicity laboratory, and Regional Board staff. When deciding whether to initiate TIE procedures for a specific site and monitoring event, a number of factors will be considered, including the level of toxicity, history of toxicity at the site, the species and endpoints exhibiting toxic effects, as well as the primary technical basis for triggering TIEs described above. The rationale for determining the TIE procedures for a specific sample will be clearly documented in subsequent data reports.

Attempts will be made to collect samples at low tide at potentially tidally-influenced monitoring sites. However, if sample salinity exceeds levels suitable for the three species identified in this Element, alternative species will be selected based on previous testing in the area and recommendations of the toxicity testing laboratory. Potential alternate species include the following:

- For *C. dubia*: *Hyallela azteca* will be used if the conductivity exceeds 3000 uS/cm. *Americamysis bahia* will be used if the salinity exceeds 15 ppt.
- For *P. promelas*: *Atherinops affinis*. If this species is unavailable, *Cyprinodon variegatus* (Sheepshead Minnow) will be used.
- For *Selenastrum*: *Thalassiosira pseudonana*.

The *Conditional Ag Waiver* Monitoring and Reporting Program (MRP, CI-8836) requires that any exceedance of the 1.0 TUc trigger be followed up with two consecutive months of toxicity testing, and that a TIE must be initiated if the toxicity exceedances persist. Although the follow-up approach is consistent with NPDES monitoring protocols, it will not provide information that will lead to the identification of specific toxicants which can allow for toxicity reductions in agricultural discharges through implementation of best management practices. Although the follow-up testing approach may provide a temporal assessment of low-level toxicity, there will be no concurrent

chemical analysis of the sample to identify a potential toxicant and therefore no indication that the same toxicant is causing toxicity from one sampling event to the next. The toxicity monitoring approach developed for the VCAILGMP is designed to identify toxicants and thereby provide a mechanism for achieving toxicity reductions in agricultural discharges. This approach was used successfully in the Calleguas Creek Watershed for toxicity monitoring in support of toxicity TMDL development, and it has been recommended by US EPA toxicologists because of its success in identifying toxicants. It is therefore the approach selected for the VCAILGMP.

Detection and Reporting Limits

Method detection limits (MDL) and reporting limits (RLs) must be distinguished for proper understanding and data use. The MDL is the minimum analyte concentration that can be measured and reported with a 99% confidence that the concentration is greater than zero.

The RL represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and with confidence in both identification and quantitation.

For this program, RLs must be verifiable by having the lowest non-zero calibration standard or calibration check sample concentration at or less than the RL. RLs have been established in this QAPP based on the verifiable levels and general measurement capabilities demonstrated for each method. These RLs should be considered as maximum allowable reporting limits to be used for laboratory data reporting. Note that samples diluted for analysis may have sample-specific RLs that exceed these RLs. This will be unavoidable in on occasion. However, if samples collected through the VCAILGMP are consistently diluted to overcome matrix interferences, the analytical laboratory will be required to notify the Project Manager how the sample preparation or test procedure in question will be modified to reduce matrix interferences so that project RLs can be met consistently.

Method Detection Limit Studies

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

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

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

Project Reporting Limits

Laboratories generally establish RLs that are reported with the analytical results—these may be called *reporting limits*, *detection limits*, *reporting detection limits*, or several other terms by the analyzing laboratory. These laboratory limits must be less than or equal to the project RLs listed in Table 9. Wherever possible, project RLs are lower than benchmarks identified in the *Conditional Ag Waiver*. However, it is acknowledged here that several of the benchmarks for pesticides are lower than current analytical methodologies are capable of detecting. Laboratories performing analyses for this project must have documentation to support quantitation at the required levels.

Laboratory Standards and Reagents

All stock standards and reagents used for standard solutions and extractions must be tracked through the laboratory. The preparation and use of all working standards must be documented according to procedures outlined in each laboratory's Quality Assurance Manual; standards must be traceable according to U.S. EPA, A2LA or National Institute for Standards and Technology (NIST) criteria. Records must have sufficient detail to allow determination of the identity, concentration, and viability of the standards, including any dilutions performed to obtain the working standard. Date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard.

Alternate Laboratories

In the event that the laboratories selected to perform analyses for the VCAILGMP are unable to fulfill data quality requirements outlined herein (e.g., due to an instrument malfunction), alternate laboratories will be selected based on their ability to meet ELAP and/or NELAP certification and data quality requirements specified in this QAPP. The original laboratory selected may recommend a qualified laboratory to act as a substitute. However, the final decision regarding alternate laboratory selection rests with the Project Manager and Project QA Manager.

14. Quality Control

Quality control procedures for field and laboratory activities are summarized in Table 10 and are discussed in more detail below. There are no SWAMP requirements for quality control for field analysis of general parameters (*i.e.*, pH, temperature, dissolved oxygen, turbidity, and conductivity). However, field crews will be required to calibrate equipment as outlined in Element 16 (Instrument / Equipment Calibration).

Table 10. Quality Control Requirements – Field and Laboratory

Quality Control Sample Type	QA Parameter	Frequency ^[1]	Acceptance Limits	Corrective Action
Quality Control Requirements – Field				
Equipment Blanks	Contamination	Once per equipment batch cleaned ^[2]	< MDL	Identify contamination source, re-clean equipment, and re-run equipment blank.
Field Blank	Contamination	5% of all samples	< MDL	Examine field log. Identify contamination source. Qualify data as needed.
Field Duplicate	Precision	5% of all samples	RPD \leq 25% if Difference \geq RL	If laboratory duplicate is within acceptance limits, no corrective action needed. Otherwise, reanalyze both samples if possible. Identify variability source. Qualify data as needed.
Quality Control Requirements – Chemistry Laboratory				
Method Blank	Contamination	1 per analytical batch	< MDL	Identify contamination source. Reanalyze method blank and all samples in batch. Qualify data as needed.
Lab Duplicate	Precision	1 per analytical batch	RPD \leq 25% if Difference \geq RL	Recalibrate and reanalyze.
Matrix Spike	Accuracy	1 per analytical batch	80-120% Recovery for GWQC 50-150% Recovery for Pesticides ^[3]	Check LCS/SRM recovery. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Matrix Spike Duplicate	Precision	1 per analytical batch	RPD \leq 25% if Difference \geq RL	Check lab duplicate RPD. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Laboratory Control Sample (or SRM)	Accuracy	1 per analytical batch	80-120% Recovery	Recalibrate and reanalyze LCS/SRM and samples.
Surrogate Spike	Accuracy	Each sample	30-150% Recovery ^[3]	Check surrogate recovery in LCS. Attempt to correct matrix problem and reanalyze sample. Qualify data as needed.

MDL = Method Detection Limit RL = Reporting Limit RPD = Relative Percent Difference

LCS = Laboratory Control Sample/Standard SRM = Standard/Certified Reference Material

GWQC = General Water Quality Constituents

[1] "Analytical batch" refers to a number of samples (not to exceed 20 environmental samples plus the associated quality control samples) that are similar in matrix type and processed/prepared together under the same conditions and using the same reagents (equivalent to preparation batch).

[2] Equipment blanks will be collected by the analytical laboratory responsible for cleaning equipment, before returning equipment to the field crew for use.

[3] Or control limits established as the mean \pm 3 standard deviations based on actual laboratory recovery data.

Comparability

Comparability of the data can be defined as the similarity of data generated by different monitoring programs. For this monitoring program, this objective will be ensured mainly through use of standardized procedures for field measurements, sample collection, sample preparation, laboratory analysis, and site selection; adherence to quality assurance protocols and holding times; and reporting in standard units. If monitoring requires participation of several monitoring teams, data comparability will be ensured through regular group training sessions, as well as adherence to

standard sample collection procedures outlined in the Monitoring and Reporting Program Plan. Additionally, comparability of analytical data will be addressed through the use of standard operating procedures and extensive analyst training at the analyzing laboratory.

Representativeness

Representativeness can be defined as the degree to which the environmental data generated by the monitoring program accurately and precisely represent actual environmental conditions. For the VCAILGMP, this objective will be addressed by the overall design of the program.

Representativeness is attained through the selection of sampling locations, methods, and frequencies for each parameter of interest, and by maintaining the integrity of each sample after collection. Sampling locations were chosen that are representative of discharges from agricultural irrigated lands, which will allow for the characterization of the impacts that such discharges may have on receiving water quality.

Completeness

Data completeness is a measure of the amount of successfully collected and validated data relative to the amount of data planned to be collected for the project. It is usually expressed as a percentage value. A project objective for percent completeness is typically based on the percentage of the data needed for the program or study to reach valid conclusions.

Because the VCAILGMP is intended to be a long term monitoring program, data that are not successfully collected for a specific monitoring event will not be collected at a later date. Rather, subsequent events conducted over the course of the program will provide a sufficient data set to appropriately characterize conditions at individual sampling sites. Moreover, some monitoring sites will often be dry during the dry season, which is important information necessary to identify areas where discharge from irrigated agricultural lands is nonexistent. For these reasons, most of the data planned for collection cannot be considered absolutely critical, and it is difficult to set a meaningful objective for data completeness. However, some reasonable objectives for data are desirable, if only to measure the effectiveness of the program. The program goals for data completeness shown in Table 11 are based on the planned sampling frequency, SWAMP recommendations, and a subjective determination of the relative importance of the monitoring element within the VCAILGMP.

Table 11. Required Data Completeness

Monitoring Element	Completeness Objective
Field Measurements	90%
General Water Quality Constituents	90%
Organic Constituents - Pesticides	90%
Aquatic Toxicity	90%

Field Procedures

For basic water quality analyses, quality control samples to be collected in the field will consist of equipment blanks, field blanks and field duplicates.

Equipment Blanks

The purpose of analyzing equipment blanks is to demonstrate that sampling equipment is free from contamination. Equipment blanks will be collected by the analytical laboratory responsible for cleaning equipment, before sending cleaned equipment back to the field crew for use, and will be analyzed for chloride, sulfate, nutrients and pesticides identified in Table 1. Equipment blanks will consist of laboratory-prepared blank water (certified to be contaminant-free by the laboratory) processed through the sampling equipment that will be used to collect environmental samples.

The blanks will be analyzed using the same analytical methods and detection limits specified for environmental samples. If any analytes of interest are detected at levels greater than the MDL, the source(s) of contamination will be identified and eliminated (if possible), the affected batch of equipment will be re-cleaned, and new equipment blanks will be prepared and analyzed before the equipment is returned to the field crew for use.

Field Blanks

The purpose of analyzing field blanks is to demonstrate that sampling procedures do not result in contamination of the environmental samples. Field blanks will be prepared and analyzed at a frequency of 5% of samples collected, along with the associated environmental samples. Blanks will consist of laboratory-prepared blank water (certified to be contaminant-free by the laboratory) processed through the sampling equipment using the same procedures used for environmental samples.

If any analytes of interest are detected at levels greater than the MDL, the source(s) of contamination should be identified and eliminated, if possible. The sampling crew should be notified so that the source of contamination can be identified (if possible) and corrective measures taken prior to the next sampling event.

Field Duplicates

The purpose of analyzing field duplicates is to demonstrate the precision of sampling *and* analytical processes. Field duplicates will be prepared at the rate of 5% of all samples, and analyzed along with the associated environmental samples. Field duplicates will consist of two grab samples collected simultaneously to the extent practicable. If the Relative Percent Difference (RPD) of field duplicate results is greater than 25% and the absolute difference is greater than the RL, the laboratory duplicate RPD should be evaluated. If laboratory duplicates were analyzed and the resulting RPD falls within acceptance limits, field duplicate variability is likely due to either sampling technique or concentration gradients of analyte in the water body sampled. The sampling crew should be notified so that the source of sampling variability can be identified (if possible) and corrective measures taken prior to the next sampling event.

Laboratory Analyses

Quality control samples prepared in the laboratory will consist of method blanks, laboratory duplicates, matrix spikes/duplicates, laboratory control samples (standard reference materials), and toxicity quality controls.

Method Blanks

The purpose of analyzing method blanks is to demonstrate that sample preparation and analytical procedures do not result in sample contamination. Method blanks will be prepared and analyzed

by the contract laboratory at a rate of at least one for each analytical batch. Method blanks will consist of laboratory-prepared blank water processed along with the batch of environmental samples. If the result for a single method blank is greater than the MDL, the source(s) of contamination should be identified and eliminated, and the sample batch should be prepared and analyzed again, if possible. If this is not possible, the data should be qualified accordingly. If method blank contamination is consistently reported, the laboratory will be expected to propose to the Project Manager a systematic approach for identifying and eliminating the source of contamination. The laboratory should also be prepared to sub-contract analysis for that method to another qualified laboratory until the contamination issue is resolved.

Laboratory Duplicates

The purpose of analyzing laboratory duplicates is to demonstrate the precision of the sample preparation and analytical methods. Laboratory duplicates will be analyzed at the rate of one pair per sample batch. Laboratory duplicates will consist of either replicate environmental samples or duplicate laboratory fortified method blanks. If the Relative Percent Difference (RPD) for any analyte is greater than 25% *and* the absolute difference between duplicates is greater than the RL, the analytical process is not being performed adequately for that analyte. In this case, the sample batch should be prepared and analyzed again, if possible.

Matrix Spikes and Matrix Spike Duplicates

The purpose of analyzing matrix spikes and matrix spike duplicates is to demonstrate the performance of the sample preparation and analytical methods in a particular sample matrix. Matrix spikes and matrix spike duplicates will be analyzed at the rate of one pair per sample batch. Each matrix spike and matrix spike duplicate will consist of an aliquot of laboratory-fortified environmental sample. Spike concentrations should be added at five to ten times the reporting limit for the analyte of interest.

If the matrix spike recovery of any analyte is outside the acceptable range, the results for that analyte have failed to meet acceptance criteria. If recovery of laboratory control samples is acceptable, the analytical process is being performed adequately for that analyte, and the problem is attributable to the sample matrix. An attempt will be made to correct the problem (*e.g.*, by dilution, concentration, etc.), and the samples and matrix spikes will be re-analyzed.

If the matrix spike duplicate RPD for any analyte is outside the acceptable range, the results for that analyte have failed to meet acceptance criteria. If the RPD for laboratory duplicates is acceptable, the analytical process is being performed adequately for that analyte, and the problem is attributable to the sample matrix. An attempt will be made to correct the problem (*e.g.*, by dilution, concentration, etc.), and the samples and matrix spikes will be re-analyzed.

Laboratory Control Samples

The purpose of analyzing laboratory control samples (or a standard reference material) is to demonstrate the accuracy of the sample preparation and analytical methods. Laboratory control samples will be analyzed at the rate of one per sample batch. Laboratory control samples will consist of a laboratory fortified method blank or a standard reference material. If recovery of any analyte is outside the acceptable range, the analytical process is not being performed adequately for that analyte. In this case, the sample batch should be prepared and analyzed again.

Surrogate Spikes

Surrogate recovery results are used to evaluate the accuracy of analytical measurements for organics analyses on a sample-specific basis. A surrogate is a compound (or compounds) added by the laboratory to all samples in a batch, including method blanks, LCSs, samples, and matrix spikes prior to sample preparation, as specified in the analytical methodology. Surrogates are generally brominated, fluorinated or isotopically labeled compounds that are not usually present in environmental media. Results are expressed as percent recovery of the surrogate spike. Surrogate spikes are applicable for analysis of organochlorine, organophosphorus and pyrethroid pesticides. Surrogate recoveries must fall within acceptance limits as specified by the analytical method.

Aquatic Toxicity Quality Control

For aquatic toxicity tests, the acceptability of test results is determined primarily by performance-based criteria for test organisms, culture and test conditions, and the results of control bioassays. Control bioassays include monthly reference toxicant testing. Test acceptability requirements are documented in the method documents for each bioassay method, which are included in Appendix D. Field duplicates will be collected for toxicity testing at a rate of 5% of samples collected (or every 20 environmental samples collected). If the RPD for the duplicates is greater than 25% but the RPD for the laboratory duplicates is within acceptance limits, the variability will be attributed to sampling processes (*i.e.*, sampling procedures, the time lapsed between collection of the two samples, or the existence of a concentration gradient in the water body.) If laboratory and field duplicates fail to meet acceptance limits, the variability will be attributed to laboratory procedures, and the laboratory will be required to provide the Project Manager with an explanation (*e.g.*, unhealthy organisms) or a systematic approach for reducing analytical variability.

15. Instrument/Equipment Testing, Inspection and Maintenance

Sample Equipment Cleaning Procedures

Equipment used for sample collection (*i.e.*, peristaltic pump tubing, sample containers and caps) will be cleaned by the analytical laboratory prior to each monitoring event, according to procedures documented for each analytical method. After cleaning, sample containers will be stored with lids secured, and additional clean caps will be stored in clean re-sealable bags. Cleaned tubing will be stored in clean polyethylene bags.

Each batch of cleaned equipment will be used to generate an equipment blank as discussed in Element 14 (Quality Control).

Field Measurement Equipment

Each field crew will be responsible for testing, inspecting, and maintaining their field measurement equipment in accordance with the manufacturer's specifications. This includes battery checks, routine replacement of membranes, and cleaning of probes and electrodes.

Analytical Equipment Testing Procedures and Corrective Actions

Testing, inspection, and maintenance of analytical equipment used by the contract laboratory and corrective actions are documented in the QA Manual for each analyzing laboratory. Laboratory QA Manuals are available for review at the analyzing laboratory.

16. Instrument/Equipment Calibration and Frequency

Laboratory Analytical Equipment

Frequencies and procedures for calibration of analytical equipment used by each contract laboratory are documented in the QA Manual for each contract laboratory. Any deficiencies in analytical equipment calibration should be managed in accordance with the QA Manual for each contract laboratory. Any deficiencies that affect analysis of samples submitted through this program must be reported to the Project Manager or designee. Laboratory QA Manuals are available for review at the analyzing laboratory.

Field Measurement Equipment

Calibration of field measurement equipment is performed as described in the user manual for each individual instrument. Each field crew will be responsible for calibrating their field measurement equipment. Field monitoring equipment must meet the requirements outlined in Table 3 and be calibrated at a frequency recommended by the manufacturer, but at a minimum prior to each event. Each calibration will be documented on each event's calibration log (presented in Figure 6).

If calibration results do not meet manufacturer specifications, the field crew should first try to recalibrate using fresh aliquots of calibration solution. If recalibration is unsuccessful, new calibration solution should be used and/or maintenance should be performed. Each attempt should be recorded on the equipment calibration log. If the calibration results cannot meet manufacturer's specifications, the field crew should use a spare field measuring device that can be successfully calibrated. Additionally, the Project Manager should be notified.

Calibration should be verified using at least one calibration fluid within the expected range of field measurements, both immediately following calibration and at the end of each monitoring day. Individual parameters should be recalibrated if results for the calibration check do not fall within the range of accuracy identified in Table 3. Calibration verification documentation will be retained in the event's Calibration Verification Log presented in Figure 7. Table 12 outlines the typical field instrument calibration procedures for each field probe requiring calibration. Results of initial calibration checks will be recorded on the Field Measurement Equipment Calibration Log, an example of which is shown in Figure 6.

Table 12. Calibration of Field Measurement Equipment

Field Meter Parameter	Calibration and Verification Description	Frequency of Calibration	Frequency of Calibration Verification	Responsible Party
pH	Calibration for pH measurement is accomplished using standard buffer solutions. Analysis of a mid-range buffer will be performed to verify successful calibration.	Day of sampling event	After each day's calibration and at the end of the sampling day	Individual Sampling Crew
Temperature	Temperature calibration is factory-set and requires no subsequent calibration.			
Dissolved Oxygen	Calibration for dissolved oxygen measurements is accomplished using a water saturated air environment. Dissolved oxygen measurement of water-saturated air will be performed to verify successful calibration.			
Conductivity	Conductivity calibration will follow manufacturer's specifications. A mid-range conductivity standard will be analyzed to verify successful calibration.			
Turbidity	Turbidity calibration will follow manufacturer's specifications. A mid-range turbidity standard will be analyzed to verify successful calibration.			

Field Measurement Equipment Calibration Log

Date:

Parameter	Meter ID	Calibration Standard	Post-Cal Measurement	Calibration Valid if:	Time	Initials
Dissolved Oxygen		_____ mmHG _____ °C	_____ mg/L (water-sat'd air)	D.O. reads within 10% of value from D.O. tables ¹		
Conductivity		500 uS/cm				
		10,000 uS/cm	_____ uS/cm (mid-range std.)	EC reads w/in 5% of expected value		
pH		7.0 Units				
		10.0 Units	_____ Units (pH = 8.0)	pH 8 reads within ± 0.2 Units (or w/in manuf's specs)		
Turbidity		0 NTU				
		100 NTU				
		1000 NTU	_____ NTU (100 NTU)	NTU reads within 10% of expected value		

Notes:

Figure 6. Example Field Measurement Equipment Calibration Log Sheet

¹ "D.O. tables" refers to tables of dissolved oxygen in water as a function of temperature and barometric pressure, typically found in wastewater engineering text books.

Field Measurement Equipment Calibration Verification Log

Date:

Parameter	Meter ID	Verification Standard	Measurement	Calibration Valid if:	Time	Initials
Dissolved Oxygen		_____ mmHg _____ °C	_____ mg/L (water-sat'd air)	D.O. reads within 10% of value from D.O. tables ²		
Conductivity		_____ uS/cm	_____ uS/cm (mid-range std.)	EC reads w/in 5% of expected value		
pH		_____ Units	_____ Units (pH = 8.0)	pH 8 reads within ± 0.2 Units (or w/in manuf's specs)		
Turbidity		_____ NTU	_____ NTU (100 NTU)	NTU reads within 10% of expected value		

Notes:

Figure 7. Example Field Measurement Equipment Calibration Verification Log Sheet

17. Inspection/Acceptance of Supplies and Consumables

Inspection of gloves, sample containers, and any other consumable equipment used for sampling will be the responsibility of each individual sampling crew. Inspection should be conducted immediately upon receipt of equipment; equipment should be rejected/returned if any obvious signs of contamination (torn packages, etc.) are observed. Inspection protocols and acceptance criteria for laboratory analytical reagents and other consumables are documented in the QA Manual for each laboratory.

18. Non-Direct Measurements

Water quality data collected through other monitoring programs may be used to augment data collected through the VCAILGMP. Data reported by other entities will be evaluated for suitability for inclusion in the VCAILGMP database. It is the responsibility of the Project QA Manager or designee to acquire, validate, and compile the necessary data from other programs. The data will be assessed against the data quality objectives stated in Element 7 of this QAPP (Quality Objectives and Criteria for Measurement Data).

19. Data Management

Event Summary Reports and Analytical Data Reports (described in Element 9) will be delivered to the Project QA Manager or designee. Each type of report will be stored separately and ordered chronologically. The field crew shall retain the original field logs. The contract laboratory shall

² "D.O. tables" refers to tables of dissolved oxygen in water as a function of temperature and barometric pressure, typically found in wastewater engineering text books.

retain original COC forms. Concentrations of all parameters will be calculated as described in laboratory SOPs or referenced method document for each analyte or parameter. The various data and information generated through the VCAILGMP will be stored and maintained as described in Element 9 (Documents and Records).

The field log and analytical data generated will be converted to a standard database format maintained on personal computers. After data entry or data transfer procedures are completed for each monitoring event, data will be validated as described in Section D (Data Validation and Usability). After the final quality assurance checks for errors are completed, the data will be added to the final database. The database will be a Microsoft Access® database developed for the program and administered by the Project QA Manager or designee. The version of the database used to manage VCAILGMP data will be upgraded as necessary to meet the requirements of the program.

Program data will be submitted electronically with the Annual Monitoring Report in either Microsoft Access® or Microsoft Excel® file format. Tabular data summaries included in the Annual Monitoring Report will be generated from this data file ("database"). Additionally, those data collected by the program will be formatted to comply with SWAMP database requirements.

C. ASSESSMENT AND OVERSIGHT

20. Assessments and Response Actions

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

- Performance assessment of the sampling procedures will be performed by the field sampling crews. Corrective action shall be carried out by the field sampling crew and reported to the Project Manager.
- Field crews will be audited at least annually over the 4-year monitoring program period by an independent auditor. Additional audits will occur as necessary to observe corrective actions taken to resolve errors identified during a previous audit.
- The laboratory is responsible for following established SOPs, including those for proper instrument maintenance, calibration of the instruments, and analytical methods used for samples submitted through the VCAILGMP.
- Assessment of laboratory QC results and implementation of corrective actions will be the responsibility of the QA Officer at each laboratory and shall be reported to the Project QA Manager or designee as part of any data reports.
- Assessment of field QC results and implementation of corrective actions shall be the responsibility of the Project QA Manager or designee.

All project data must be reviewed as part of the data assessment. Review is conducted on a preparation batch basis by assessing QC samples and all associated environmental sample results. Project data review established for this project includes the following steps:

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

The Project QA Manager or designee is responsible for conducting the data assessment and for ensuring that data qualifier flags are assigned, as needed, based on the established quality control criteria. If an assessment or audit discovers any discrepancy, the Project QA Manager will address the observed discrepancy with the appropriate person responsible for the activity. Discussion points will include whether the information collected is accurate, identifying the cause(s) leading to the deviation, how the deviation might impact data quality, and what corrective actions might be considered. The Project QA Manager will maintain a QA Log of all communications and any specified corrective actions, and will make the QA Log available to the Project Manager upon request.

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

Routine procedures to assess the success of the data collection effort are discussed in Section D (Data Validation and Usability). Routine procedures for corrective actions are summarized in Table 10.

21. Reports to Management

In addition to the information provided in Element 9 (Documents and Records), the following reports will be generated:

- **Toxicity Trigger Exceedance Report:** Prepared by the Project Manager and submitted to the Regional Board's QA Officer, this report will consist of an email notification that the toxicity trigger has been exceeded and at which site(s). This report will be submitted within five business days of a toxicity trigger exceedance.
- **Quarterly Summary Report:** Prepared by the Project QA Manager or designee after each monitoring event and submitted to the Project Manager, this will present a tabular summary of sample results and provide a summary of QA/QC assessments and evaluations, including precision, accuracy, comparability, representativeness, and completeness of the monitoring data, a summary of any lab and/or field performance audits that were conducted, and a summary of any exceedances of water quality benchmarks. The information will be submitted to the VCAILG Steering Committee at their quarterly meeting for review.
- **Annual Monitoring Report:** The Annual Monitoring Report will be prepared annually by the Project Manager and will be submitted within three months of receipt of the final

analytical data report for the monitoring year. As required by Monitoring and Reporting Program No. CI-8836, the Annual Monitoring Report will contain the following components:

- Description of the Group membership and setting;
 - Monitoring objectives;
 - Monitoring site descriptions including GPS coordinates for each site and a location map of all sites;
 - Tabulated results of field laboratory data, including sampling and analytical methods used;
 - Copies of chain-of-custody forms;
 - Associated field and laboratory quality control sample results, including a summary of accuracy and precision;
 - A summary of compliance / non-compliance with water quality benchmarks;
 - A summary of education requirements fulfilled by each VCAILG participant;
 - Conclusions and recommendations;
 - An electronic database will be submitted as an attachment to the Annual Report and will include the results of all field and laboratory data, as well as copies of all field documentation and laboratory original data reports in PDF format. Data submitted electronically will be made available for inclusion in the SWAMP database.
- **Water Quality Management Plan (WQMP):** A Water Quality Management Plan (WQMP) will be submitted annually six months after the first Annual Monitoring Report is submitted that contains data demonstrating that water quality benchmarks have been exceeded. As required by Monitoring and Reporting Program No. CI-8836, a WQMP will contain the following components:
 - Monitoring objectives;
 - Monitoring site descriptions including GPS coordinates for each site and a location map of all sites;
 - Tabulated results of laboratory analyses specifying locations where benchmarks were exceeded and including sampling dates and times, weather and crop conditions or any other information (*e.g.*, pesticide evaluation) which may be pertinent to the determination of the source of the benchmark exceedance;
 - If feasible, the source and direction of flow of discharges containing constituents of concern will be identified by location on a map, by the timing and frequency of discharge, and by characteristics of the flow which accounts for the presence of constituents of concern;
 - A description of existing management practices which serve to limit the movement of the constituent of concern into waters of the state;
 - A description of a time-limited implementation of management practices (new or revised) that will reduce pollutant concentrations to benchmark levels or lower, where feasible, including an estimate of the time necessary for the results to be measurable and any future plans for pollutant management;
 - A description of a revised MRP Plan which will document the efficiency of the management practice(s);
 - Conclusions and recommendations.

Table 13 outlines the schedule of report submittals to management.

Table 13. Schedule of Report Submittals to Management

Type of Report	Frequency	Delivery Date	Person/Organization Responsible for Preparation	Report Recipient(s)
Toxicity Trigger Exceedance	Per Occurrence	Within 5 business days of receipt of exceedance result	Project Manager	LA-RWQCB
Event Summary Reports	Quarterly	Within 1 week of completion of a monitoring event	Field Crew(s)	Project Manager and Project QA Manager
Analytical Data Reports	Quarterly	Within 30 calendar days of sample receipt by the lab	Analytical Laboratories	Project QA Manager
Quarterly Summary Report	Quarterly	At each quarterly VCAILG Steering Committee Meeting	Project QA Manager	VCAILG Steering Committee
Annual Monitoring Report	Annually	Two months after receipt of the final analytical data report	Project Manager	LA-RWQCB, VCAILG Steering Committee
Water Quality Management Plan	Annually, if necessary	Six months after each Annual Monitoring Report containing a benchmark exceedance	Project Manager	LA-RWQCB, Steering Committee

D. DATA VALIDATION AND USABILITY

22. Data Review, Verification and Validation Requirements

The acceptability of data is determined through data verification and data validation. Both processes are discussed in detail below. In addition to the data quality objectives presented in Table 3, the standard data validation procedures documented in the contract laboratory's QA Manual will be used to accept, reject, or qualify the data generated by the laboratory. Each laboratory's QA Officer will be responsible for validating data generated by the laboratory.

Once analytical results are received from the analyzing laboratory, the Project QA Manager will perform an independent review and validation of analytical results. Appendix G contains equations that are used to calculate precision, accuracy, and completeness of the data. Decisions to reject or qualify data will be made by the Project QA Manager, based on the evaluation of field and laboratory quality control data according to procedures outlined in Section 13 of Caltrans document No. CTSW-RT-00-005, *Guidance Manual: Stormwater Monitoring Protocols*, 2nd Edition (LWA, July 2000), included in this QAPP as Appendix H.

23. Data Verification

Data verification involves verifying that required methods and procedures have been followed at all stages of the data collection process, including sample collection, sample receipt, sample preparation, sample analysis, and documentation review for completeness. Verified data have been checked for a variety of factors, including transcription errors, correct application of dilution factors, and correct application of conversion factors. Verification of data may also include laboratory qualifiers, if assigned.

Data verification should occur in the field and the laboratory at each level (*i.e.*, all personnel should verify their own work) and as information is passed from one level to the next (*i.e.*, supervisors should verify the information produced by their staff). Records commonly examined during the verification process include field and sample collection logs, chain-of-custody forms, sample preparation logs, instrument logs, raw data, and calculation worksheets.

In addition, laboratory personnel will verify that the measurement process was "in control" (*i.e.*, all specified data quality objectives were met or acceptable deviations explained) for each batch of samples before proceeding with the analysis of a subsequent batch. Each laboratory will also establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data.

24. Data Validation

In general, data validation involves identifying project requirements, obtaining the documents and records produced during data verification, evaluating the quality of the data generated, and determining whether project requirements were met. The main focus of data validation is determining data quality in terms of accomplishment of measurement quality objectives (*i.e.*, meeting QC acceptance criteria). Data quality indicators, such as precision, accuracy, sensitivity, representativeness, and completeness, are typically used as expressions of data quality. The Project QA Manager or designee will review verified sample results for the data set as a whole, including laboratory qualifiers, summarize data and QC deficiencies and evaluate the impact on overall data quality, assign data validation qualifiers as necessary, and include this information in a Quality Assurance Report. The validation process applies to both field and laboratory data.

In addition to the data quality objectives presented in Table 3 the standard data validation procedures documented in the analyzing laboratory's QA Manual will be used to accept, reject or qualify the data generated. The laboratory will submit only data that have met data quality objectives, or data that have acceptable deviations explained. When QC requirements have not been met, the samples will be reanalyzed when possible, and only the results of the reanalysis will be submitted, provided that they are acceptable. Each laboratory's QA Officer is responsible for validating the data it generates.

E. AMENDMENTS TO QAPP

The intent of this section is to provide a place within the QAPP to document significant additions, deletions and revisions to the approved QAPP and to provide the rationale for changes.

Revision 1: December 5, 2006

Revisions include:

- Changes based on the October 11, 2006 comment letter from the Los Angeles Regional Water Quality Control Board.
- Finalized site list.