MAY 26, 2015

VENTURA COUNTY AGRICULTURAL IRRIGATED LANDS GROUP (VCAILG)

DRAFT

2013 - 2014 Water Quality Management Plan

submitted to:

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

prepared by:

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On behalf of the

VENTURA COUNTY AGRICULTURAL IRRIGATED LANDS GROUP (VCAILG)

LARRY WALKER ASSOCIATES

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Acronyms

AMR	Annual Monitoring Report
BMP	Best Management Practice
CCWTMP	Calleguas Creek Watershed TMDL Monitoring Program
LA	Load Allocation
MIL	Mobile Irrigation Lab
MRP	Monitoring and Reporting Program Plan
NOA	Notice of Applicability
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
OC	Organochlorine
OP	Organophosphorus
PCB	Polychlorinated biphenyl
QAPP	Quality Assurance Project Plan
RCD	Resource Conservation District
TMDL	Total Maximum Daily Load
UCCE	University of California Cooperative Extension
VCAILG	Ventura County Agricultural Irrigated Lands Group
VCAILGMP	Ventura County Agricultural Irrigated Lands Group Monitoring Plan
WQMP	Water Quality Management Plan

Executive Summary

The *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region* (Waiver) requires the development of a Water Quality Management Plan (WQMP) if monitoring results demonstrate exceedances of water quality benchmarks. This WQMP is being submitted on behalf of the Ventura County Agricultural Irrigated Lands Group (VCAILG) to address exceedances of both the "standard" water quality benchmarks pertaining to the Waiver (those specified in Waiver Appendix 2, plus Basin Plan objectives and applicable California Toxics Rule limits referenced in the Waiver) and applicable total maximum daily load (TMDL) load allocations (LAs) for irrigated agriculture in Ventura County. Appendix 3 of the Waiver lists water quality benchmarks that originate from TMDL LAs. Because these LAs are included as benchmarks in the Waiver, exceedances trigger the development of a WQMP. Additionally, several TMDLs in Ventura County require that a WQMP be submitted regardless of whether monitoring data exceed applicable LAs.[1]

Two dry weather monitoring events and one wet weather monitoring event took place during the 2013-2014 monitoring program. Standard water quality benchmarks that were exceeded during one or both dry weather sampling events were as follows: nitrate-N (5 sites); dissolved copper (3 sites); the 4,4´ isomers of DDD, DDE, and/or DDT (4 sites); toxaphene (4 sites); TDS, chloride and sulfate (2 sites); and chronic toxicity (1 site). The standard water quality benchmarks that were exceeded during the wet weather sampling event were: nitrate-N (4 sites); dissolved copper (3 sites); total chlordane (10 sites); 4,4´ isomers of DDD, DDE, and/or DDT (9 sites); toxaphene (3 sites); chlorpyrifos (5 sites); TDS, chloride and sulfate (1 site); and chronic toxicity (2 sites).

Appendix B of this WQMP contains detailed information about the water quality benchmark exceedances and a qualitative discussion of possible correlations between water quality and various factors. Summary observations are as follows:

- In the Calleguas Creek Watershed there does not appear to be a correlation between exceedances of benchmarks and weather, season, or crop-specific practices.
- In the Oxnard Coastal Watershed there appears to be a correlation between wet weather and organochlorine pesticide concentrations higher than the applicable water quality benchmark.
- In the Santa Clara River Watershed there appears to be a correlation between weather and exceedances of several constituent classes.
- Monitoring sites in the Ventura River Watershed were dry during all of the 2013-2014 monitoring events, preventing evaluation of trends between practices, conditions and runoff quality.

The sites and constituents associated with exceedances of TMDL LAs during the 2013-2014 monitoring year were similar to those in previous years. Specifically, the Salts TMDL interim

[1] TMDLs that require a WQMP irrespective of monitoring data results are the Calleguas Creek Watershed and Mugu Lagoon OC Pesticides and PCBs TMDL; Calleguas Creek Watershed and Mugu Lagoon Toxicity, Chlorpyrifos, and Diazinon TMDL; Calleguas Creek Watersed Metals and Selenium TMDL; and the Calleguas Creek Watershed Boron, Chloride, Sulfate, and TDS (Salts) TMDL.

LAs are currently being met at all sites, with the exception of boron at the 04_WOOD site, which represents the Revolon Slough subwatershed. The interim LA for selenium was exceeded in Revolon Slough. Final TMDL LA exceedances occurred for both nitrogen TMDLs that are addressed in the current Waiver (Calleguas Creek Watershed and Santa Clara River Nitrogen Compounds TMDLs).

As required, a pesticide use evaluation was performed for this WQMP to correlate applications of chlorpyrifos and diazinon with water quality results. Of the fourteen monitoring sites, five sites had a total of five exceedances of the chlorpyrifos water quality benchmark during the February 28, 2014 storm event only. The following factors are likely to contribute to the off-site transportation of chlorpyrifos: pesticide formulation and application method, date of application in relation to subsequent rain events, and proximity to a drainage channel, stream, or tributary. There were no exceedances of the water quality benchmark for diazinon. Consistent with this observation, the amount of diazinon applied in 2013-2014 was lower than in 2012-2013, and diazinon use was much less widespread than use of chlorpyrifos in 2013-2014.

The processes and Best Management Practices (BMPs) outlined in the WQMP are designed to result in compliance with all water quality benchmarks. To provide documentation of progress made during this last cycle, this WQMP presents and compares the results of the web-based BMP surveys completed by VCAILG members in 2014 and 2015. Aggregate responses addressed 71.5% of the County's irrigated acreage in 2014 and 63.8% of irrigated acreage in 2015. Metrics used to evaluate the survey results for this WQMP were "rates of adoption" for 36 individual BMPs (and various groupings of the BMPs) calculated as the percent of applicable irrigated acreage within which the BMP(s) were reported to be in use by survey respondents.

A variety of approaches were used to identify trends and preferences in BMP adoption before and during the Waiver term, and plans for future BMP implementation. Survey metrics were organized on the basis of agricultural land use monitoring site drainages and by categorizing BMPs into "management" or "action" categories. Management BMP categories include irrigation and salinity, nutrients, sediment, pesticides, or trash. Action categories include use of real time data, testing, use of specialized knowledge, cropped area actions, and uncropped area actions.

Notable highlights of the 2014 and 2015 BMPs surveys include:

- BMPs were in fairly wide use by survey respondents when the current Waiver was adopted in October 2010.

- Results show that only 2 of the 36 BMPs were in use on less than 50% of applicable acreage in October 2010, and 25 of the BMPs were in use on ≥ 75% of applicable acreage by 2010. During the current Waiver term, adoption rates continued to increase resulting in current adoption rates ranging 93-100% for most of these "early adopted" BMPs.

- At the beginning of the current Waiver term, half of the BMPs most widely in use addressed pesticide management and the least widely in use addressed irrigation and salinity management. Sediment management BMPs were among both the most- and least-widely used practices.

- Current adoption rates were ≥ 90% for 26 of the 36 BMPs. The BMPs that increased in use the most during the current waiver term addressed irrigation, salinity, or sediment management.

- Half of the top-ranked BMPs for future adoption involve methods of testing (e.g., chemical tests of irrigation water, foliage, and soil; irrigation pressure tests; and pest scouting devices) or use of real time data (such as for weather, soil moisture, and evapotranspiration).

- Overall responses were very similar between 2014 and 2015 surveys indicating that reported farming practices and plans for future BMP adoption did not vary much between 2014 and 2015. This result implies that yearly BMP surveys may not be the optimal time frame to track meaningful changes in farming practices during the term of future waivers.

Outreach and education are important to the success of the VCAILG program. The main method of communication with VCAILG members has been the annual direct mailing to the entire VCAILG membership via the annual newsletter. VCAILG also works collaboratively with a number of organizations and agencies to provide relevant and crop-specific information regarding Waiver requirements, water quality status as demonstrated by VCAILG monitoring, and applicable management practice information to improve water quality. Since the adoption of the 2010 Waiver, over 54 education opportunities have been offered to VCAILG members adding up to 171 hours of Regional Board-approved credits. VCAILG education meetings included Waiver updates, crop-specific tutorials, field tours, and field BMP research demonstrations. In addition, Farm Bureau staff gave three talks at education meetings highlighting the benefits of efficient irrigation systems and proper use. Agencies whose funding sources and programs supplemented the outreach activities of VCAILG include the Ventura County Resources Conservation District (especially through their Mobile Irrigation Lab), University of California Cooperative Extension, California Strawberry Commission, California Celery Research Advisory Board, and the Ventura County Agricultural Commissioner's Office.

It is anticipated that the 2015 Waiver will be adopted in October with potentially modified requirements and guidance regarding what should be included in a WQMP. On December 15, 2015, the VCAILG Annual Monitoring Report covering the 2014-2015 monitoring year will be submitted and combined with an updated WQMP. Over the next six months, WQMP implementation will primarily focus on an analysis of BMP survey results in conjunction with water quality information to guide more targeted program actions. Efforts related to education and outreach are important aspects of the Waiver and VCAILG's responsibilities as a discharger group; however, an extensive number of opportunities have been offered during the course of the 2010 Waiver. These programs will resume in accordance with the new Waiver that is adopted and may also be guided by the results of the survey and monitoring data analysis.

Introduction

On October 7, 2010 the Los Angeles Regional Water Quality Control Board (Regional Board) adopted a *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region* ("Waiver", Order No. R4-2010-0186). The purpose of the Waiver is to assess the effects of and control discharges from irrigated agricultural lands in Los Angeles and Ventura Counties, including irrigation return flows, flows from tile drains, and storm water runoff. These discharges can affect water quality by transporting nutrients, pesticides, sediment, salts, and other pollutants from cultivated fields into surface waters, potentially impairing designated beneficial uses. Owners and operators of agricultural lands in Ventura and Los Angeles Counties must comply with provisions contained in the Waiver or be regulated under other Regional Board programs.

The Waiver allows individual landowners and growers to comply with its provisions by working collectively as a Discharger Group, or as individuals. A Discharger Group is defined by the Waiver as "any group of dischargers and/or organizations that forms to comply with this Order. Discharger Groups can be, but are not limited to, organizations formed on a geographic basis or formed with other factors in common such as commodities." The primary purpose of allowing Discharger Groups is to encourage collaboration on monitoring and reporting and to increase the effectiveness of management practices throughout a watershed to attain water quality standards. Those landowners and growers choosing to comply with the Waiver as a Discharger Group must signify by submitting a Group Notice of Intent and by developing a Discharger Group monitoring program.

To assist agricultural landowners and growers that farm within the boundaries of Ventura County, various agricultural organizations, water districts and individuals joined together to form the Ventura County Agricultural Irrigated Lands Group (VCAILG), which is intended to act as one unified "Discharger Group" for those agricultural landowners and growers that wish to participate. A Notice of Intent (NOI) to comply with the Waiver was submitted to the Regional Board by VCAILG on April 7, 2011. The NOI included the VCAILG membership roster, as well as the required Quality Assurance Project Plan (QAPP) and Monitoring and Reporting Program Plan (MRP), which detail the water quality monitoring and reporting procedures being conducted in compliance with the terms of the Waiver. The Regional Board responded by issuing the Notice of Applicability (NOA) to VCAILG on September 15, 2011, signifying the Regional Board's approval of VCAILG and its Monitoring Program.

The first Annual Monitoring Report (AMR) was submitted by VCAILG to the Regional Board February 26, 2013, the second AMR was submitted on the same date in 2014, and the third AMR was submitted in coordination with the Ventura County Stormwater Report and Calleguas Creek Watershed Total Maximum Daily Loads (TMDLs) AMR on December 15, 2014. Each AMR provides a detailed summary of activities of VCAILG during the past year, including administration of VCAILG, an overview of farming in Ventura County, coursework offered to Group members to fulfill the Waiver's education requirement, a list of education hours completed to date by each member, and data collected during the wet and dry monitoring events. Also included is a discussion of monitoring results that exceeded water quality benchmarks.

The Waiver specifies that if the monitoring results demonstrate an exceedance of water quality benchmarks, then a Water Quality Management Plan (WQMP) must be developed. Per the August 3, 2012 approval letter from the Regional Board Executive Officer, the first WQMP

developed under the 2010 Waiver was submitted on March 15, 2013. This and future WQMPs are to be submitted May 26th or each year. As specified in the Waiver, "the primary objective of the WQMP is to identify and construct or implement targeted management practices to reduce or eliminate waste discharges from irrigated agriculture lands to the water of the state in order to achieve water quality objectives." To meet this objective, the WQMP is designed to:

- Assess the impacts of waste discharges from irrigated lands to surface waters;
- Quantify and identify waste sources;
- Identify and implement new and/or revised management practices to reduce or eliminate discharges of waste that cause or contribute to exceedances of water quality benchmarks;
- Document the implementation and maintenance of management practices; and
- Document attainment of water quality benchmarks.

This document serves as the WQMP for exceedances of water quality benchmarks that occurred during the 2013-2014 monitoring year. All of the water quality benchmark exceedances are addressed by this WQMP. The WQMP also discusses the water quality problems that can be caused by the benchmark exceedance and the degree to which agricultural discharges are contributing to the problem (where feasible and appropriate). By addressing exceedances of all Waiver water quality benchmarks, applicable TMDL allocations for agriculture, as specified in Appendix 3 of the Waiver, are included. Additionally, past WQMPs written under both the 2005 and 2010 Waivers serve to meet the WQMP development requirement for those TMDLs that compel one.

The WQMP contains four major sections. The first section provides a discussion of the VCAILG Monitoring Plan (VCAILGMP) and TMDL monitoring site locations, crop types that drain to each site, standard water quality benchmarks, TMDL load allocation benchmarks, a summary of exceedances that occurred during the 2012-2013 monitoring year, and pesticide use evaluation. To further support this first section, constituent-specific information in Appendix A summarizes the currently available information on sources of the constituents and discusses the water quality problems associated with the benchmark exceedances. Site specific detail regarding benchmark exceedances can be found in Appendix B. The second section describes the WQMP implementation process and identifies priority areas. The next section details the progress made in implementing the 2013 WQMP. Finally, next steps are identified to continue the WQMP iterative process.

Identification of Benchmark Exceedances

This section provides background information regarding the monitoring that took place, such as monitoring objectives and sample locations, and crop types that drain to each monitoring site. Tables with the standard water quality benchmarks and TMDL load allocation benchmarks are provided to place the summarized benchmark exceedances in context. All of this information is also included in the VCAILG 2013-14 Annual Monitoring Report. Site-specific exceedance information is further detailed in Appendix B.

MONITORING OBJECTIVES

The objectives of the VCAILGMP required under the Waiver include the following:

- Monitor the discharge of wastes in irrigation return flows, tile drains, stormwater, and waters of the state and identify waste sources;
- Where discharges of waste cause or contribute to exceedances of water quality benchmarks, or cause pollution or nuisance, submit a WQMP to implement targeted management practices to reduce or eliminate the discharge of waste;
- Report results and other required information on an annual basis; and
- 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 TMDL Monitoring Programs within Ventura County).

MONITORING SITE SELECTION

The first step toward fulfilling monitoring program objectives was selecting appropriate monitoring sites. Because the focus of the program is on impacts to surface waterbodies from discharges from irrigated agricultural lands, monitoring sites were selected to best characterize agricultural inputs and are generally located at the lower ends of mainstem tributaries or agricultural drainages in areas associated primarily with agricultural activity. A background ("BKGD") site was chosen for one of the Santa Clara River Watershed sites in the natural area upstream. Calleguas Creek Watershed sites supplement monitoring performed under the Calleguas Creek Watershed TMDL Monitoring Program (CCWTMP) and retain consistency with previous VCAILG sampling. Monitoring sites in the Santa Clara River and Ventura River Watersheds were selected to continue building on existing data previously collected by VCAILG and meet TMDL requirements, where applicable.

The specific criteria for selection of monitoring sites are as follows:

- Land use (primarily agricultural drainages);
- Subwatershed representation;
- Acres of agricultural irrigated lands represented;
- Proximity to agricultural operations;
- Previous or existing monitoring locations under the *2005 Waiver* or TMDL monitoring programs;
- Drainage into waterbodies included on or proposed for the federal Clean Water Act 303(d) list of impaired waterbodies;
- Size and complexity of watershed;
- Size and flow of waterbodies; and,

- Safe access during dry and wet weather.

Table 1 lists monitoring sites selected in each watershed and associated global positioning system (GPS) coordinates for monitoring for constituents listed in Waiver Appendix 1, Table 1. **Table 2** lists monitoring sites and GPS coordinates for effective TMDL monitoring locations. **Figure 1** through **Figure 7** show site locations for all monitoring sites within each watershed. To further distinguish sites, **Table 3** and **Table 4** provide acreages of different crop types within each monitoring drainage area.

The format for the monitoring site ID/code is XXXA_YYYY_ZZZZ, where:

- "XXX" is a 2- or 3-character code that identifies the mainstem receiving water reach (where applicable) into which the monitored waterbody drains;
- "A" identifies the monitored waterbody as an agricultural drain (D) or a tributary (T) to the receiving water;
- "YYYY" is a 3-, 4-, or 5-character abbreviation for the site location;
- "ZZZZ" is an optional 3-, 4-, or 5-character abbreviation that provides additional site location information (*e.g.*, "BKGD" indicates a background site).

Examples:

S03D_BARDS signifies that the monitoring site is an agricultural drain located in the Santa Clara River Watershed. The site is located along Bardsdale Avenue.

S04T_TAPO_BKGD signifies that this a background monitoring site located on Tapo Creek, which is a tributary to the Santa Clara River, Reach 4.

Table 1. VCAILGMP Monitoring Locations for Waiver Constituents

Watershed/ Subwatershed	Site ID	Reach	Waterbody Type [1]	Site Location	GPS Coordinates [2]	
					Latitude	Longitude
Calleguas Creek / Mugu Lagoon	01T_ODD3_ARN	1	T	Rio de Santa Clara/Oxnard Drain #3 at Arnold Rd.	34.123564	-119.156514
Calleguas Creek / Revolon Slough	04D_ETTG	4	D	Discharge to Revolon Slough at Etting Rd.	34.161797	-119.091419
	04D_LAS	4	D	Discharge to Revolon Slough at S. Las Posas Rd.	34.134208	-119.079767
Calleguas Creek / Beardsley Channel	05D_LAVD	5	T	La Vista Drain at La Vista Ave.	34.265950	-119.093589
	05T_HONDO	5	T	Hondo Barranca at Hwy. 118	34.263608	-119.057431
Calleguas Creek / Arroyo Las Posas	06T_LONG2	6	T	Long Canyon at Balcom Canyon Rd. crossing	34.281721	-118.958565
Oxnard Coastal	OXD_CENTR	--	D	Central Ditch at Harbor Blvd.	34.220555	-119.254983
Santa Clara River	S02T_ELLS	2	T	Ellsworth Barranca at Telegraph Rd.	34.306805	-119.141275
	S02T_TODD	2	T	Todd Barranca at Hwy. 126	34.313584	-119.117095
	S03T_TIMB	3	T	Timber Canyon at Hwy. 126	34.370172	-119.020939
	S03T_ BOULD	3	T	Boulder Creek at Hwy. 126	34.389578	-118.958738
	S03D_BARDS	3	D	Discharge along Bardsdale Ave. upstream of confluence with Santa Clara River	34.371535	-118.964470
	S04T_TAPO	4	T	Tapo Canyon Creek	34.401717	-118.723706
	S04T_TAPO_BKGD	4	B	S04T_TAPO background site upstream of agricultural operations	34.387316	-118.7204509
Ventura River	VRT_THACH	--	T	Thacher Creek at Ojai Avenue	34.446719	-119.210893
	VRT_SANTO	--	T	San Antonio Creek at Grand Avenue	34.454455	-119.221723

1. T = Tributary to receiving water; D = agricultural Drain; B = Background site.
2. All GPS coordinates presented in decimal degrees latitude and longitude in North American Datum 1983 (NAD83).

Table 2. Monitoring Locations for Effective TMDLs

Watershed/ Subwatershed	Site ID	Reach	Waterbody Type [1]	Site Location	GPS Coordinates [2]	
					Latitude	Longitude
Calleguas Creek/ Mugu Lagoon	01T_ODD2_DCH	1	T	Duck Pond/Oxnard Drain #2/Mugu Drain S. of Hueneme Rd.	34.1395	-119.1183
Calleguas Creek/ Calleguas Creek	02D_BROOM	2	D	Discharge to Calleguas Creek at Broome Ranch Rd.	34.1434	-119.0711
Calleguas Creek/ Revolon Slough	04D_WOOD	4	D	Agricultural drain on E. side of Wood Rd. N of Revolon	34.1707	-119.0960
	05D_SANT_VCWPD	5	D	Santa Clara Drain at VCWPD Gage #781	34.2425	-119.1114
Calleguas Creek/ Arroyo Las Posas	06T_FC_BR	6	T	Fox Canyon at Bradley Rd.	34.2646	-119.0115
Calleguas Creek/ Arroyo Simi	07D_HITCH_LEVEE_2	7	D	2nd corrugated pipe discharging on N. site of Arroyo Simi flood control levee off of Hitch Blvd.	34.2714	-118.9205
Calleguas Creek/ Conejo Creek	9BD_GERRY	9B	D	Drain crossing Santa Rosa Rd. at Gerry Rd.	34.2369	-118.9473
Santa Clara River Estuary	S01D_MONAR	1	D	Drain entering SCR Estuary at Monarch Lane between Harbor Blvd. and Victoria Ave.	34.2333	-119.2413
Santa Clara River	S02T_ELLS	2	T	Ellsworth Barranca at Telegraph Rd.	34.3068	-119.1413
Oxnard Coastal	OXD_CENTR	--	D	Central Ditch at Harbor Blvd.	34.2206	-119.2550
Oxnard Coastal/ Channel Islands Harbor	CIHD_VICT	--	D	Discharge to Doris Drain at S. Victoria Ave.	34.2099	-119.2207

1. T = Tributary to receiving water; D = agricultural Drain
2. All GPS coordinates presented in decimal degrees latitude and longitude in North American Datum 1983 (NAD83).

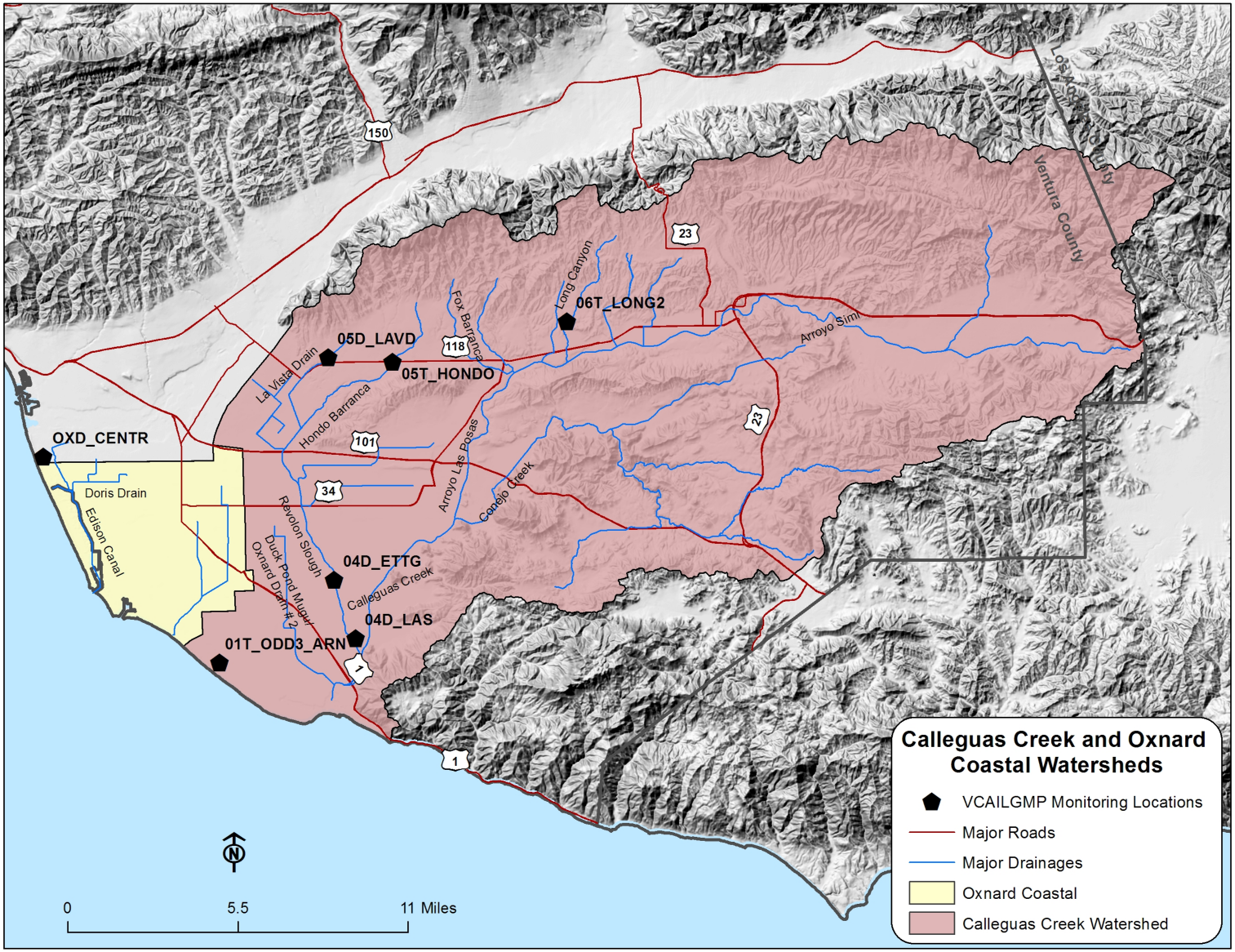

Figure 1. VCAILG Monitoring Sites in the Calleguas Creek/Oxnard Coastal Watersheds

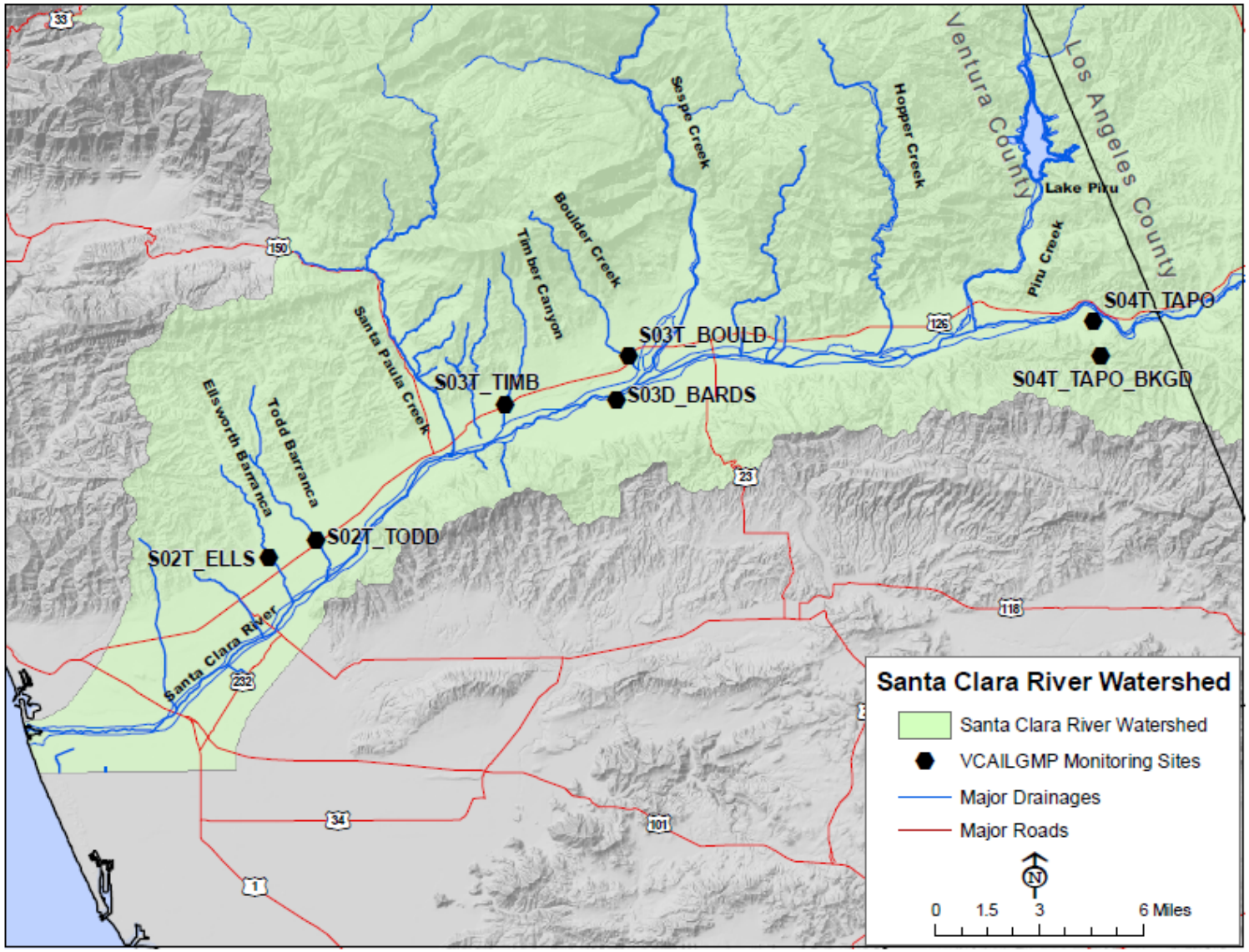

Figure 2. VCAILG Monitoring Sites Located in the Santa Clara River Watershed

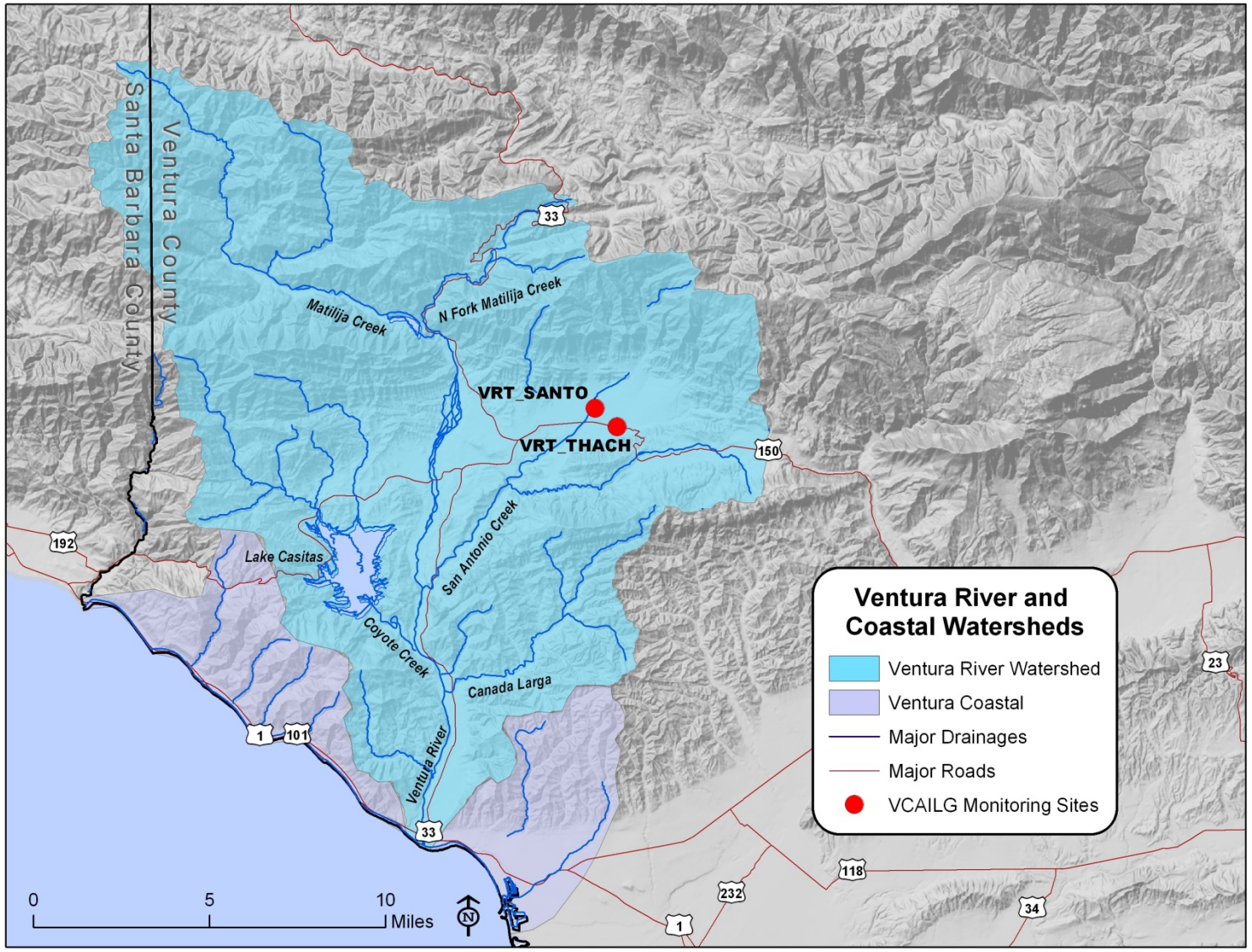

Figure 3. VCAILG Monitoring Sites Located in the Ventura River Watershed

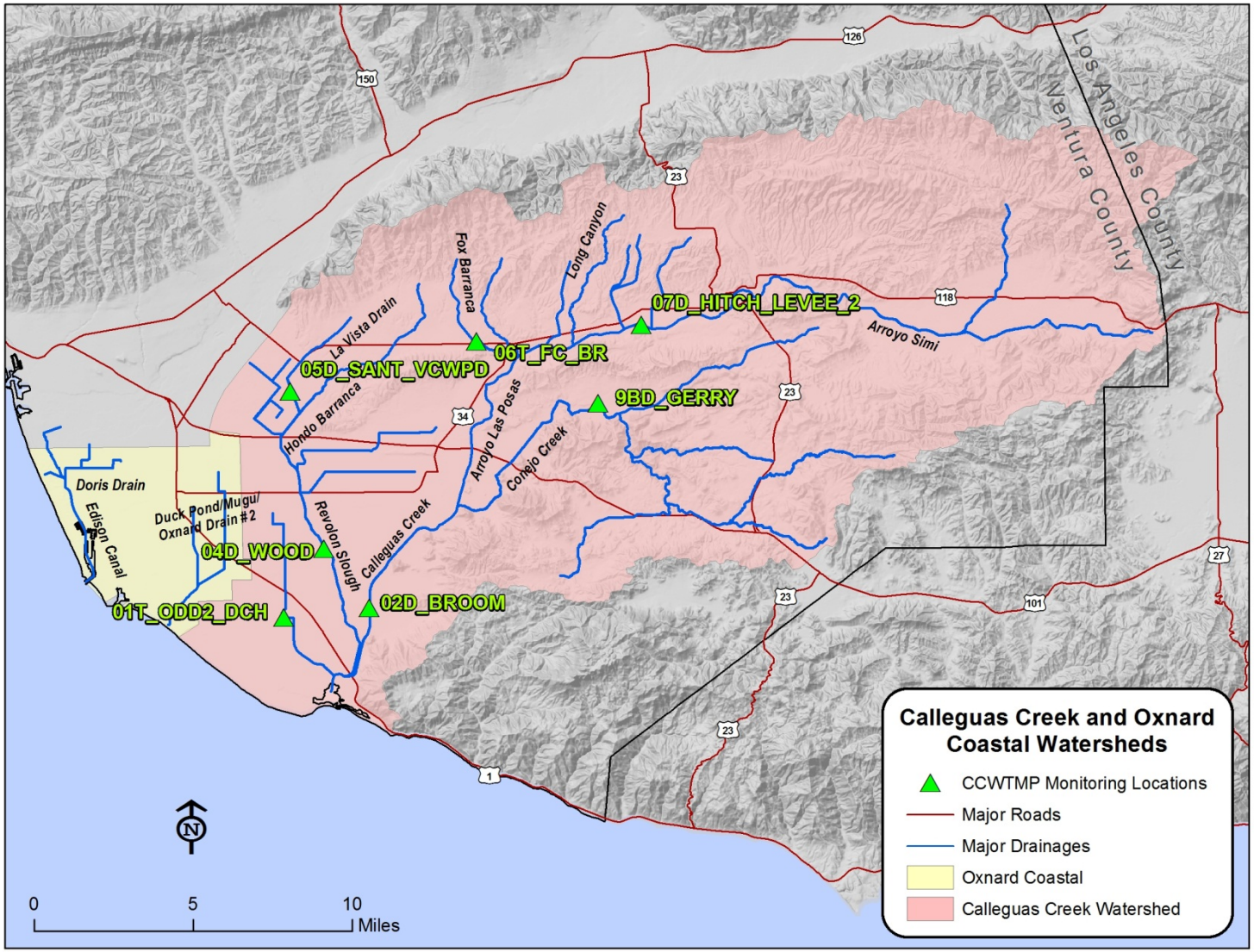

Figure 4. CCWTMP Monitoring Sites

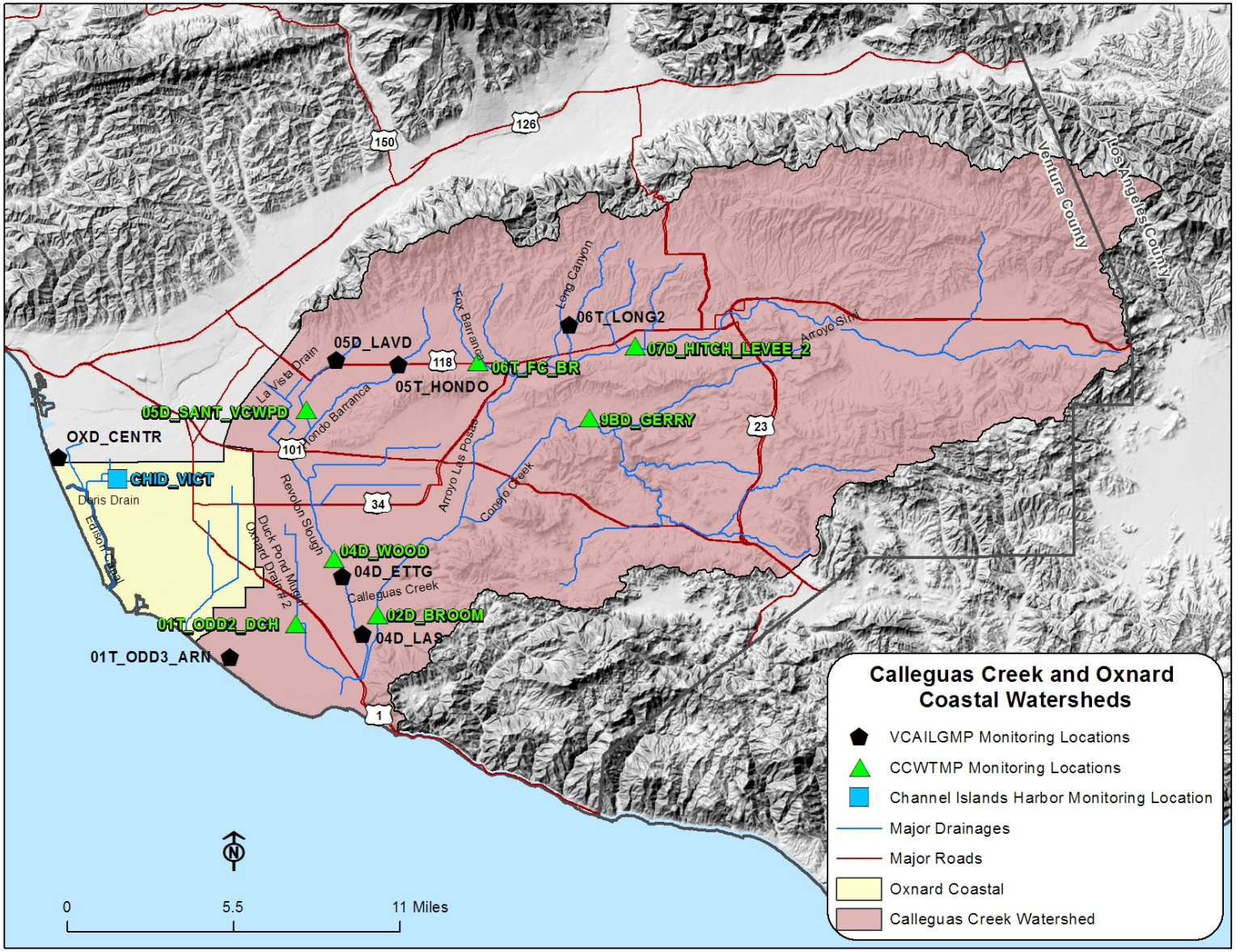

Figure 5. Calleguas Creek and Oxnard Coastal Watershed Monitoring Sites for All Programs

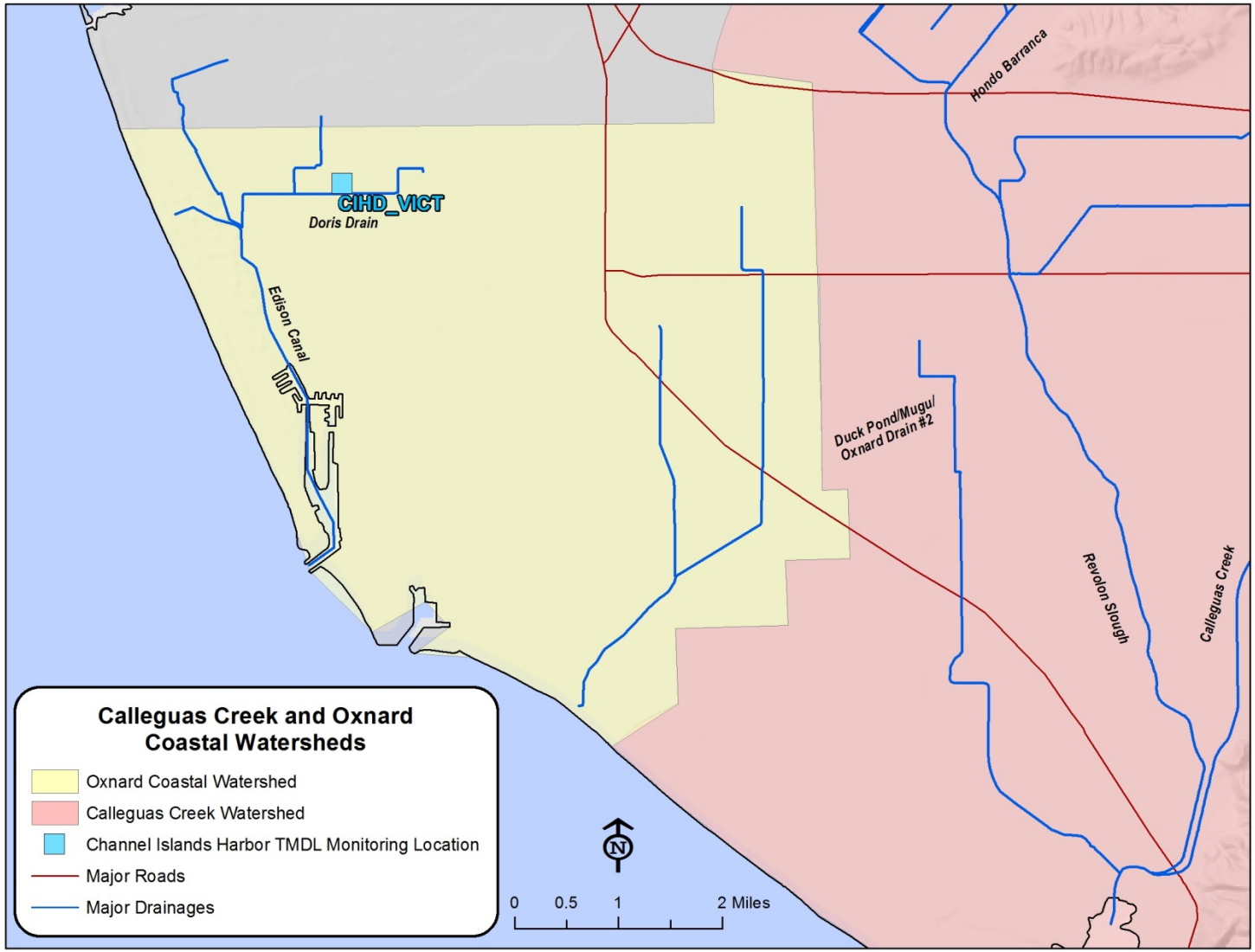

Figure 6. Channel Islands Harbor Bacteria TMDL Monitoring Site

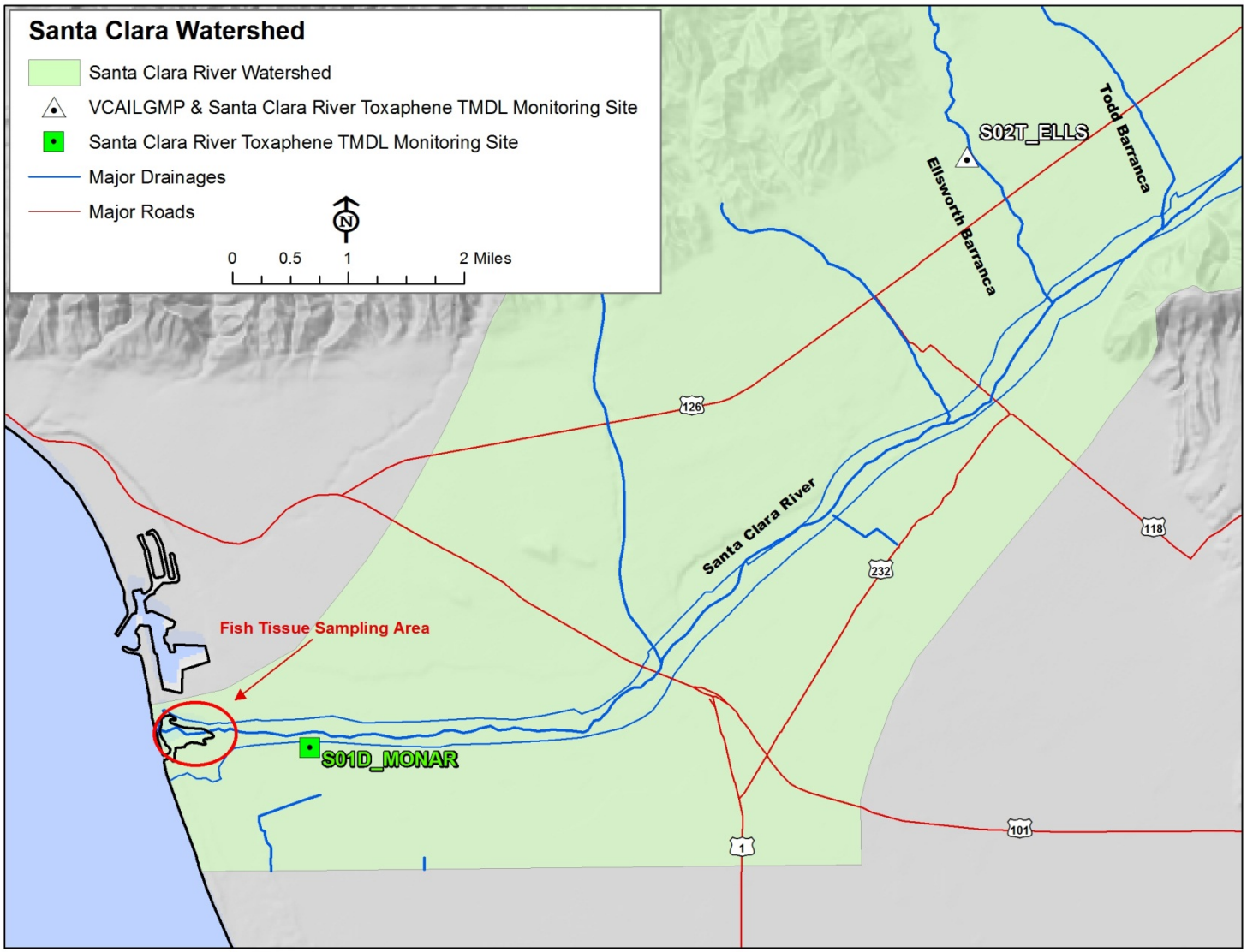

Figure 7. Santa Clara River Estuary Toxaphene TMDL Monitoring Sites

Table 3. Estimated Irrigated Acreage Represented at VCAILG Monitoring Sites

Station ID	Irrigated Agricultural Acreage [1, 2]									Total Drainage Area Acres
	Row Crops	Cut Flowers	Citrus	Avocados	Other Tree Crops	Strawberries	Other Berries	Sod	Nursery	
01T_ODD3_ARN	414							235		800
04D_ETTG	2789		117			254	240			3,779
04D_LAS	951	10				81		16		1,339
05D_LAVD	36		202	168		21	128			877
05T_HONDO	16	1	1108	567	2		81		5	3,928
06T_LONG2	4	13	428	673	1	27	166		39	2,813
OXD_CENTR	66	77				787				1,243
S02T_ELLS	64		322	451	3	32				9,015
S02T_TODD	97	46	233	132	2					5,748
S03D_BARDS	30		707	110					17	2,214
S03T_BOULD	8		192	652					149	3,764
S03T_TIMB	9		87	381	2		1			2,183
S04T_TAPO	60		33						20	3,686
VRT_SANTO			284	252	17					7,220
VRT_THACH	6		637	149	14				2	6,003

1. Data Source: Ventura County Agricultural Commissioner's Office, December 2014.
2. Some acreage is double or triple counted due to multi-cropping practices.

Table 4. Estimated Irrigated Acreage Represented at TMDL Monitoring Sites

Station ID [1]	Irrigated Agricultural Acreage [2, 3]									Total Drainage Area Acres
	Row Crops	Cut Flowers	Citrus	Avocados	Strawberries	Other Berries	Sod	Nursery	Other	
01T_ODD2_DCH	701	2				296	119	291	1	1,564
02D_BROOM	1189	0	334	328	5		481		24	8,236
04D_WOOD	320						39			470
05D_SANT_VCWPD	143		404	173		66	198			1,154
06T_FC_BR	32	13	791	62		36	110		5	2,602
07D_HITCH_LEVEE_2	67								47	142
9BD_GERRY			32	86			120			447
S01D_MONAR						232				209
CIHD_VICT						92				99

1. Sites OXD_CENTR and S02T_ELLS are also monitored for specific TMDL constituents; their drainage area and crop type information is listed in the previous table.
2. Data Source: Ventura County Agricultural Commissioner's Office, December 2014.
3. Some acreage is double or triple counted due to multi-cropping practices.

STANDARD WATER QUALITY BENCHMARKS

This section presents the water quality benchmarks as specified in the Waiver (R4-2010-0186) used to evaluate monitoring data collected at VCAILG monitoring sites in 2013 through 2014. Benchmarks used for determining exceedances of the standard water quality benchmarks include numeric and narrative water quality objectives contained in Appendix 2 of the Waiver, which consist of narrative and numeric Basin Plan objectives and water quality standards from the California Toxics Rule (CTR). In instances where the Waiver references the Basin Plan or CTR, without specifying a benchmark number, the lowest applicable number was selected for each watershed. The Waiver also includes effective TMDL load allocations (LAs) as water quality benchmarks. A subset of those TMDLs includes the provision to develop WQMPs regardless of whether monitoring data exceed water quality benchmarks. This WQMP has been written to meet any mandatory TMDL requirements compelling WQMP development.

Several of the narrative water quality objectives contained in the Basin Plan specify that discharges of wastes to receiving waters cannot alter "natural" or "ambient" conditions above or below a stated level. Many of the VCAILG monitoring sites are located on agricultural drains that discharge to receiving waters. Because "natural" and "ambient" conditions have not been established in receiving waters or are non-existent on agricultural drains and ephemeral streams, monitoring data from sites located on agricultural drains are evaluated based on the assumption that if benchmarks are not exceeded in the agricultural drain, it is unlikely that the discharge from that drain will cause benchmark exceedances in the receiving water. The following tables specify applicable water quality benchmarks by watershed or stream reach, where appropriate.

Table 5. Standard Water Quality Benchmarks Derived From Narrative Objectives and Toxicity

Constituent	Watershed [1]	Narrative Objective [2]	Applicable Benchmark
pH	CC, OXD, SCR, VR	The pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed by more than 0.5 pH units from natural conditions as a result of waste discharges.	6.5 ≤ pH ≤ 8.5 Changes to ambient receiving water conditions are not assessed; "ambient" or "natural" conditions have not been established
Temperature	CC, OXD, SCR, VR	For waters designated WARM, water temperature shall not be altered by more than 5°F above the natural temperature. At no time shall WARM-designated waters be raised above 80°F as a result of waste discharges.	WARM: ≤ 80°F Changes to ambient receiving water conditions are not assessed; "ambient" or "natural" conditions have not been established
	SCR, VR	For waters designated COLD, water temperature shall not be altered by more than 5°F above the natural temperature.	COLD: No numeric benchmark. Changes to ambient receiving water conditions are not assessed; "ambient" or "natural" conditions have not been established
Dissolved Oxygen	OXD	No single dissolved oxygen determination shall be less than 5 mg/L, except when natural conditions cause lesser concentrations.	≥ 5 mg/L
	CC, SCR, VR	The dissolved oxygen content of all surface waters designated as WARM shall not be depressed below 5 mg/L as a result of waste discharges.	WARM: ≥ 5 mg/L
	SCR, VR	The dissolved oxygen content of all surface waters designated as COLD and SPWN shall not be depressed below 7 mg/L as a result of waste discharges.	COLD, SPWN: ≥ 7 mg/L
Turbidity	CC, OXD, SCR, VR	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in natural turbidity attributable to controllable water quality factors shall not exceed the following limits: ▪ Where natural turbidity is between 0 and 50 NTU, increases shall not exceed 20%; ▪ Where natural turbidity is greater than 50 NTU, increases shall not exceed 10%.	No numeric benchmarks. Changes to ambient receiving water conditions are not assessed; "ambient" or "natural" conditions have not been established
Biostimulatory Substances	CC, OXD, SCR, VR	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses.	No numeric benchmarks. Waterbody-specific benchmarks for nutrients are listed in Table 6.
Total Suspended Solids (TSS)	CC, OXD, SCR, VR	Wastes shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.	No numeric benchmarks.
Pesticides	CC, OXD, SCR, VR	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.	No numeric benchmarks. Applicable benchmarks for specific pesticides are listed in Tables 8, 9, and 10.
Toxicity	CC, OXD, SCR, VR	All waters shall be free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal or aquatic life. There shall be no chronic toxicity in ambient waters outside mixing zones.	≤ 1.0 TUc [3] Benchmarks for specific potentially toxic constituents are listed in Tables 6 through 10.

1. CC = Calleguas Creek Watershed OXD = Oxnard Coastal Watershed SCR = Santa Clara River Watershed VR = Ventura River Watershed
2. Source: Water Quality Control Plan, Los Angeles Region (Basin Plan), 1994.
3. Source: "Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands," Order No. R4-2010-0186, Los Angeles Regional Water Quality Control Board, adopted October 7, 2010.

Table 6. Standard Water Quality Benchmarks for Salts and Nutrients (Basin Plan Table 3-8 Numeric Water Quality Objectives)

Watershed / Reach	Reach Description	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Nitrogen (mg/L)	Ammonia [1] (mg/L)	Phosphate (mg/L)
CC below Potrero Rd.	-----	-----	-----	-----	10 [2]	pH, temperature dependent	-----
CC above Potrero Rd.	-----	150	250	850	10 [3]	pH, temperature dependent	-----
OXD	-----	-----	-----	-----	10 [2]	pH, temperature dependent	-----
SCR Reach 1	Tidally-influenced mouth of Santa Clara River upstream to 101 Bridge	-----	-----	-----	10 [2]	pH, temperature dependent	-----
SCR Reach 2	Upstream of Hwy 101 Bridge to Freeman Diversion	150	600	1200	10 [2]	pH, temperature dependent	-----
SCR Reach 3	Upstream of Freeman Diversion to A Street Bridge in Fillmore	100 [4]	650	1300	5 [3]	pH, temperature dependent	-----
SCR Reach 4	Upstream of A Street Bridge in Fillmore to Blue Cut Gaging Station	100	600	1300	5 [3]	pH, temperature dependent	-----
VR Reach 4	Between Camino Cielo Rd. and Casitas Vista Rd.	60	300	800	5 [3]	pH, temperature dependent	-----

Watersheds: CC = Calleguas Creek OXD = Oxnard Coastal SCR = Santa Clara River VR = Ventura River

1. Ammonia benchmarks are based on 1) freshwater ammonia objectives as calculated according to LARWQCB Resolutions 2002-011 and 2005-014, and 2) saltwater ammonia objectives as calculated according to LARWQCB Resolution 2004-022. Ammonia objectives are calculated based on the pH and temperature of the receiving water measured at the time of sample collection for ammonia analysis. Ammonia objectives used as benchmarks are chronic, 30-day averages.
2. There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N was used for comparison with VCAILG data collected at monitoring sites in this reach.
3. The Nitrogen benchmark listed is as Nitrate-N plus Nitrite-N.
4. The 100 mg/L benchmark for chloride is the revised water quality objective adopted by the Regional Board in Resolution 2003-015.

Table 7. Standard Water Quality Benchmarks for Copper

	Freshwater [1]		Brackish or Saltwater [1]	
Constituent	**Benchmark (µg/L)**	**Benchmark Source**	**Benchmark (µg/L)**	**Benchmark Source**
Copper [2]	$= 0.96$[illegible]$^{[0.8545(\ln h\text{[illegible]})+(-1.702)]}$	CTR CCC [3]	3.1	CTR CCC [3]

1. Freshwater benchmark applies to discharges to waters with salinities <1 ppt at least 95% of the time. Saltwater benchmark applies when salinities are ≥10 ppt at least 95% of the time. For discharges between these categories, or tidally influenced freshwater that supports EST beneficial uses, the lower criteria of the two shall be used; which is the saltwater benchmark.
2. As per footnote "m" to the Table in Paragraph (b)(1) of the CTR; "The freshwater and saltwater criteria for metals are expressed in terms of the dissolved fraction of the metal in the water column." In instances where the measured hardness is >400 mg/L as $CaCO_3$, a hardness of 400 is used to calculate the benchmark. This was done in accordance with CTR §31692, f. Hardness.
3. CTR = California Toxics Rule (USEPA, May 18, 2000).
   CCC = Criteria Continuous Concentration

Table 8. Standard Water Quality Benchmarks for Organochlorine Pesticides

	CC Watershed		OXD, SCR Watersheds		VR Watershed	
Constituent	**Benchmark (ug/L)**	**Benchmark Source [1]**	**Benchmark (ug/L)**	**Benchmark Source [1]**	**Benchmark (ug/L)**	**Benchmark Source [1]**
Aldrin	0.00014	CTR HHO	0.00014	CTR HHO	0.00013	CTR HHWO
Alpha-BHC	0.013	CTR HHO	0.013	CTR HHO	0.0039	CTR HHWO
Beta-BHC	0.046	CTR HHO	0.046	CTR HHO	0.014	CTR HHWO
Gamma-BHC (Lindane)	0.063	CTR HHO	0.063	CTR HHO	0.019	CTR HHWO
Delta-BHC	-----	-----	-----	-----	-----	-----
Chlordane-alpha	-----	-----	-----	-----	-----	-----
Chlordane-gamma	-----	-----	-----	-----	-----	-----
Chlordane, sum	0.00059	CTR HHO	0.00059	CTR HHO	0.00059	CTR HHO
2,4'-DDD	-----	-----	-----	-----	-----	-----
2,4'-DDE	-----	-----	-----	-----	-----	-----
2,4'-DDT	-----	-----	-----	-----	-----	-----
4,4'-DDD	0.00084	CTR HHO	0.00084	CTR HHO	0.00084	CTR HHO
4,4'-DDE	0.00059	CTR HHO	0.00059	CTR HHO	0.00059	CTR HHWO
4,4'-DDT	0.00059	CTR HHO	0.00059	CTR HHO	0.00059	CTR HHWO
Dieldrin	0.00014	CTR HHO	0.00014	CTR HHO	0.00014	CTR HHWO
Endosulfan I	0.056	CTR AFWC	0.056	CTR AFWC	0.056	CTR AFWC
Endosulfan II	0.056	CTR AFWC	0.056	CTR AFWC	0.056	CTR AFWC
Endosulfan Sulfate	240	CTR HHO	240	CTR HHO	110	CTR HHWO
Endrin	0.036	CTR AFWC	0.036	CTR AFWC	0.036	CTR AFWC
Endrin Aldehyde	0.81	CTR HHO	0.81	CTR HHO	0.76	CTR HHWO
Endrin Ketone	-----	-----	-----	-----	-----	-----
Toxaphene	0.00075	CTR HHO	0.00075	CTR HHO	0.00075	CTR HHO

Watersheds: CC = Calleguas Creek OXD = Oxnard Coastal SCR = Santa Clara River VR = Ventura River

1. CTR = California Toxics Rule (USEPA, May 18, 2000).
   HHO = Human Health for Consumption of Organisms Only (30-day average)
   HHWO = Human Health for Consumption of Water and Organisms (MUN-designation) (30-day average)
   FWC = Aquatic Life, Freshwater Chronic (4-day average)

Table 9. Standard Water Quality Benchmarks for Organophosphorus Pesticides

Constituent	CC, OXD, SCR, VR Watersheds Benchmark (ug/L) [1]
Bolstar	-----
Chlorpyrifos	0.025
Demeton	-----
Diazinon	0.10
Dichlorvos	-----
Disulfoton	-----
Ethoprop	-----
Fenchlorophos	-----
Fensulfothion	-----
Fenthion	-----
Malathion	-----
Merphos	-----
Methyl Parathion	-----
Mevinphos	-----
Phorate	-----
Tetrachlorvinphos	-----
Tokuthion	-----
Trichloronate	-----

Watersheds: CC = Calleguas Creek OXD = Oxnard Coastal SCR = Santa Clara River VR = Ventura River

1. Benchmarks are from Appendix 2 of the Waiver

Table 10. Standard Water Quality Benchmarks for Pyrethroid Pesticides

Constituent	CC, OXD, SCR, VR Watersheds Benchmark (ug/L) [1]
Allethrin	-----
Bifenthrin	-----
Cyfluthrin	-----
L-Cyhalothrin	-----
Cypermethrin	-----
Danitol	-----
Deltamethrin	-----
Esfenvalerate	-----
Fenvalerate	-----
Permethrin	-----
Prallethrin	-----

Watersheds: CC = Calleguas Creek OXD = Oxnard Coastal SCR = Santa Clara River VR = Ventura River

1. There currently are no Waiver benchmarks in effect for these watersheds.

SUMMARY OF STANDARD WATER QUALITY BENCHMARK EXCEEDANCES

The following summarizes the exceedances of standard water quality benchmarks as specified in Waiver Appendix 2 or included by reference to narrative and numeric Basin Plan objectives and water quality standards from the California Toxics Rule. A discussion of the sources of these constituents is provided after the discussion of TMDL benchmarks and exceedances. Site specific information regarding benchmark exceedances and conditions can be found in Appendix B.

Monitoring data from samples collected at 13 of the 15 VCAILG Monitoring Program (VCAILGMP) sites exceeded benchmarks and triggered the requirement to develop WQMPs to address the exceedances. Background sites are not included in the total number of monitoring sites because they are located upstream of irrigated agricultural operations and do not trigger the development of a WQMP. Exceedances of standard water quality benchmarks occurred in all watersheds, except Ventura River Watershed where no samples were collected during the 2013-2014 monitoring year due to lack of flow.

Table 11 lists the exceedances that occurred at each site for each monitoring event. This table also identifies sites that were not sampled due to the absence of flowing water. OC pesticides, primarily DDT compounds, caused the highest number of exceedances overall, followed by nitrogen compounds. Benchmark exceedances of the OP pesticide chlorpyrifos occurred exclusively during wet weather and at sites located in the Calleguas Creek, Oxnard Coastal, and Santa Clara River Watersheds. During the two dry events (Event 19, August 2013 and Event 21, May 2014), all sites sampled had exceedances. During the storm event (Event 20, February 2014) all sites sampled had exceedances except one (S02T_TODD).

Toxicity sampling took place during all three monitoring events during 2013-2014 to make up for the lack of dry weather toxicity monitoring during the 2012-2013 monitoring year. An exceedance of the 1.0 TU_c benchmark occurred during all three events at the S02T_TODD site and during the wet weather event at S03T_BOULD.

Table 11. Exceedances of Standard Water Quality Benchmarks for 2013-2014 – by Site and Event [1]

Site	Event 19 – Dry August 22, 2013	Event 20 – Wet February 28, 2014	Event 21 – Dry May 29, 2014
01T_ODD3_ARN	Nitrate-N 4,4'-DDD, 4,4'-DDE	*NS*	Nitrate-N Dissolved copper 4,4'-DDD, 4,4'-DDE, 4,4'-DDT
04D_ETTG	Nitrate-N Dissolved Copper 4,4'-DDE Toxaphene	Nitrate-N, Dissolved Copper Total Chlordane 4,4'-DDD, 4,4'-DDE, 4,4'-DDT Toxaphene, Chlorpyrifos	Nitrate-N Dissolved Copper 4,4'-DDE
04D_LAS	Nitrate-N 4,4'-DDE Toxaphene	Nitrate-N Dissolved Copper Total Chlordane 4,4'-DDD, 4,4'-DDE, 4,4'-DDT Toxaphene	Nitrate-N Dissolved copper 4,4'-DDD, 4,4'-DDE, 4,4'-DDT
05D_LAVD	*NS*	Dissolved Copper Total Chlordane 4,4'-DDD, 4,4'-DDE, Chlorpyrifos	*NS*
05T_HONDO	*NS*	Total Chlordane 4,4'-DDD, 4,4'-DDE, 4,4'-DDT Chlorpyrifos	*NS*
06T_LONG2	*NS*	Total Chlordane 4,4'-DDD, 4,4'-DDE, 4,4'-DDT Chlorpyrifos	*NS*
OXD_CENTR	Nitrate-N Toxaphene	Total Chlordane 4,4'-DDD, 4,4'-DDE, 4,4'-DDT Toxaphene	Nitrate-N
S02T_ELLS	*NS*	Chloride, Total Chlordane 4,4'-DDE, Chlorpyrifos	*NS*
S02T_TODD	TDS, Chloride, Sulfate Toxaphene Chronic Toxicity	Chronic Toxicity	TDS, Chloride, Sulfate Nitrate-N, Chronic Toxicity
S03T_TIMB	*NS*	TDS, Chloride, Sulfate	*NS*
S03T_BOULD	*NS*	Nitrate-N, Total Chlordane Chronic Toxicity	*NS*
S03D_BARDS	*NS*	Nitrate-N, Total Chlordane 4,4'-DDD, 4,4'-DDE, 4,4'-DDT	4,4'-DDE, 4,4'-DDT
S04T_TAPO	TDS, Chloride, Sulfate Nitrate-N,	Total Chlordane 4,4'-DDE	TDS, Chloride, Sulfate Nitrate-N
VRT_SANTO	*NS*	*NS*	*NS*
VRT_THACH	*NS*	*NS*	*NS*
Total Number of Sites Sampled	6	12	7
Total Number of Sites with Exceedances	6	12	7

NS = Not Sampled; site dry, ponded, or inaccessible

1. Listed exceedances for DDD, DDE, and DDT are all in the form of 4,4' isomers.

TMDL WQMP REQUIREMENTS

Appendix 3 of the Waiver lists water quality benchmarks that come from TMDL load allocations (LAs). Including these LAs as benchmarks in the Waiver means an exceedance triggers the development of a WQMP. Additionally, certain TMDLs include a requirement for development of a WQMP regardless of whether monitoring data exceed the LAs for irrigated agriculture; they include the Calleguas Creek Watershed and Mugu Lagoon OC Pesticides and PCBs TMDL, Calleguas Creek Watershed and Mugu Lagoon Toxicity, Chlorpyrifos, and Diazinon TMDL, Calleguas Creek Watershed Metals and Selenium TMDL and Calleguas Creek Watershed Boron, Chloride, Sulfate, and TDS (Salts) TMDL. Therefore, this WQMP covers all the previously listed TMDLs regardless of benchmark exceedances. TMDLs that only require a WQMP in the event of a load allocation benchmark exceedance are explained below. The process and BMPs outlined in the WQMP are designed to result in compliance with both the standard water quality and TMDL LA benchmarks. Standard water quality and TMDL LA benchmark exceedances are further detailed in Appendix B.

Calleguas Creek Watershed Nitrogen Compounds TMDL

The LA for the Calleguas Creek Watershed Nitrogen Compounds TMDL is expressed as the sum of nitrate-nitrogen and nitrite-nitrogen (**Table 12**).

Table 12. Load Allocations for Nitrogen Compounds

Constituent	Load Allocation (mg/L)
Nitrate-N + Nitrite-N	9

Revolon Slough and Beardsley Wash Trash TMDL

LAs for this TMDL are zero trash. Dischargers may achieve compliance with the LAs by implementing a minimum frequency of assessment and collection/best management practice (MFAC/BMP) program. By March 6, 2010, agricultural dischargers were required to demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events.

Non-point source dischargers are complying with the Trash TMDL requirements through a program that includes a combination of a Minimum Frequency Assessment Collection (MFAC) Program and other BMPs. The MFAC program includes regular collection and counting of trash. Various components of the WQMP address the BMP portion of Trash TMDL compliance, including VCAILG education, outreach, and the Management Practice Survey, that all provide information and BMPs related to trash collection and proper disposal.

Santa Clara River Nitrogen Compounds TMDL

The LA for the Santa Clara River Nitrogen Compounds TMDL applicable to VCAILG monitoring sites is listed in **Table 13**.

Table 13. Load Allocations for Nitrogen Compounds

Constituent	Load Allocation (mg/L) [1]
Ammonia-N + Nitrate-N + Nitrite-N	10

1. The specified load allocation applies to all Santa Clara River reaches within Ventura County.

Ventura River Estuary Trash TMDL

LAs are zero trash. Dischargers may achieve compliance with the LAs by implementing a minimum frequency of assessment and collection/best management practice (MFAC/BMP) program. By March 6, 2010, agricultural dischargers must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events.

Non-point source dischargers are complying with the Trash TMDL requirements through a program that includes a combination of a MFAC program and other BMPs. Various components of the WQMP address the BMP portion of Trash TMDL compliance, including VCAILG education, outreach, and the Management Practice Survey that have all provided information and BMPs related to trash collection and proper disposal.

Santa Clara River Estuary Toxaphene TMDL

The Waiver incorporated toxaphene LAs for suspended sediment and fish tissue as Water Quality Benchmarks (Appendix 3) shown in Table 14.

Table 14. Load Allocations for Toxaphene

Reach	Toxaphene in Fish Tissue (µg/kg)	Toxaphene in Suspended Sediment (µg/kg)
Santa Clara River Estuary	6.1	0.1

SUMMARY OF TMDL LOAD ALLOCATION BENCHMARK EXCEEDANCES

Details regarding the monitoring sites and conditions during which TMDL LA benchmark exceedances occurred can be found in Appendix B. The Salts TMDL interim LAs are currently being met at all sites, with the exception of boron at the 04_WOOD site, which represents the Revolon Slough subwatershed. The Calleguas Creek Watershed and Mugu Lagoon Metals and Selenium TMDL interim LA for selenium was exceeded in Revolon Slough, however, this TMDL already requires a WQMP. Final TMDL LA exceedances occurred for both nitrogen TMDLs in Ventura County that apply to the current Waiver (Calleguas Creek Watershed and Santa Clara River Nitrogen Compounds TMDLs).

PESTICIDE USE EVALUATION

In 1990, California became the first state to require full reporting of agricultural pesticide use in response to demands for more realistic and comprehensive pesticide use data. Under the program, all agricultural pesticide use must be reported monthly to county agricultural commissioners, who in turn, report the data to DPR.

California has a broad legal definition of "agricultural use" so the reporting requirements include pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. In addition, all postharvest pesticide treatments of agricultural commodities must be reported along with all pesticide treatments in poultry and fish production as well as some livestock applications. Only agricultural applications, as noted by specific commodity treated, are summarized in this document.

Pesticide use records for 2013-2014 were compared with VCAILG monitoring data for the same year. The evaluation focused on diazinon and chlorpyrifos since those are the only two presently permitted pesticides with water quality benchmarks under the Ag Waiver. For the comparison of the 2013-2014 pesticide use records to VCAILG monitoring data, pesticide application locations had to be linked to the appropriate monitoring site drainage area as not all pesticide applications within Ventura County occurred within a monitoring site drainage area. Additional manipulation of the pesticide use data included converting the percent concentration of active ingredient based on the product name to an amount of active ingredient applied during each application. Depending on the product formulation, the conversion was either into gallons or pounds of active chlorpyrifos or diazinon. The dates and amounts of pesticides applied were then compared to the benchmark exceedances. **Table 15** includes 2013-2014 chlorpyrifos application information by crop type as well as a comparison to water quality data from associated VCAILG monitoring sites. **Table 16** includes 2013-2014 diazinon application information by crop type as well as a comparison of water quality data from associated VCAILG monitoring sites.

PESTICIDE USE AND VCAILG MONITORING DATA

Chlorpyrifos

For agricultural application, chlorpyrifos is the active ingredient in several products including Lorsban, Dursban, Nufos, and Warhawk. Use of chlorpyrifos is common on lemons, strawberries, and cabbage in Ventura County. Chlorpyrifos was applied within the drainage areas of 14 of 15 VCAILG monitoring sites. Of the 14 monitoring sites, five sites had a total of five exceedances of the chlorpyrifos water quality benchmark during the monitoring year. Exceedances only occurred during wet weather and specifically only during the February 28, 2014 storm event. The following factors may contribute to the likelihood that chlorpyrifos is transported off-site: pesticide formulation and application method, date of application in relation to subsequent rain events, and proximity to a drainage channel, stream, or tributary. **Table 15** provides chlorpyrifos application details within the VCAILG monitoring site drainage areas and exceedances of the 0.025 µg/L benchmark.

Table 15. Chlorpyrifos Applications and Benchmark Exceedances by Monitoring Site for 2013-2014

Site	Date	Commodity	Active Ingredient Applied (gal)	Active Ingredient Applied (lbs.)	Total Applied per Site (gal)	Total Applied per Site (lbs.)	Date Benchmark Exceeded	Dry or Wet Event?	Exceedance Concentration (µg/L)	Total Drainage Area (acres)
04D_ETTG	7/1/2013	Cabbage		6.0	18.4	42.3	2/28/14	Wet	0.2056	3778
	7/16/2013	Cabbage		9.4						
	8/1/2013	Cabbage	0.8							
	9/13/2013	Kale		15.7						
	11/9/2013	Strawberry	6.0							
	11/16/2013	Strawberry	4.1							
	11/26/2013	Radish	0.5							
	11/26/2013	Strawberry	7.1							
	5/21/2014	Cabbage	11.3							
04D_LAS	8/28/2013	Strawberry	4.3		4.4		N/A	N/A	N/A	1338
	1/30/2014	Kale	0.1							
05D_LAVD	8/22/2013	Lemon	1.7		16.4		2/28/14	Wet	0.223	876
	10/31/2013	Lemon	9.4							
	11/8/2013	Lemon	5.2							
05T_HONDO	11/14/2013	Lemon	25.2		45.3		2/28/14	Wet	0.175	3927
	11/15/2013	Lemon	0.5							
	12/3/2013	Lemon	19.6							
06T_LONG2	10/12/2013	Lemon	1.4		15.7		2/28/14	Wet	0.109	2813
	10/15/2013	Lemon	4.0							
	10/25/2013	Lemon	2.0							
	10/29/2013	Lemon	2.7							
	11/19/2013	Lemon	2.0							
	11/26/2013	Avocado	0.9							
	11/26/2013	Lemon	1.4							

Site	Date	Commodity	Active Ingredient Applied (gal)	Active Ingredient Applied (lbs.)	Total Applied per Site (gal)	Total Applied per Site (lbs.)	Date Benchmark Exceeded	Dry or Wet Event?	Exceedance Concentration (µg/L)	Total Drainage Area (acres)
	11/30/2013	Tangerine	1.4							
OXD_CENTR	7/3/2013	Grnhs Flower	0.2		2.9	29.7	N/A	N/A	N/A	1242
	8/31/2013	Strawberry	2.6							
	12/11/2013	Cabbage		0.9						
	12/27/2013	Outdr Flower	0.1							
	3/28/2014	Cabbage		28.8						
S02T_ELLS	7/25/2013	Lemon	2.8		30.8		2/28/14	Wet	0.06	9013
	9/19/2013	Lemon	20.4							
	10/23/2013	Lemon	1.7							
	11/4/2013	Lemon	5.9							
S02T_TODD	8/13/2013	Lemon	0.8		0.8	57.6	N/A	N/A	N/A	5747
	8/17/2013	Cabbage		28.8						
	3/28/2014	Cabbage		28.8						
S03D_BARDS	11/15/2013	Orange	0.2		19.0		N/A	N/A	N/A	2213
	11/15/2013	Orange	0.8							
	5/9/2014	Tangerine	18.0							
S03T_BOULD	8/16/2013	Lemon	4.3		18.5		N/A	N/A	N/A	3763
	11/21/2013	Lemon	10.9							
	5/31/2014	Lemon	1.9							
	6/3/2014	Tangerine	1.4							
S03T_TIMB	9/5/13	Lemon	7.4		17.8		N/A	N/A	N/A	2183
	10/1/13	Lemon	10.0							
	4/18/2014	Lemon	0.4							
S04T_TAPO	8/5/2013	Orange	5.1		6.4		N/A	N/A	N/A	3687
	11/20/2013	Mustard	1.3							
VRT_SANTO	9/21/2013	Lemon	0.9		3.3		N/A	N/A	N/A	7218

Site	Date	Commodity	Active Ingredient Applied (gal)	Active Ingredient Applied (lbs.)	Total Applied per Site (gal)	Total Applied per Site (lbs.)	Date Benchmark Exceeded	Dry or Wet Event?	Exceedance Concentration (µg/L)	Total Drainage Area (acres)
	10/3/2013	Orange	2.4							
	8/23/2013	Lemon	1.1							
VRT_THACH	9/25/2013	Lemon	2.6		3.7	0.6	N/A	N/A	N/A	6002
	1/2/2014	Tangerine		0.6						

Diazinon

Diazinon usage was much less widespread than chlorpyrifos in 2013-2014. The commodity receiving the most diazinon was green onions. Applications of diazinon occurred within three VCAILG monitoring site drainage areas. There were no exceedances of the 0.10 µg/L benchmark. **Table 16** includes diazinon application information for the VCAILG monitoring site drainage areas.

Table 16. Diazinon Applications and Benchmark Exceedances by Monitoring Site for 2013-2014

Site	Date	Commodity	Active Ingredient Applied (gal)	Active Ingredient Applied (lbs.)	Total Applied per Site (gal)	Total Applied per Site (lbs.)	Date Benchmark Exceeded	Dry or Wet Event?	Exceedance Concentration (µg/L)	Total Drainage Area (ac.)
05T_HONDO	4/9/2014	Outdoor Plants	0.1		0.1		N/A	N/A	N/A	3928
OXD_CENTR	2/20/2013	Greenhouse Flowers		0.5		0.5	N/A	N/A	N/A	1243
S04T_TAPO	12/3/2012	Green Onion		5.0		15.0	N/A	N/A	N/A	3686
	12/13/2012	Green Onion		10.0						

PESTICIDE USE SUMMARY

For the 2013-2014 monitoring year, chlorpyrifos and diazinon were applied throughout the year. Of the fifteen sites visited during three monitoring events, five of the VCAILG monitoring sites had exceedances of the chlorpyrifos water quality benchmark, all during the February 28, 2013 wet event. There does not appear to be any correlation between chlorpyrifos application amount and benchmark exceedances. There were no exceedances of the diazinon water quality benchmark during the three monitoring events and application amounts within the monitoring drainage areas were minimal.

Pesticide use is variable and performed in response to a variety of factors such as pest pressures, sudden outbreaks of latent diseases and/or pathogens, cropping patterns, variation in neighboring crops that may have incompatible maximum residue limits, etc. Also, the use of a specific pesticide on a particular crop varies from year to year. All pesticide use decisions are based on farmer and pest control advisor (PCA) expertise, and applied under the authority of the local Agricultural Commissioner's office and the Department of Pesticide Regulation (DPR). Outside of compiling the provided pesticide use information and observing any trends, VCAILG does not have the authority to require pest control application modifications. Six questions in the new management practice survey relate to pesticide management (page 42), they include scouting, maintenance, storage, and application timing considerations. The results of these questions will be used in evaluating future pesticide usage records.

WQMP Implementation Process

The purpose of this section is to outline the process utilized by VCAILG to identify the need for management practices, implement specific management practices and track the implementation and effectiveness of those management practices to mitigate water quality benchmark exceedances and achieve TMDL load allocations. In addition to VCAILG, other agencies and organizations are working with Ventura County farmers to provide technical expertise, assistance with BMP implementation, and in some cases, cost sharing opportunities. This WQMP includes an evaluation of the two years of online management practice survey results. The next WQMP is to be submitted in approximately six months, in conjunction with the Annual Monitoring Report due in December 2015. As no new survey data will be available for the upcoming combined report, its primary goal will be to evaluate available survey data in conjunction with water quality monitoring results.

Past outreach efforts and WQMP implementation actions were driven by the identification of priority areas. At a meeting on April 27, 2015 between Regional Board staff and VCAILG representatives, Regional Board staff expressed the opinion that the priority areas were no longer a useful tool in WQMP implementation. The preference shared was to extend outreach to VCAILG members related to specific water quality benchmark exceedances and to better integrate the presentation of monitoring results with BMP implementation. **Figure 8** has been revised from previously submitted WQMPs to better represent this new iterative WQMP implementation process.

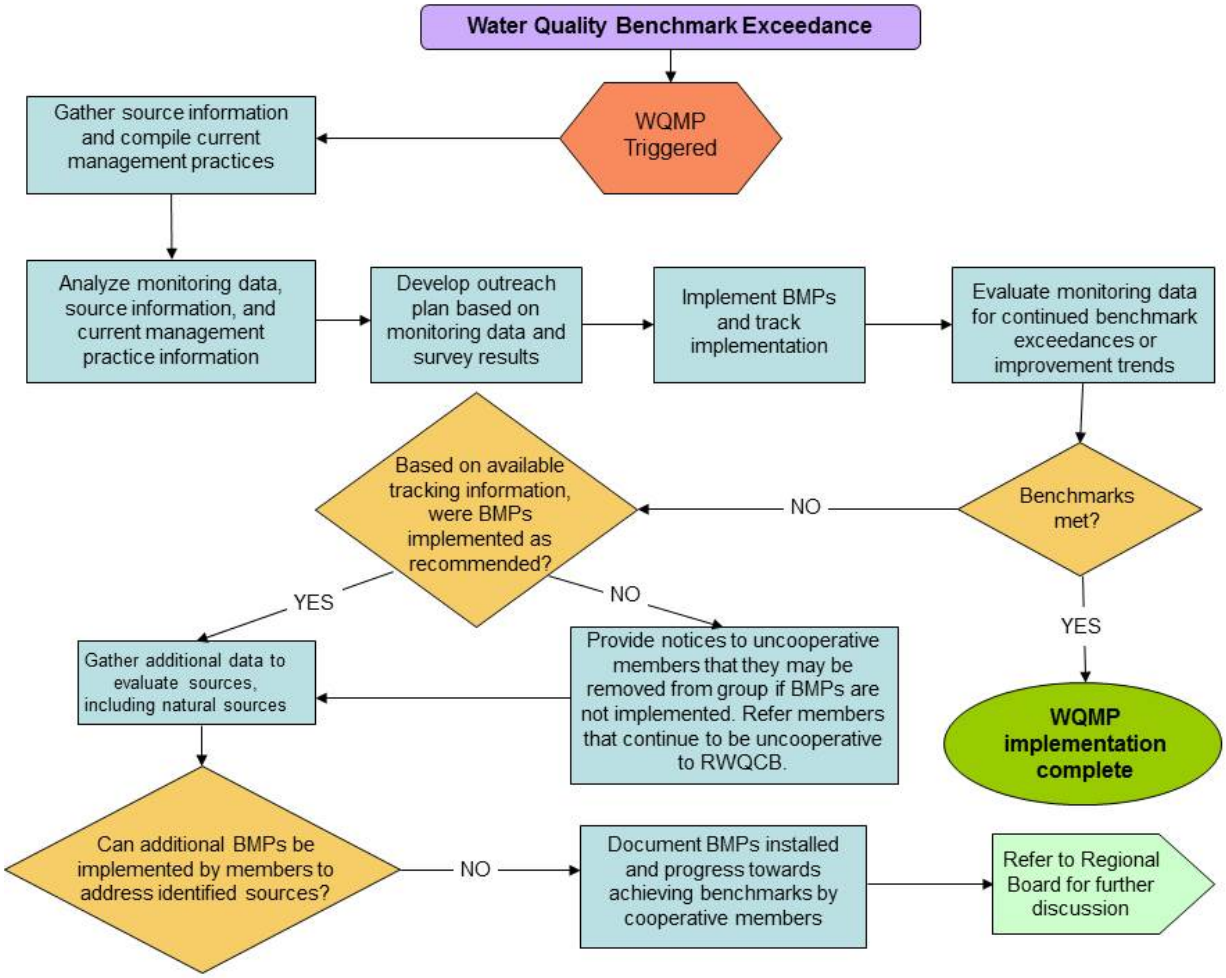

Figure 8. WQMP Implementation Process

WQMP Implementation Progress

In the first WQMP developed under the 2010 Waiver, a three part approach was identified to address water quality priorities. The following bullets summarize that approach and the subsequent sections provide relevant details related to implementing the WQMP, specifically focusing on the results of the first two years of the web-based management practice survey.

- ✓ Develop a comprehensive web-based survey system to better track and evaluate BMP implementation. Feedback VCAILG has received from outreach efforts and past surveys was used to develop the new web-based survey.

- ✓ Continue to provide outreach and education information to engage VCAILG members regarding education opportunities, water quality monitoring results, and Waiver requirements.

- ✓ Provide targeted additional follow-up activities focused on documenting occurrences and implementing BMPs to address irrigation runoff.

WEB-BASED MANAGEMENT PRACTICE SURVEY

Utilizing the information and experience from surveying the farmers whose properties drain to Tier 1, 2, and 3 priority sites, a web-based management practice survey (Survey) was developed in 2013 and further refined in 2014. The Survey was an adaptation of the paper BMP surveys used during implementation of past WQMPs. The web-based survey approach was detailed in the 2012 WQMP, and received conditional approval from the Regional Board on December 11, 2013. Using the web-based survey provides benefits to both VCAILG and its members. Farmers are able to enter information easily for all parcels that they grow on and answer crop specific questions. VCAILG members have the ability to print their completed surveys for their own records and progress tracking. Additionally, development of the online survey took into consideration errors and inaccurate responses typically received using the paper forms. Error messages and prompts were incorporated to prevent issues such as the number of reported irrigated acres exceeding the assessed parcel acreage or incorrect parcel number entry. While these prompts and backstops have improved the accuracy of the survey data, additional modifications were considered to further refine the process and minimize manual clean-up of the data set.

Further modifications were made to the web survey from information gathered during the initial web based survey process. To expedite the survey process in 2015, answers were pre-populated into 2015's survey based on 2014's submissions. Owners and growers simply updated the answers to questions, as needed. In 2014, information regarding crops was collected at the survey level, which caused difficulties when survey results were aggregated using drainage areas. In 2015, the survey was augmented to gather information at the parcel level pertaining to crop types, overhead cover, surface treatments, and irrigation system types. A PDF link was also included on the website that allows owners and growers to preview the survey and/or print it out if they preferred to submit a hard copy for manual entry of their survey responses.

The online management practice survey compiles the following information related to the ownership and farm operations:

- Identification of person filling out the survey and confirmation of landowner contact information;
- Parcels and irrigated acreage under the management of the person filling out the survey;
- Crop acreage associated with each parcel, and a confirmation that all irrigated acres are accounted for;
- Crops farmed on each parcel within the following categories:
    - Strawberries
    - Raspberries
    - Row Crops
    - Orchard
    - Nursery
    - Cut Flowers
    - Sod
    - Other (must be specified)

Management questions related to overhead cover, surface treatments, and irrigation methods are asked separately for each parcel and crop type that is farmed. Some of the options listed below are only applicable to certain crops and within the survey; only the most applicable answers are given as options for a particular crop. To avoid redundancy, all possible answers are provided below:

1. What type of overhead cover is used in the production area?
    - Greenhouse ____ acres
    - Hoop House ____ acres
    - Shade House/ Cloth ____ acres
    - No Overhead Cover ____ acres
    - Other (specified) ____ acres

2. What type of surface treatments are used in the production area?
    - Bare Soil ____ acres
    - Cover Crop ____ acres
    - Gravel ____ acres
    - Mulch (Plant Based) ____ acres
    - Plastic ____ acres
    - Weed Cloth ____ acres
    - Other (specified) ____ acres

3. What type of irrigation systems are used?
    - Drip Only ____ acres
    - Furrow/Flood ____ acres
    - Hand Watering ____ acres
    - Micro-Sprinkler Only ____ acres
    - Micro-Sprinkler, Then Drip ____ acres
    - Overhead Sprinkler Only ____ acres
    - Overhead Sprinkler, Then Drip ____ acres
    - Other (specified) ____ acres

The BMP portion of the survey includes thirty-six questions presented in five categories: Irrigation and Salinity Management, Nutrient Management, Sediment Management, Pesticide Management, and Trash Management. Only one answer can be provided for each BMP. Each management practice category also includes a free form field for farmers to describe additional practices they are implementing if not captured by the survey questions. This information may be useful to refine the survey questions or learn about new innovative BMPs that could be the topic of future education and outreach. The web-based BMP survey questions and possible answers are provided in the following table. BMPs related to equipment and systems maintenance are noted with a "M".

Irrigation and Salinity Management						
#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not applicable
1	Sprinkler irrigation runoff is captured or kept on the property.					
2 M	At least every 5 years, the irrigation system is tested for distribution uniformity by monitoring water delivery or pressure differences within a block.					
3 M	Regular maintenance is performed on the irrigation system to maintain distribution uniformity and prevent runoff caused by leaks or clogged lines.					
4	Pressure regulators or pressure compensating emitters are used.					
5 M	Sprinkler heads and drip emitters of the same flow rate are used within each block and replaced with the same heads or emitters, when necessary.					
6	Soil moisture is measured using any of the following: • Sensors • Tensiometers • Probes • Irrigation monitoring service					
7	Flow meters are used to measure actual water use and are coupled with known crop use values or other measurements to match irrigation to plant needs.					
8	Irrigation water quality is tested for parameters of interest including: • Nitrate • pH • Electrical Conductivity (EC) • Sodium • Chloride • Bicarbonate • Boron					
9	Water use for plant establishment has been reduced by adopting more efficient irrigation methods such as: • Early drip use • Intermittent sprinklers • Microsprinklers					

Irrigation and Salinity Management

#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not applicable
10	Irrigation decisions are made by trained personnel who understand appropriate irrigation management.					
11	Salt leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).					

Please note (by number) any of the Irrigation and Salinity Management BMPs that do not apply to your entire operation and quantify using appropriate units (acres, number, etc.). Additionally, please use this space to describe any additional irrigation and/or salinity management practices employed on your farm, or ways you have reduced water use.

Nutrient Management

#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not Applicable
12	Soil or leaf/petiole tests are conducted to determine fertilization needs and the minimum amount necessary is applied based on the results.					
13	Fertilizer applications are split into multiple smaller applications to maximize plant uptake.					
14 M	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.					
15	Fertilizer applications are timed to consider irrigation and potential rain events.					
16	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.					
17	Fertilizer decisions are made by trained personnel who understand the 4R's of nutrient management: • Right fertilizer source • Right rate • Right time • Right place					

Nutrient Management						
#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not Applicable
18	Fertilizers are stored where they are protected from rain and on an impermeable pad with a curb to contain spills.					
19 M	Backflow prevention devices are installed and maintained.					
Please note (by number) any of the Nutrient Management BMPs that do not apply to your entire operation and quantify using appropriate units (acres, number, etc.). Additionally, please use this space to describe any additional nutrient management practices employed on your farm.						

Sediment Management						
#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not Applicable
20	Long runs of production area are broken up by access roads or buffer strips to reduce sediment movement.					
21	In sloped production areas, one or more of the following management practices is used to minimize erosion: • Contour farming • Contoured buffer strips • Terracing					
22 M	Bare soil is minimized through use of cover crops, mulch, leaving plant debris, or planting subsequent crops, and the soil cover is replenished periodically to maintain effectiveness.					
23	Soil amendments, such as polyacrylamide (PAM), are used to reduce sediment movement and retain water.					
24 M	Berms, culverts, or flow channels are in place to divert water away from roads. These devices or structures are maintained to preserve their functionality.					

Sediment Management						
#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not Applicable
25	Road erosion is minimized by use of any of the following: • Grading • Gravel • Grass • Mulch • Water bars • Drains					
26	Non-cropped areas with bare soil are protected from erosion with any of the following: • Vegetation • Mulch • Gravel • Water diversion					
27	Ditch banks are protected from erosion with vegetation, rock placement or geotextiles.					
28	One or more of the following is in place to treat runoff before it leaves the property. • Grassed waterways • Vegetated filter strips • Sediment traps • Tailwater recycling systems					
Please note (by number) any of the Sediment Management BMPs that do not apply to your entire operation and quantify using appropriate units (acres, number, etc.). Additionally, please use this space to describe any additional sediment management practices employed on your farm.						

Pesticide Management

#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not Applicable
29	Before application of pesticides, pest scouting is conducted using one or more of the following methods: • Yellow sticky traps • Pheromone traps • Plant inspection • Beating • Net sweeping					
30	Natural enemy populations are considered when choosing pesticides, application rates, and timing.					
31 M	Sprayers are routinely calibrated to ensure accurate application rates.					
32 M	Worn nozzles and screens are replaced to ensure the best coverage of pesticide applications.					
33	Pesticides are stored and mixed on an impermeable pad and at least 100 feet down slope from water sources (such as wells).					
34	Pesticides are not applied when rain or scheduled irrigation events are anticipated.					

Please note (by number) any of the Pesticide Management BMPs that do not apply to your entire operation and quantify using appropriate units (acres, number, etc.). Additionally, please use this space to describe any additional pesticide management practices employed on your farm.

Trash Management

#	BMP	Yes, New since Oct. 2010	Yes, Prior to Oct. 2010	Planned for Future	No, not currently used	Not Applicable
35 M	The property is kept clean and free of trash.					
36 M	The property has an adequate number of trash containers that are covered and emptied regularly.					

Please note (by number) any Trash Management BMPs that do not apply to your entire operation and quantify using appropriate units (acres, number, etc.). Additionally, please use this space to describe any additional trash management practices employed on your farm.

MANAGEMENT PRACTICE SURVEY EVALUATION

Background

Distribution of the Survey to VCAILG enrollees occurred in two phases in 2015. Survey login and completion instructions were initially distributed to approximately half of the landowners and growers on February 18th, who were instructed to complete the survey by March 16th. The other half of the VCAILG membership was sent Survey instructions on February 23rd and asked to complete the survey by March 23rd. The website remained open until March 25th, to allow for late submissions. Letters notifying VCAILG members of the survey requirement and deadlines for completion are included in Appendix C. Following the final survey deadline, the survey data was downloaded into an Access database for evaluation and analysis.

As explained above, the Survey was designed, in part, to gather information about the extent of use of thirty-six BMPs, each of which was assigned to one of the following management categories:

- Irrigation and Salinity Management
- Nutrient Management
- Sediment Management
- Pesticide Management
- Trash Management

As part of the Survey, respondents were asked to assign one of the following five descriptors ("scores") to each of the BMPs:

- 1 - Yes, new since October 2010
- 2 - Yes, prior to October 2010
- 3 - Planned for future
- 4 - No, not currently used
- 5 - Not applicable

The design of the survey resulted in associations between Ventura County Assessor's Parcel Numbers (APNs) and the scores (1 – 5) for each of the thirty-six BMPs.

In order to expand options for stratifying and exploring survey data, BMPs are also assigned to one of four "Action Categories", which were designed to reflect differences in the underlying nature of the activity involved. The Action Categories are listed in **Table 17** with brief descriptions.

Table 17. Action Categories Used to Stratify Survey Data

Action Category	Example Activities
Real Time Data	Use of weather data, soil moisture sensors, tensiometers, sources of real time evapotranspiration data
Testing	Use of pest scouting devices Chemical testing of irrigation water Measurements for timing and amount of irrigation needed Soil tests Leaf and petiole analysis Irrigation system pressure tests
Specialized Knowledge	Acquisition (including web sites) and use of up-to-date, specialized knowledge about soil types, crop rooting depths, pests and disease, nutrient requirements of crops, pesticide effectiveness and recommendations for application, etc.
Cropped Area Actions	Actions taken in areas under production, such as field preparation, planting, mulching, irrigation, fertilization
Uncropped Area Actions	Actions taken in areas where crops are not growing, such as maintenance of equipment, storage and disposal of chemicals and waste, maintenance and layout of ditches and roads, employee training, treatment of riparian zones and natural vegetation, ground cover in non-cropped areas

Level of Response

This WQMP includes an updated reporting of the 2014 survey results as well as evaluation of the 2015 survey results. The survey response for each year was as follows:

2014: Letters and instructions requesting that members of VCAILG complete the on line survey were sent to all landowners and growers of record during February/March 2014. This resulted in receipt of 601 surveys (after correcting for multiple responses for the same irrigated fields). The 2012-2013 VCAILG WQMP included an evaluation of data from this first round of the web-based survey in 2014. Subsequent to submittal of the 2012-2013 WQMP, VCAILG contacted members that did not complete a survey and provided a second opportunity to answer the questions and improve the group response rate. An additional 215 useable surveys were submitted in August/September 2014, generating a total of 816 useable survey responses for 2014.

2015: Letters and instructions requesting that VCAILG members complete the web-based management practice survey were sent to all landowners (1,185 letters) and growers (221 letters) during February 2015. This request resulted in the submittal of 628 complete surveys.

The areal-based survey response rate for the 2014 and 2015 surveys is provided in Table 18. A breakdown of areal survey coverage based on crop type is provided in **Table 19.**

Table 18. Management Practice Survey Coverage

Area Type	2014 Irrigated Acres	2015 Irrigated Acres
Total farm acreage	86,702	86,488
Total VCAILG member acres	78,500	78,711
Total VCAILG member acres surveyed	56,110	50,194
Percent survey coverage of VCAILG member acres	71.5%	63.8%

Table 19. Surveyed Acres by Crop Type

Crop Type	2014 Acres Surveyed	2015 Acres Surveyed	2014 Percentage of Total Surveyed Acreage	2015 Percentage of Total Surveyed Acreage
Strawberry	7,040	6,321	12.5%	12.6%
Raspberry	2,147	3,125	3.8%	6.2%
Row Crop	14,593	11,648	26.0%	23.2%
Orchard	30,217	26,166	53.9%	52.1%
Sod	252	1,329	0.4%	2.6%
Nursery	867	915	1.5%	1.8%
Cut Flowers	437	285	0.8%	0.6%
Other	548	401	1.0%	0.8%
Total	56,110	50,190	100%	100%

Survey Results Evaluation

Survey results were downloaded from the website into an Access database. The database was queried on the basis of Assessor Parcel Number (APN). In many cases, a single set of management practices (a single set of scores for the 36 BMPs) applied to an entire parcel. In other cases, where more than one survey was returned that applied to a particular parcel (e.g., when an owner and a tenant both reported management practices for subsets of the same parcel), and it was evident that the same irrigated area was being addressed by both respondents, the survey responses from one of the respondents were deleted for that parcel using professional judgment after inspecting the titles of the survey respondents (e.g., owner, manager, etc.).

Survey results were aggregated using the drainage areas for the monitoring sites listed in Table 3 and Table 4. This was done in ArcGIS by identifying surveyed parcels in a shapefile containing the Ventura County Assessor's Parcel database and intersecting them with monitoring drainages in a second shapefile. Many surveyed parcels straddle boundaries between two monitoring site drainages or between a monitoring site drainage and unmonitored areas. In order to assign survey responses to the correct amounts and locations of irrigated land, ArcGIS was used to partition parcels that overlapped two drainages. In these cases, survey responses were assigned to the fractions of the parcels

belonging to both of the drainage areas. Irrigated acreage was assumed to be distributed between drainages in the same proportions that applied to entire parcels.

The survey answers associated with all of the whole and partial parcels contained within each drainage area were pooled and used to derive drainage-specific survey metrics for each of the 36 BMPs. The survey metrics are described in Table 20.

Table 20. Metrics Used to Evaluate the 2014 and 2015 Survey Results

Applicable Irrigated Acres	$a = (Total\ Surveyed\ Irrigated\ Acres) - (acres\ with\ Score\ "5")$
Current Adoption Rate (%)	$x = \frac{(acres\ with\ Score\ "1") + (acres\ with\ Score\ "2")}{a}$
Adoption Rate Prior to October 2010 (%)	$y = \frac{(acres\ with\ Score\ "2")}{a}$
Change in Adoption Rate During the Current Waiver Term (%)	$x - y$
Future Additional Planned Adoption (%)	$z = \frac{(acres\ with\ Score\ "3")}{a}$

This approach resulted in 4,320 values for each survey year [(36 BMPs) x (5 metrics) x (24 drainage areas)] which represent the finest-scaled survey data possible using VCAILG and CCW TMDL monitored drainage areas as a basis for aggregation. These detailed results are provided for 2014 and 2015 surveys in **Appendix D**.

Patterns in Use of Individual BMPs

The drainage-specific adoption rates for individual BMPs (listed in **Appendix D**) were pooled and averaged to derive overall adoption rates for each BMP. For this analysis, two of the available drainages were omitted because they are nested within a larger drainage, and their inclusion would have resulted in "double-counting" of some of the survey results. The S01D_MONAR drainage was excluded because it is wholly contained within the larger OXD_CENTR drainage. The 04D_WOOD drainage was excluded because it is wholly contained within the 04D_ETTG drainage.

BMP-specific overall adoption rates from the 2014 and 2015 surveys are compared in Table 21.

Table 21. Comparison of 2014 and 2015 Survey Results for Individual BMPs, Averaged Across all Drainage Areas

BMP	Management Category	Action Category	Description	Current Adoption Rate		Adoption Rate on Oct 2010		Change During Waiver Term		Planned Future Adoption	
				2014	2015	2014	2015	2014	2015	2014	2015
1	Irrigation & Salinity Management	Cropped Area Action	Sprinkler irrigation runoff is captured or kept on the property.	66%	66%	54%	53%	12%	12%	21%	22%
2	Irrigation & Salinity Management	Testing	At least every 5 years, the irrigation system is tested for distribution uniformity by monitoring water delivery or pressure differences within a block.	79%	80%	54%	52%	25%	29%	17%	12%
3	Irrigation & Salinity Management	Cropped Area Action	Regular maintenance is performed on the irrigation system to maintain distribution uniformity and prevent runoff caused by leaks or clogged lines.	100%	100%	82%	78%	18%	22%	0%	0%
4	Irrigation & Salinity Management	Cropped Area Action	Pressure regulators or pressure compensating emitters are used.	85%	88%	72%	66%	13%	21%	9%	9%
5	Irrigation & Salinity Management	Cropped Area Action	Sprinkler heads and drip emitters of the same flow rate are used within each block and replaced with the same heads or emitters, when necessary.	98%	100%	81%	79%	17%	21%	0%	0%
6	Irrigation & Salinity Management	Real Time Data/ Testing	Soil moisture is measured using any of the following: sensors, tensiometers, probes, irrigation monitoring service	66%	74%	56%	59%	10%	15%	17%	16%
7	Irrigation & Salinity Management	Real Time Data/ Testing	Flow meters are used to measure actual water use and are coupled with known crop use values or other measurements to match irrigation to plant needs.	67%	79%	58%	63%	10%	16%	15%	14%
8	Irrigation & Salinity Management	Testing	Irrigation water quality is tested for parameters of interest including: nitrate, pH, electrical conductivity (EC), sodium, chloride, bicarbonate, boron.	89%	96%	66%	67%	23%	29%	4%	1%
9	Irrigation & Salinity Management	Cropped Area Action	Water use for plant establishment has been reduced by adopting more efficient irrigation methods such as: early drip use, intermittent sprinklers, micro-sprinklers.	96%	94%	81%	77%	15%	16%	0%	1%

BMP	Management Category	Action Category	Description	Current Adoption Rate		Adoption Rate on Oct 2010		Change During Waiver Term		Planned Future Adoption	
				2014	2015	2014	2015	2014	2015	2014	2015
10	Irrigation & Salinity Management	Cropped Area Action	Irrigation decisions are made by trained personnel who understand appropriate irrigation management.	98%	100%	88%	87%	10%	13%	23%	24%
11	Irrigation & Salinity Management	Testing	Salt leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).	62%	72%	50%	59%	12%	13%	17%	11%
12	Nutrient Management	Testing	Soil or leaf/petiole tests are conducted to determine fertilization needs and the minimum amount necessary is applied based on the results.	87%	97%	74%	81%	13%	15%	0%	0%
13	Nutrient Management	Cropped Area Action	Fertilizer applications are split into multiple smaller applications to maximize plant uptake.	96%	99%	76%	77%	20%	22%	10%	10%
14	Nutrient Management	Testing	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.	71%	72%	60%	60%	11%	13%	0%	0%
15	Nutrient Management	Cropped Area Action	Fertilizer applications are timed to consider irrigation and potential rain events.	97%	100%	88%	92%	9%	8%	19%	18%
16	Nutrient Management	Cropped Area Action	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.	90%	95%	72%	76%	18%	19%	16%	15%
17	Nutrient Management	Specialized Knowledge	Fertilizer decisions are made by trained personnel who understand the 4R's of nutrient management: right fertilizer source, right rate, right time, right place	97%	100%	82%	84%	15%	16%	5%	1%
18	Nutrient Management	Uncropped Area Action	Fertilizers are stored where they are protected from rain and on an impermeable pad with a curb to contain spills.	86%	94%	78%	86%	8%	8%	0%	1%
19	Nutrient Management	Uncropped Area Action	Backflow prevention devices are installed and maintained.	90%	92%	82%	86%	8%	7%	2%	0%
20	Sediment Management	Cropped Area Action	Long runs of production area are broken up by access roads or buffer strips to reduce sediment movement.	93%	95%	84%	82%	9%	13%	14%	13%

BMP	Management Category	Action Category	Description	Current Adoption Rate		Adoption Rate on Oct 2010		Change During Waiver Term		Planned Future Adoption	
				2014	2015	2014	2015	2014	2015	2014	2015
21	Sediment Management	Cropped Area Action	In sloped production areas, one or more of the following management practices is used to minimize erosion: contour farming, contoured buffer strips, terracing.	81%	96%	68%	78%	13%	18%	7%	1%
22	Sediment Management	Cropped Area Action	Bare soil is minimized through use of cover crops, mulch, leaving plant debris, or planting subsequent crops, and the soil cover is replenished periodically to maintain effectiveness.	91%	93%	75%	80%	16%	13%	3%	0%
23	Sediment Management	Cropped Area Action	Soil amendments, such as polyacrylamide (PAM), are used to reduce sediment movement and retain water.	20%	29%	8%	21%	12%	8%	14%	16%
24	Sediment Management	Uncropped Area Action	Berms, culverts, or flow channels are in place to divert water away from roads. These devices or structures are maintained to preserve their functionality.	96%	98%	90%	91%	6%	7%	3%	0%
25	Sediment Management	Uncropped Area Action	Road erosion is minimized by use of any of the following: grading, gravel, grass, mulch, water bars, drains.	95%	98%	90%	88%	5%	11%	5%	0%
26	Sediment Management	Uncropped Area Action	Non-cropped areas with bare soil are protected from erosion with any of the following: vegetation, mulch, gravel, water diversion.	92%	93%	86%	84%	6%	9%	3%	0%
27	Sediment Management	Uncropped Area Action	Ditch banks are protected from erosion with vegetation, rock placement or geotextiles.	82%	79%	78%	71%	4%	8%	13%	5%
28	Sediment Management	Uncropped Area Action	One or more of the following is in place to treat runoff before it leaves the property: grassed waterways, vegetated filter strips, sediment traps. tailwater recycling systems.	62%	72%	44%	42%	18%	30%	4%	5%
29	Pesticide Management	Testing	Before application of pesticides, pest scouting is conducted using one or more of the following methods: yellow sticky traps, pheromone traps, plant inspection, beating, net sweeping.	98%	98%	94%	93%	4%	5%	2%	2%
30	Pesticide Management	Specialized Knowledge	Natural enemy populations are considered when choosing pesticides, application rates, and timing.	93%	99%	87%	92%	6%	6%	1%	0%

BMP	Management Category	Action Category	Description	Current Adoption Rate		Adoption Rate on Oct 2010		Change During Waiver Term		Planned Future Adoption	
				2014	2015	2014	2015	2014	2015	2014	2015
31	Pesticide Management	Cropped Area Action	Sprayers are routinely calibrated to ensure accurate application rates.	98%	99%	93%	93%	5%	6%	4%	3%
32	Pesticide Management	Cropped Area Action	Worn nozzles and screens are replaced to ensure the best coverage of pesticide applications.	99%	99%	93%	92%	6%	7%	12%	13%
33	Pesticide Management	Uncropped Area Action	Pesticides are stored and mixed on an impermeable pad and at least 100 feet down slope from water sources (such as wells).	87%	95%	79%	86%	8%	9%	0%	0%
34	Pesticide Management	Cropped Area Action	Pesticides are not applied when rain or scheduled irrigation events are anticipated.	99%	99%	94%	93%	5%	6%	1%	0%
35	Trash Management	Uncropped Area Action	The property is kept clean and free of trash.	100%	100%	96%	95%	3%	5%	2%	1%
36	Trash Management	Uncropped Area Action	The property has an adequate number of trash containers that are covered and emptied regularly.	98%	98%	86%	90%	12%	8%	12%	16%

[1] All percentages are based on applicable surveyed irrigated acreage.

Inspection of the BMP averages reveals survey responses were very similar in 2014 and 2015. In other words, farming practices and plans for future BMP adoption did not change much between 2014 and 2015. This implies that yearly BMP surveys may not be the optimal time frame to track meaningful changes in farming practices during the term of the Waiver.

The BMP-specific averages reported in Table 21 were ranked in a variety of ways to identify individual BMPs that are being prioritized by VCAILG members. Selected results from the BMP-specific evaluations are summarized below.

Use of BMPs Prior to the Current Waiver Term

BMPs included in the 2014-2015 surveys were in fairly wide use by survey respondents when the current Waiver was adopted in October 2010. According to survey respondents in 2015, only 2 of the 36 BMPs were in use on less than 50% of applicable acreage in October 2010[2] and 25 of the BMPs were in use on ≥ 75% of applicable acreage by 2010. Regardless, adoption rates increased during the Waiver term for most of these "early adopted" BMPs, resulting in current adoption rates ranging 93-100% for these BMPs.

Half of the BMPs most widely in use prior to the current Waiver term address Pesticide Management. As a group, BMPs addressing Irrigation and Salinity Management were the least widely in use at the beginning of the Waiver term. Sediment Management BMPs were among the most- and least-widely used BMPs at the beginning of the current Waiver term. The ten top-ranked BMPs based on their adoption rates by October 2010 (as reported in 2015) are listed in Table 22.

Table 22. Top-Ranked BMPs Based on Adoption Rate Prior to the Waiver Term

BMP	Pollutant Category	Action Category	Adoption Rate on Oct 2010	Description
35	Trash Management	Uncropped Area Action	95%	The property is kept clean and free of trash.
34	Pesticide Management	Cropped Area Action	93%	Pesticides are not applied when rain or scheduled irrigation events are anticipated.
31	Pesticide Management	Cropped Area Action	93%	Sprayers are routinely calibrated to ensure accurate application rates.
29	Pesticide Management	Testing	93%	Before application of pesticides, pest scouting is conducted using one or more of the following methods: yellow sticky traps, pheromone traps, plant inspection, beating, net sweeping.
30	Pesticide Management	Specialized Knowledge	92%	Natural enemy populations are considered when choosing pesticides, application rates, and timing.
32	Pesticide Management	Cropped Area Action	92%	Worn nozzles and screens are replaced to ensure the best coverage of pesticide applications.
15	Nutrient Management	Cropped Area Action	92%	Fertilizer applications are timed to consider irrigation and potential rain events.
24	Sediment Management	Uncropped Area Action	91%	Berms, culverts, or flow channels are in place to divert water away from roads. These devices or structures are maintained to preserve their functionality.

[2] Pre-Waiver adoption rate was 42% for BMP #28 and 21% for BMP #23.

BMP	Pollutant Category	Action Category	Adoption Rate on Oct 2010	Description
36	Trash Management	Uncropped Area Action	90%	The property has an adequate number of trash containers that are covered and emptied regularly.
25	Sediment Management	Uncropped Area Action	88%	Road erosion is minimized by use of any of the following: grading, gravel, grass, mulch, water bars, drains.

Current Adoption Rates

Most of the individual BMPs are reported to be in very widespread use on applicable acreage when drainages are aggregated. Current adoption rates are ≥ 90% for 26 of the 36 BMPs. The eleven top-ranked BMPs based on current adoption rates are listed in Table 23, although many other BMPs not listed in **Table 23** have current adoption rates well above 90%.

Table 23. Top-Ranked BMPs Based on Current Adoption Rates from 2015 Survey

BMP	Management Category	Action Category	Current Adoption Rate	Description
35	Trash Management	Uncropped Area Action	100%	The property is kept clean and free of trash.
10	Irrigation & Salinity Management	Cropped Area Action	100%	Irrigation decisions are made by trained personnel who understand appropriate irrigation management.
3	Irrigation & Salinity Management	Cropped Area Action	100%	Regular maintenance is performed on the irrigation system to maintain distribution uniformity and prevent runoff caused by leaks or clogged lines.
17	Nutrient Management	Specialized Knowledge	100%	Fertilizer decisions are made by trained personnel who understand the 4R's of nutrient management: right fertilizer source, right rate, right time, right place
5	Irrigation & Salinity Management	Cropped Area Action	100%	Sprinkler heads and drip emitters of the same flow rate are used within each block and replaced with the same heads or emitters, when necessary.
15	Nutrient Management	Cropped Area Action	100%	Fertilizer applications are timed to consider irrigation and potential rain events.
34	Pesticide Management	Cropped Area Action	99%	Pesticides are not applied when rain or scheduled irrigation events are anticipated.
32	Pesticide Management	Cropped Area Action	99%	Worn nozzles and screens are replaced to ensure the best coverage of pesticide applications.
30	Pesticide Management	Specialized Knowledge	99%	Natural enemy populations are considered when choosing pesticides, application rates, and timing.
31	Pesticide Management	Cropped Area Action	99%	Sprayers are routinely calibrated to ensure accurate application rates.
13	Nutrient Management	Cropped Area Action	99%	Fertilizer applications are split into multiple smaller applications to maximize plant uptake.

Increase in Use During the Current Waiver Term

The ten top-ranked BMPs based on percent increase in use during the current Waiver term are listed in Table 24. The majority of these BMPs address irrigation and salinity

management. However, one sediment management BMP (BMP #28) had the highest rate of increase in adoption during the Waiver term when drainages were pooled (30% increase between 2010-2015).

Table 24. Top-Ranked BMPs Based on Percent Change in Adoption Rate during the Waiver Term (2010-2015)

BMP	Management Category	Action Category	Current Adoption Rate (as of 2015)	Percent Increase in Use During Waiver Term (2010-2015)	Description
28	Sediment Management	Uncropped Area Action	72%	30%	One or more of the following is in place to treat runoff before it leaves the property: grassed waterways, vegetated filter strips, sediment traps. tailwater recycling systems
8	Irrigation & Salinity Management	Testing	96%	29%	Irrigation water quality is tested for parameters of interest including: nitrate, pH, electrical conductivity (EC), sodium, chloride, bicarbonate, boron.
2	Irrigation & Salinity Management	Testing	80%	29%	At least every 5 years, the irrigation system is tested for distribution uniformity by monitoring water delivery or pressure differences within a block.
3	Irrigation & Salinity Management	Cropped Area Action	100%	22%	Regular maintenance is performed on the irrigation system to maintain distribution uniformity and prevent runoff caused by leaks or clogged lines.
13	Nutrient Management	Cropped Area Action	99%	22%	Fertilizer applications are split into multiple smaller applications to maximize plant uptake.
4	Irrigation & Salinity Management	Cropped Area Action	88%	21%	Pressure regulators or pressure compensating emitters are used.
5	Irrigation & Salinity Management	Cropped Area Action	100%	21%	Sprinkler heads and drip emitters of the same flow rate are used within each block and replaced with the same heads or emitters, when necessary.
16	Nutrient Management	Cropped Area Action	95%	19%	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.
21	Sediment Management	Cropped Area Action	96%	18%	In sloped production areas, one or more of the following management practices is used to minimize erosion: contour farming, contoured buffer strips, terracing.
9	Irrigation & Salinity Management	Cropped Area Action	94%	16%	Water use for plant establishment has been reduced by adopting more efficient irrigation methods such as: early drip use, intermittent sprinklers, micro-sprinklers.

Reported Plans for Future BMP Adoption

The ten BMPs with the highest planned future adoption rates are listed in descending order in Table 25, together with their associated current adoption rates. Principal observations from this view of the survey results are as follows:

- None of the top-ranked BMPs for future adoption involve Pesticide Management. This is probably due to the current high adoption rates for pesticide management BMPs. Current adoption rates for Pesticide Management BMPs range 96%-98%.
- Half of the top-ranked BMPs for future adoption involve Testing or use of Real Time Data.
- Half of the top-ranked BMPs for future adoption address Irrigation & Salinity Management.
- Only one of the top-ranked BMPs for future adoption (BMP #23, involving amendments to reduce sediment movement and retain water) is currently poorly utilized (29% overall current average adoption rate).
- Plans to adopt these particular BMPs in the future did not change much from 2014-2015. The largest discrepancy between survey years was for BMP #28. In 2015, survey respondents reported that BMP #28 was planned for a smaller future percent of applicable acreage (13%) than was reported in 2014 (20%). The discrepancy may reflect adoption of the BMP between survey years rather than a change in plans for future action; adoption of BMP #28 increased from 62% to 72% from 2014-2015.

Table 25. Top-Ranked BMPs Identified As Planned for Future Implementation

BMP	Management Category	Action Category	Planned Future Adoption		Current Adoption Rate (2015)	Description
			Reported in 2014	Reported in 2015		
1	Irrigation & Salinity Management	Cropped Area Action	23%	24%	66%	Sprinkler irrigation runoff is captured or kept on the property.
6	Irrigation & Salinity Management	Real Time Data/Testing	19%	18%	74%	Soil moisture is measured using any of the following: sensors, tensiometers, probes, irrigation monitoring service
27	Sediment Management	Uncropped Area Action	12%	16%	79%	Ditch banks are protected from erosion with vegetation, rock placement or geotextiles.
14	Nutrient Management	Testing	14%	16%	72%	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.

BMP	Management Category	Action Category	Planned Future Adoption		Current Adoption Rate (2015)	Description
			Reported in 2014	Reported in 2015		
7	Irrigation & Salinity Management	Real Time Data/Testing	16%	15%	79%	Flow meters are used to measure actual water use and are coupled with known crop use values or other measurements to match irrigation to plant needs.
11	Irrigation & Salinity Management	Testing	14%	13%	72%	Salt leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).
28	Sediment Management	Uncropped Area Action	20%	13%	72%	One or more of the following is in place to treat runoff before it leaves the property: grassed waterways, vegetated filter strips, sediment traps. tailwater recycling systems.
23	Sediment Management	Cropped Area Action	12%	13%	29%	Soil amendments, such as polyacrylamide (PAM), are used to reduce sediment movement and retain water.
2	Irrigation & Salinity Management	Testing	17%	11%	80%	At least every 5 years, the irrigation system is tested for distribution uniformity by monitoring water delivery or pressure differences within a block.
4	Irrigation & Salinity Management	Cropped Area Action	10%	10%	88%	Pressure regulators or pressure compensating emitters are used.

Results by BMP Category

Averages of survey metrics for BMP categories are listed by drainage using the Management and Action Categories in Table 26 and Table 27, respectively. Results for individual drainages are reasonably consistent between years. Larger discrepancies between 2014 and 2015 survey metrics for individual drainages are difficult to interpret because the average applicable acreage addressed by surveys for each category and drainage was not the same for both survey years. In other words, a difference in survey metrics between survey years could reflect static practices reported for different subsets of irrigated acreage a particular drainage, changes in farming practices between years in the drainage, or a blend of both phenomena.

Very high current adoption rates are reported across all drainages for the Trash and Pesticide Management BMPs categories (most are between 97%-100%). Except in one drainage (06T_LONG2), there was little change in adoption of Trash or Pesticide BMPs during the current Waiver term (in 06T_LONG2 respondents reported ~30% increase in use of these BMPs during the Waiver term). Most of the increase in BMP use during the Waiver term appears to have occurred for BMPs addressing irrigation and salinity,

nutrients, or sediment. The largest increases in adoption of irrigation and salinity management BMPs during the Waiver term were reported by respondents farming in the S03D_BARDS, OXD_CENTR, 06T_LONG, and 05D_SANT_VCWPD drainages. Survey respondents farming in the 06T_LONG2 drainage reported the highest rates of BMP adoption during the Waiver term across all BMP categories.

Some differences in BMP adoption emerge from the category evaluation which may be helpful for planning of education and outreach. For example, Real Time Data BMPs are currently in lower use in the 05D_SANT_VCWPD and 02D_BROOM drainages than in most of the other drainages. However, survey respondents farming in these two drainages also indicate higher rates of planned future use of Real Time Data BMPs than those farming in other drainages. Specialized Knowledge BMPs are in widespread use in every drainage (current average adoption rates range 97%-100%), suggesting that increased outreach and education regarding the two BMPs in this category may not be a high priority. Survey respondents farming in the drainages of VRT_SANTO, SO4_TAPO, and SO3_BOULD, and 07D_HITCH_LEVEE_2 report the highest rate of planned future use of Testing BMPs.

Table 26. Comparison of 2014 and 2015 Survey Metrics per Drainage based on Management Categories

Drainage	Survey Year	Irrigation and Salinity Management		Nutrient Management		Sediment Management		Pesticide Management		Trash Management	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Area Not Draining to a VCAILG Monitoring Site	Applicable Irrigated Acreage	39,990	36,292	40,648	36,790	36,237	33,808	39,692	36,096	41,828	37,199
	Current Adoption Rate	82%	86%	92%	94%	79%	82%	97%	98%	98%	99%
	Adoption Rate on October 2010	65%	69%	77%	81%	66%	71%	87%	89%	85%	90%
	Change During Waiver Term	17%	17%	15%	13%	13%	11%	10%	9%	13%	9%
	Planned Future Adoption	8%	7%	3%	3%	7%	6%	1%	1%	1%	0%
VRT_THACH	Applicable Irrigated Acreage	661	253	627	248	579	187	295	179	671	257
	Current Adoption Rate	73%	68%	86%	95%	64%	77%	96%	94%	100%	99%
	Adoption Rate on October 2010	70%	64%	84%	91%	57%	65%	96%	93%	100%	99%
	Change During Waiver Term	2%	4%	3%	3%	7%	12%	0%	1%	0%	0%
	Planned Future Adoption	14%	9%	7%	0%	3%	1%	0%	0%	0%	1%
VRT_SANTO	Applicable Irrigated Acreage	438	386	446	399	395	342	456	360	459	403
	Current Adoption Rate	74%	73%	85%	87%	78%	82%	91%	90%	97%	99%
	Adoption Rate on October 2010	71%	70%	84%	86%	76%	81%	90%	90%	96%	95%
	Change During Waiver Term	3%	3%	2%	1%	3%	2%	1%	0%	2%	4%
	Planned Future Adoption	8%	10%	3%	2%	5%	2%	0%	0%	1%	1%
S04T_TAPO	Applicable Irrigated Acreage	320	321	321	321	321	319	321	321	321	321
	Current Adoption Rate	64%	64%	88%	88%	77%	77%	99%	100%	100%	100%
	Adoption Rate on October 2010	29%	29%	52%	52%	44%	45%	99%	100%	100%	100%
	Change During Waiver Term	35%	35%	36%	36%	33%	33%	0%	0%	0%	0%
	Planned Future Adoption	36%	35%	12%	12%	12%	11%	1%	0%	0%	0%

Drainage	Survey Year	Irrigation and Salinity Management		Nutrient Management		Sediment Management		Pesticide Management		Trash Management	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
S03T_TIMB	Applicable Irrigated Acreage	308	401	311	404	286	383	298	389	322	412
	Current Adoption Rate	64%	81%	81%	86%	61%	68%	94%	96%	100%	100%
	Adoption Rate on October 2010	53%	56%	66%	75%	56%	64%	92%	95%	97%	98%
	Change During Waiver Term	11%	24%	15%	11%	5%	4%	2%	2%	3%	2%
	Planned Future Adoption	23%	9%	6%	5%	1%	1%	1%	2%	0%	0%
S03T_BOULD	Applicable Irrigated Acreage	692	646	764	721	635	603	763	721	764	721
	Current Adoption Rate	90%	89%	90%	90%	88%	89%	100%	100%	100%	100%
	Adoption Rate on October 2010	68%	66%	75%	74%	79%	79%	87%	86%	80%	79%
	Change During Waiver Term	22%	24%	15%	17%	9%	10%	13%	14%	20%	21%
	Planned Future Adoption	8%	9%	10%	10%	6%	5%	0%	0%	0%	0%
S03D_BARDS	Applicable Irrigated Acreage	473	622	455	607	413	525	434	588	464	608
	Current Adoption Rate	68%	86%	82%	86%	50%	72%	98%	99%	100%	100%
	Adoption Rate on October 2010	53%	36%	75%	54%	47%	31%	93%	68%	93%	67%
	Change During Waiver Term	15%	50%	7%	32%	3%	40%	4%	32%	7%	33%
	Planned Future Adoption	3%	7%	1%	6%	2%	1%	2%	0%	0%	0%
S02T_TODD	Applicable Irrigated Acreage	450	404	474	428	411	373	476	435	481	420
	Current Adoption Rate	96%	97%	99%	99%	84%	84%	98%	99%	100%	100%
	Adoption Rate on October 2010	72%	85%	79%	91%	65%	75%	81%	95%	84%	100%
	Change During Waiver Term	24%	12%	20%	9%	19%	9%	17%	4%	16%	0%
	Planned Future Adoption	2%	2%	0%	0%	6%	6%	2%	0%	0%	0%
S02T_ELLS	Applicable Irrigated Acreage	775	595	822	643	768	640	836	633	836	646
	Current Adoption Rate	93%	96%	98%	100%	92%	95%	98%	100%	100%	100%
	Adoption Rate on October 2010	74%	84%	78%	88%	81%	82%	79%	88%	81%	88%
	Change During Waiver Term	19%	12%	21%	12%	11%	13%	18%	12%	19%	12%
	Planned Future Adoption	3%	0%	1%	0%	6%	4%	2%	0%	0%	0%

Drainage	Survey Year	Irrigation and Salinity Management		Nutrient Management		Sediment Management		Pesticide Management		Trash Management	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
S01D_MONAR	Applicable Irrigated Acreage	165	166	182	182	141	142	182	182	182	182
	Current Adoption Rate	100%	100%	100%	100%	86%	86%	100%	100%	100%	100%
	Adoption Rate on October 2010	100%	100%	100%	100%	71%	71%	100%	100%	100%	100%
	Change During Waiver Term	0%	0%	0%	0%	14%	14%	0%	0%	0%	0%
	Planned Future Adoption	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
OXD_CENTR	Applicable Irrigated Acreage	745	806	774	833	651	700	779	833	779	833
	Current Adoption Rate	88%	92%	59%	97%	77%	77%	99%	100%	95%	100%
	Adoption Rate on October 2010	88%	54%	57%	76%	72%	71%	99%	99%	95%	93%
	Change During Waiver Term	0%	38%	1%	21%	5%	6%	1%	1%	0%	7%
	Planned Future Adoption	1%	7%	40%	0%	8%	9%	1%	0%	5%	0%
9BD_GERRY	Applicable Irrigated Acreage	217	194	211	194	203	189	223	194	223	194
	Current Adoption Rate	90%	99%	93%	100%	87%	89%	99%	98%	100%	100%
	Adoption Rate on October 2010	85%	96%	84%	95%	86%	88%	87%	97%	96%	95%
	Change During Waiver Term	5%	3%	10%	5%	1%	1%	11%	2%	4%	5%
	Planned Future Adoption	3%	0%	0%	0%	2%	3%	1%	1%	0%	0%
07D_HITCH_LEVEE_2	Applicable Irrigated Acreage	15	47	15	51	14	41	15	51	15	51
	Current Adoption Rate	82%	89%	75%	85%	75%	85%	67%	97%	100%	100%
	Adoption Rate on October 2010	82%	89%	75%	85%	75%	85%	67%	97%	100%	100%
	Change During Waiver Term	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Planned Future Adoption	9%	2%	25%	15%	25%	15%	33%	3%	0%	0%
06T_LONG2	Applicable Irrigated Acreage	823	616	847	622	748	583	841	621	882	631
	Current Adoption Rate	88%	95%	93%	97%	81%	81%	91%	97%	99%	100%
	Adoption Rate on October 2010	54%	55%	53%	56%	54%	48%	65%	64%	71%	68%
	Change During Waiver Term	34%	40%	39%	41%	27%	33%	27%	33%	28%	32%
	Planned Future Adoption	3%	1%	2%	1%	5%	9%	2%	1%	0%	0%

Drainage	Survey Year	Irrigation and Salinity Management		Nutrient Management		Sediment Management		Pesticide Management		Trash Management	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
06T_FC_BR	Applicable Irrigated Acreage	748	196	740	185	675	188	748	201	757	201
	Current Adoption Rate	89%	90%	98%	94%	85%	85%	99%	99%	98%	91%
	Adoption Rate on October 2010	86%	75%	98%	92%	85%	85%	99%	96%	98%	91%
	Change During Waiver Term	3%	15%	0%	2%	0%	0%	0%	3%	0%	0%
	Planned Future Adoption	2%	7%	0%	0%	0%	5%	1%	0%	0%	0%
05T_HONDO	Applicable Irrigated Acreage	389	795	390	832	381	777	365	827	405	847
	Current Adoption Rate	90%	92%	99%	98%	89%	94%	100%	100%	99%	100%
	Adoption Rate on October 2010	78%	84%	96%	97%	80%	90%	99%	100%	98%	100%
	Change During Waiver Term	12%	9%	4%	1%	10%	4%	0%	0%	1%	0%
	Planned Future Adoption	5%	2%	0%	0%	1%	2%	0%	0%	0%	0%
05D_SANT_VCWPD	Applicable Irrigated Acreage	465	727	479	760	481	690	479	760	481	760
	Current Adoption Rate	79%	77%	91%	93%	89%	88%	100%	100%	100%	100%
	Adoption Rate on October 2010	32%	41%	65%	75%	84%	80%	93%	91%	100%	95%
	Change During Waiver Term	47%	36%	26%	17%	5%	8%	7%	9%	0%	5%
	Planned Future Adoption	21%	21%	9%	7%	5%	8%	0%	0%	0%	0%
05D_LAVD	Applicable Irrigated Acreage	218	226	212	226	205	230	218	234	219	236
	Current Adoption Rate	82%	100%	89%	98%	83%	92%	91%	99%	100%	100%
	Adoption Rate on October 2010	71%	83%	77%	81%	67%	60%	91%	97%	100%	100%
	Change During Waiver Term	11%	17%	12%	17%	15%	32%	0%	2%	0%	0%
	Planned Future Adoption	12%	0%	4%	0%	5%	0%	7%	0%	0%	0%
04D_WOOD	Applicable Irrigated Acreage	363	247	359	247	317	222	361	247	364	247
	Current Adoption Rate	87%	80%	94%	96%	75%	77%	100%	100%	100%	100%
	Adoption Rate on October 2010	76%	67%	82%	83%	64%	62%	95%	96%	100%	100%
	Change During Waiver Term	11%	13%	12%	13%	11%	15%	5%	4%	0%	0%
	Planned Future Adoption	5%	7%	3%	0%	13%	16%	0%	0%	0%	0%

Drainage	Survey Year	Irrigation and Salinity Management		Nutrient Management		Sediment Management		Pesticide Management		Trash Management	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
04D_LAS	Applicable Irrigated Acreage	918	747	912	730	814	728	918	736	971	790
	Current Adoption Rate	83%	86%	97%	95%	89%	93%	100%	100%	100%	100%
	Adoption Rate on October 2010	80%	72%	94%	86%	74%	81%	100%	100%	100%	100%
	Change During Waiver Term	3%	14%	4%	8%	15%	12%	0%	0%	0%	0%
	Planned Future Adoption	11%	10%	2%	4%	9%	3%	0%	0%	0%	0%
04D_ETTG	Applicable Irrigated Acreage	2,014	1,328	2,004	1,320	1,748	1,183	2,032	1,332	2,078	1,346
	Current Adoption Rate	89%	85%	96%	95%	77%	79%	99%	98%	97%	95%
	Adoption Rate on October 2010	77%	68%	84%	81%	70%	68%	95%	90%	94%	90%
	Change During Waiver Term	12%	18%	12%	15%	6%	11%	4%	8%	3%	4%
	Planned Future Adoption	5%	6%	2%	1%	9%	11%	1%	1%	2%	4%
02D_BROOM	Applicable Irrigated Acreage	1,895	890	1,845	892	1,717	849	1,872	859	1,940	935
	Current Adoption Rate	78%	70%	89%	89%	86%	85%	100%	100%	100%	100%
	Adoption Rate on October 2010	52%	49%	77%	71%	75%	65%	100%	100%	100%	100%
	Change During Waiver Term	27%	21%	12%	18%	11%	19%	0%	0%	0%	0%
	Planned Future Adoption	13%	21%	3%	7%	2%	5%	0%	0%	0%	0%
01T_ODD3_ARN	Applicable Irrigated Acreage	0	630	0	630	0	622	0	630	79	630
	Current Adoption Rate	N/A	90%	N/A	98%	N/A	82%	N/A	98%	100%	100%
	Adoption Rate on October 2010	N/A	77%	N/A	91%	N/A	69%	N/A	90%	50%	94%
	Change During Waiver Term	N/A	12%	N/A	8%	N/A	12%	N/A	8%	50%	6%
	Planned Future Adoption	N/A	10%	N/A	2%	N/A	6%	N/A	0%	0%	0%
01T_ODD2_DCH	Applicable Irrigated Acreage	819	1,145	819	1,145	737	1,067	819	1,145	819	1,145
	Current Adoption Rate	89%	90%	93%	95%	69%	83%	97%	97%	91%	94%
	Adoption Rate on October 2010	76%	77%	82%	85%	61%	71%	89%	90%	91%	91%
	Change During Waiver Term	12%	13%	12%	10%	8%	12%	8%	7%	0%	3%
	Planned Future Adoption	10%	9%	7%	3%	11%	7%	3%	2%	9%	6%

Table 27. Comparison of 2014 and 2015 Survey Metrics per Drainage based on Action Categories

Drainage	Survey Metric	Cropped Area Actions		Uncropped Area Actions		Testing		Use of Real Time Data		Use of Specialized Knowledge	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Area Not Draining to a VCAILG Monitoring Site	Applicable Irrigated Acreage	38,504	35,330	39,474	35,964	39,849	35,974	41,115	37,380	40,441	36,627
	Current Adoption Rate	90%	91%	88%	90%	80%	85%	76%	80%	98%	99%
	Adoption Rate on October 2010	75%	77%	76%	80%	67%	71%	55%	61%	83%	87%
	Change During Waiver Term	15%	13%	12%	11%	14%	14%	21%	19%	15%	11%
	Planned Future Adoption	2%	3%	6%	4%	9%	7%	11%	10%	1%	1%
VRT_THACH	Applicable Irrigated Acreage	577	226	578	210	544	227	666	260	502	223
	Current Adoption Rate	82%	88%	85%	91%	64%	59%	65%	52%	94%	93%
	Adoption Rate on October 2010	77%	84%	84%	82%	60%	54%	62%	50%	92%	89%
	Change During Waiver Term	5%	3%	1%	8%	5%	5%	3%	2%	2%	4%
	Planned Future Adoption	4%	2%	1%	1%	14%	9%	11%	12%	2%	0%
VRT_SANTO	Applicable Irrigated Acreage	428	363	435	378	429	379	453	401	459	407
	Current Adoption Rate	84%	86%	91%	92%	56%	57%	63%	67%	98%	100%
	Adoption Rate on October 2010	83%	86%	88%	90%	52%	53%	61%	63%	94%	100%
	Change During Waiver Term	1%	1%	3%	2%	4%	4%	2%	4%	4%	0%
	Planned Future Adoption	3%	1%	3%	2%	12%	17%	9%	5%	2%	0%
S04T_TAPO	Applicable Irrigated Acreage	321	320	321	321	321	321	315	321	321	321
	Current Adoption Rate	92%	81%	89%	90%	84%	84%	2%	3%	100%	100%
	Adoption Rate on October 2010	55%	45%	79%	80%	36%	35%	2%	3%	100%	100%
	Change During Waiver Term	37%	37%	10%	10%	48%	48%	0%	0%	0%	0%
	Planned Future Adoption	0%	12%	11%	10%	16%	16%	98%	97%	0%	0%
S03T_TIMB	Applicable Irrigated Acreage	308	400	281	378	309	402	322	412	322	412
	Current Adoption Rate	75%	85%	83%	83%	63%	79%	20%	51%	97%	97%
	Adoption Rate on October 2010	64%	72%	82%	83%	51%	55%	17%	42%	72%	78%
	Change During Waiver Term	10%	13%	1%	0%	12%	24%	3%	9%	24%	19%
	Planned Future Adoption	3%	0%	6%	6%	14%	5%	48%	35%	0%	0%

Drainage	Survey Metric	Cropped Area Actions		Uncropped Area Actions		Testing		Use of Real Time Data		Use of Specialized Knowledge	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
S03T_BOULD	Applicable Irrigated Acreage	675	639	727	684	735	687	764	721	764	721
	Current Adoption Rate	92%	95%	95%	94%	77%	74%	97%	100%	100%	100%
	Adoption Rate on October 2010	77%	77%	83%	82%	60%	57%	65%	65%	89%	88%
	Change During Waiver Term	15%	18%	12%	13%	16%	17%	32%	35%	11%	12%
	Planned Future Adoption	4%	3%	4%	5%	21%	22%	2%	0%	0%	0%
S03D_BARDS	Applicable Irrigated Acreage	447	573	432	584	454	610	481	631	460	613
	Current Adoption Rate	82%	90%	65%	80%	69%	84%	32%	67%	100%	100%
	Adoption Rate on October 2010	74%	54%	62%	41%	54%	37%	19%	11%	87%	67%
	Change During Waiver Term	8%	36%	3%	38%	15%	47%	13%	56%	13%	32%
	Planned Future Adoption	0%	0%	4%	5%	3%	4%	6%	26%	0%	0%
S02T_TODD	Applicable Irrigated Acreage	446	402	469	426	420	373	481	435	481	435
	Current Adoption Rate	92%	92%	95%	95%	96%	97%	97%	100%	95%	100%
	Adoption Rate on October 2010	74%	87%	74%	85%	66%	81%	77%	89%	79%	95%
	Change During Waiver Term	18%	5%	21%	10%	30%	16%	20%	11%	16%	5%
	Planned Future Adoption	3%	3%	2%	2%	2%	2%	0%	0%	5%	0%
S02T_ELLS	Applicable Irrigated Acreage	809	636	808	644	732	571	812	613	835	646
	Current Adoption Rate	96%	98%	96%	98%	88%	93%	93%	97%	100%	100%
	Adoption Rate on October 2010	80%	87%	80%	85%	69%	78%	73%	90%	78%	88%
	Change During Waiver Term	16%	12%	16%	13%	20%	15%	20%	8%	22%	12%
	Planned Future Adoption	2%	1%	4%	2%	7%	0%	0%	1%	0%	0%
S01D_MONAR	Applicable Irrigated Acreage	159	159	182	182	152	152	182	182	182	182
	Current Adoption Rate	91%	93%	100%	100%	100%	100%	100%	100%	100%	100%
	Adoption Rate on October 2010	91%	93%	90%	90%	100%	100%	100%	100%	100%	100%
	Change During Waiver Term	0%	0%	10%	10%	0%	0%	0%	0%	0%	0%
	Planned Future Adoption	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Drainage	Survey Metric	Cropped Area Actions		Uncropped Area Actions		Testing		Use of Real Time Data		Use of Specialized Knowledge	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
OXD_CENTR	Applicable Irrigated Acreage	708	760	773	830	723	783	760	833	779	833
	Current Adoption Rate	78%	88%	91%	91%	79%	96%	66%	91%	73%	100%
	Adoption Rate on October 2010	77%	67%	87%	85%	79%	79%	66%	37%	72%	72%
	Change During Waiver Term	1%	21%	4%	6%	0%	18%	0%	54%	2%	28%
	Planned Future Adoption	13%	5%	8%	7%	19%	1%	4%	5%	27%	0%
9BD_GERRY	Applicable Irrigated Acreage	214	191	205	193	214	194	231	194	231	194
	Current Adoption Rate	92%	95%	97%	97%	83%	98%	77%	100%	100%	100%
	Adoption Rate on October 2010	85%	92%	94%	96%	81%	97%	74%	95%	74%	91%
	Change During Waiver Term	8%	4%	3%	1%	1%	2%	4%	5%	26%	9%
	Planned Future Adoption	0%	0%	3%	3%	6%	0%	0%	0%	0%	0%
07D_HITCH_LEVEE_2	Applicable Irrigated Acreage	14	45	15	47	15	51	15	51	15	51
	Current Adoption Rate	92%	92%	70%	86%	83%	83%	50%	91%	50%	100%
	Adoption Rate on October 2010	92%	92%	70%	86%	83%	83%	50%	91%	50%	100%
	Change During Waiver Term	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Planned Future Adoption	8%	2%	30%	14%	17%	17%	0%	0%	50%	0%
06T_LONG2	Applicable Irrigated Acreage	809	610	801	603	823	613	881	633	850	628
	Current Adoption Rate	88%	93%	90%	91%	82%	94%	77%	91%	92%	97%
	Adoption Rate on October 2010	56%	57%	62%	57%	51%	53%	46%	59%	45%	50%
	Change During Waiver Term	33%	36%	28%	34%	31%	40%	31%	32%	46%	47%
	Planned Future Adoption	2%	2%	3%	6%	5%	2%	3%	1%	1%	0%
06T_FC_BR	Applicable Irrigated Acreage	709	195	743	194	737	180	757	201	757	201
	Current Adoption Rate	90%	91%	98%	93%	81%	85%	94%	85%	100%	100%
	Adoption Rate on October 2010	89%	89%	98%	91%	78%	65%	94%	76%	100%	100%
	Change During Waiver Term	0%	3%	0%	2%	4%	21%	0%	9%	0%	0%
	Planned Future Adoption	0%	4%	0%	0%	2%	8%	1%	6%	0%	0%
05T_HONDO	Applicable Irrigated Acreage	383	774	385	838	377	821	405	845	395	837

Drainage	Survey Metric	Cropped Area Actions		Uncropped Area Actions		Testing		Use of Real Time Data		Use of Specialized Knowledge	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
	Current Adoption Rate	94%	98%	97%	97%	88%	85%	82%	97%	100%	100%
	Adoption Rate on October 2010	87%	93%	95%	96%	74%	78%	81%	87%	98%	100%
	Change During Waiver Term	7%	4%	3%	1%	14%	7%	1%	10%	2%	0%
	Planned Future Adoption	0%	1%	1%	0%	5%	4%	12%	0%	0%	0%
05D_SANT_VC WPD	Applicable Irrigated Acreage	470	718	480	728	479	760	481	760	481	760
	Current Adoption Rate	95%	94%	89%	89%	87%	88%	45%	37%	100%	100%
	Adoption Rate on October 2010	78%	71%	76%	76%	52%	65%	24%	20%	90%	95%
	Change During Waiver Term	18%	23%	13%	13%	35%	22%	21%	17%	10%	5%
	Planned Future Adoption	0%	5%	11%	11%	13%	9%	55%	63%	0%	0%
05D_LAVD	Applicable Irrigated Acreage	216	227	206	228	215	232	219	236	219	236
	Current Adoption Rate	93%	96%	82%	96%	81%	100%	62%	100%	100%	100%
	Adoption Rate on October 2010	82%	83%	74%	78%	70%	80%	56%	74%	94%	77%
	Change During Waiver Term	11%	14%	8%	18%	11%	20%	6%	26%	6%	23%
	Planned Future Adoption	2%	0%	10%	0%	9%	0%	23%	0%	0%	0%
04D_WOOD	Applicable Irrigated Acreage	342	233	352	247	361	247	364	247	364	247
	Current Adoption Rate	89%	83%	86%	93%	94%	92%	75%	63%	100%	100%
	Adoption Rate on October 2010	82%	75%	76%	77%	86%	84%	62%	51%	83%	79%
	Change During Waiver Term	8%	9%	11%	16%	8%	8%	13%	13%	17%	21%
	Planned Future Adoption	3%	5%	11%	7%	6%	8%	2%	3%	0%	0%
04D_LAS	Applicable Irrigated Acreage	871	731	895	734	912	750	971	790	929	748
	Current Adoption Rate	98%	92%	91%	98%	95%	91%	79%	72%	100%	100%
	Adoption Rate on October 2010	86%	78%	90%	95%	90%	80%	79%	63%	100%	100%
	Change During Waiver Term	12%	13%	1%	3%	5%	11%	0%	10%	0%	0%
	Planned Future Adoption	0%	4%	8%	2%	2%	5%	17%	23%	0%	0%
04D_ETTG	Applicable Irrigated Acreage	1,891	1,259	1,976	1,306	1,990	1,319	2,077	1,346	2,078	1,346
	Current Adoption Rate	90%	87%	88%	89%	93%	90%	86%	80%	100%	99%

Drainage	Survey Metric	Cropped Area Actions		Uncropped Area Actions		Testing		Use of Real Time Data		Use of Specialized Knowledge	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
	Adoption Rate on October 2010	81%	75%	82%	78%	86%	77%	65%	56%	89%	84%
	Change During Waiver Term	10%	12%	5%	11%	7%	13%	20%	24%	11%	15%
	Planned Future Adoption	2%	5%	8%	7%	6%	7%	4%	7%	0%	0%
02D_BROOM	Applicable Irrigated Acreage	1,826	874	1,844	873	1,838	906	1,940	935	1,799	794
	Current Adoption Rate	90%	83%	92%	95%	84%	80%	53%	38%	100%	100%
	Adoption Rate on October 2010	75%	63%	90%	89%	55%	57%	53%	36%	100%	100%
	Change During Waiver Term	16%	21%	2%	7%	29%	24%	0%	2%	0%	0%
	Planned Future Adoption	0%	9%	2%	5%	8%	10%	39%	47%	0%	0%
01T_ODD3_ARN	Applicable Irrigated Acreage	0	626	16	630	0	630	0	630	0	630
	Current Adoption Rate	N/A	87%	100%	96%	N/A	94%	N/A	94%	N/A	100%
	Adoption Rate on October 2010	N/A	75%	50%	83%	N/A	90%	N/A	94%	N/A	88%
	Change During Waiver Term	N/A	12%	50%	14%	N/A	4%	N/A	0%	N/A	12%
	Planned Future Adoption	N/A	8%	0%	1%	N/A	4%	N/A	6%	N/A	0%
01T_ODD2_DCH	Applicable Irrigated Acreage	773	1,101	819	1,145	819	1,145	819	1,145	819	1,145
	Current Adoption Rate	84%	90%	87%	91%	88%	91%	81%	87%	100%	100%
	Adoption Rate on October 2010	75%	79%	78%	79%	79%	84%	70%	78%	88%	90%
	Change During Waiver Term	9%	11%	9%	11%	8%	8%	11%	9%	12%	10%
	Planned Future Adoption	3%	4%	11%	8%	12%	7%	19%	13%	0%	0%

Approaches for Additional Survey Analysis in the Near Term

Subsets of the web-based survey results can potentially be compared to monitoring results for drainages containing surveyed acreage. In both 2014 and 2015, 25% percent of the surveyed acreage fell in a drainage with an agricultural land use monitoring site at its base. It may be possible to spatially bin some of the remaining 75% of surveyed acreage using other types of subwatershed delineations, such a receiving water reaches or drainages of receiving water monitoring sites used by other monitoring programs. However, defensible comparisons between BMPs survey data and any kind of water quality monitoring data will require careful consideration of a variety of potentially confounding factors. Surveyed acres do not represent all of VCAILG-enrolled irrigated acreage in monitored and unmonitored drainages, and water quality is also affected by irrigated land not enrolled in the waiver program. The extent to which surveyed acreage reflects the total irrigated land in a drainage varies widely among the monitored drainages (Table 28). In addition, even in drainages with agricultural land use monitoring sites, total irrigated land can represent a small portion of total land cover (Table 28). The extent to which irrigated land, or surveyed irrigated land, will reflect the land covers in larger drainage units will be even smaller. In addition, data for parameters applicable to agricultural practices or TMDL allocations are not necessarily available for receiving waters outside the Calleguas Creek watershed.

Approaches for evaluating spatial relationships between BMP survey data and water quality monitoring data will be developed during the remaining months of the current Waiver term, and preliminary evaluations will be included in the 2014-2015 VCAILG annual monitoring report. An important first step will be identification of appropriate uses of monitoring data collected outside of VCAILG monitoring site drainages. If patterns between BMP use and water quality are observed after the preliminary evaluations, additional survey-derived parameters (such as predominance of crop types or irrigation practices) could potentially be evaluated in subwatersheds with water quality conditions of interest. Because water quality has evolved during the waiver program, and several reaches are now candidates for delisting for pollutants addressed by many agricultural BMPs, it will be appropriate to focus additional analyses of BMP survey database in ways that reflect updated water quality priorities.

Table 28. Comparison of Surveyed Acreage with Total Drainage Size and Total Irrigated Acreage for Monitored Drainages

Site ID	Size of Drainage Area (acres)	Total Irrigated Acres (VCAILG and non-member)	Surveyed Irrigated Acres		Percent of Total Irrigated Acres Surveyed		Percent of Whole Drainage Area Addressed by Survey	
			2014	2015	2014	2015	2014	2015
01T_ODD3_ARN	800	649	79	630	12%	97%	10%	79%
04D_ETTG	3,779	3400	2,078	1,469	61%	43%	55%	39%
04D_LAS	1,339	1058	971	790	92%	75%	73%	59%
05D_LAVD	877	555	219	236	39%	43%	25%	27%
05T_HONDO	3,928	1780	405	847	23%	48%	10%	22%
06T_LONG2	2,813	1351	884	633	65%	47%	31%	23%
OXD_CENTR	1,243	930	779	833	84%	90%	63%	67%
S02T_ELLS	9,015	872	836	646	96%	74%	9%	7%
S02T_TODD	5,748	510	481	435	94%	85%	8%	8%
S03D_BARDS	2,214	864	481	631	56%	73%	22%	29%
S03T_BOULD	3,764	1001	764	721	76%	72%	20%	19%
S03T_TIMB	2,183	480	322	412	67%	86%	15%	19%
S04T_TAPO	3,686	113	321	321	[a]	[a]	9%	9%
VRT_SANTO	7,220	553	459	407	83%	74%	6%	6%
VRT_THACH	6,003	808	674	260	83%	32%	11%	4%
01T_ODD2_DCH	1,564	1410	819	1,145	58%	81%	52%	73%
02D_BROOM	8,236	2361	1,953	936	83%	40%	24%	11%
04D_WOOD	470	359	364	247	101%	69%	77%	53%
05D_SANT_VCWPD	1,154	984	481	760	49%	77%	42%	66%
06T_FC_BR	2,602	1049	757	201	72%	19%	29%	8%
07D_HITCH_LEVEE_2	142	114	15	51	13%	45%	11%	36%
9BD_GERRY	447	238	231	194	97%	82%	52%	43%
S01D_MONAR	209	232	182	182	78%	78%	87%	87%
CIHD_VICT	99	92	0	0	0%	0%	0%	0%

[a] Total irrigated acreage needs to be updated to reflect the higher reported irrigated acreage by survey respondents

GROWER OUTREACH AND BMP IMPLEMENTATION PROJECTS

Ventura County Agricultural Irrigated Lands Group

Outreach and education programs have been an important requirement of the Waiver and a focus of VCAILG efforts. The main method of communication with VCAILG members has been the annual direct mailing to the entire VCAILG membership in the annual newsletter. The 2014 newsletter is included in Appendix C and the 2015 newsletter will be sent this summer.

VCAILG has also worked with a number of organizations and agencies to provide relevant and crop specific information regarding Waiver requirements, water quality status as demonstrated by VCAILG monitoring, and applicable management practice information to improve water quality. Since the adoption of the 2010 Waiver, over 54 education opportunities have been offered to VCAILG members adding up to 171 hours of Regional Board-approved credits. These courses have included: Waiver update meetings in each of the major watersheds, crop specific meetings, field tours (typically crop specific), and field BMP research demonstrations. To further promote the practice of preventing irrigation runoff, Farm Bureau staff gave three talks at education meetings highlighting the benefits of efficient irrigation systems and proper use. Two of these courses focused on strawberry and row crop production. The third class was not crop specific, but local farmers spoke about their experiences with different irrigation hardware and moisture sensor systems. Vendors of irrigation system and sensing equipment were also in attendance to answer questions about available products. A list of all education courses that took place since the adoption of the 2010 Waiver to date is provided in Table 29.

Table 29. Courses Offered for Education Credit

Date	Course Title	Education Hours
Ongoing	Online FCGMA Irrigation Allowance Index Training	2
11/01/2010	ABC's of Fertilizer and Irrigation Management	6
11/02/2010	ABC sobre Manejo de Fertilizantes y Riego	6
02/28/2011	Strawberry Irrigation Field Day	2
06/20/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
06/21/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
06/22/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
06/23/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
07/25/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
07/26/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
07/27/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
07/28/2011	Waiver & TMDL Regulatory Overview & BMP Info.	4
09/13/2011	Erosion and Pesticide Runoff Management in Nurseries	4
9/14/2011	Erosion and Pesticide Runoff Management in Orchards	4

11/02/2011	Managing Nitrogen in Row Crops	2
11/15/2011	Irrigation and Nutrient Management	2
11/16/2011	General Waiver Education (Spanish)	4
02/23/2012	Reducing runoff through tailwater capture and reuse	2
03/21/2012	Nutrient Management, Grassed Waterways, & IPM for Improved Water Quality	4
04/05/2012	Irrigation and Nutrient Management	2
04/19/2012	Manejo de Irrigacion en Fresas	2
04/24/2012	Site Planning to Improve Water Quality from Farm Runoff	2
06/05/2012	Effective Use of Pesticides to Produce Healthy Ornamental Plants	4
06/06/2012	Irrigation Management	2
07/17/2012	Nursery Farm and Orchard Seminar	8
08/31/2012	Strawberry Production Meeting	2
09/11/2012	The New FCGMA Irrigation Allocation Index	2
10/10/2012	Managing Nitrogen in Row Crops	2
10/11/2012	Irrigation and Nutrient Management – Vendor Fair	2
10/17/2012	UC Hansen Ag Center Field Day	2
11/13/2012	Nutrient Management, Grassed Waterways, and IPM for Improved Water Quality	2
11/26/2012	Private Applicator Seminar	1
11/29/2012	Waiver – General overview	4
01/22/2013	NGA Water School	4
02/19/2013	4Rs of Nutrient Stewardship and Moisture Sensors	2
03/06/2013	Nutrient Trials and Moisture Sensors in Row Crops	2
03/20/2013	BMP's for California Nurseries	4
04/23/2013	Detention Basins and Nutrient Management for Improved Water Quality	2
05/08/2013	Algae TMDL Update and Nutrient Needs of Tree Crops	2
07/24/2013	Avocado Irrigation (Spanish)	3
08/07/2013	Farming without Fumigants, Grower Demonstration Field Day	2
09/05/2013	Strawberry Production Meeting	3
09/17/2013	BMPs for California Nurseries	3
09/19/2013	LAILG Summer Water School	5

09/26/2013	Strawberry Field Day, Water Saving Practices	2
01/27/2014	Strawberry Irrigation and Nutrient Management	4
01/28/2014	Programma Educativo del Manejo de Nutrientes y Riego en Fresas	4
03/04/2014	Waiver Educational Class	2
03/26/2014	Water Management in Strawberry: Field Day	2
04/08/2014	Vegetable Production Meeting	1.5
06/10/2014	Grower Demonstration Field Day Raised Bed Trough Experimental Site	2
06/24/2014	RCD Ag Education Breakfast	2.5
08/27/2014	Annual Strawberry Production Meeting	3
08/28/2014	Irrigation Management Efficiency in Nurseries	7.5
10/16/2014	Crop Production Services Grower Meeting	1.5

Ventura County Resource Conservation District Mobile Irrigation Lab

Program Description

The Ventura County Resource Conservation District (VCRCD) Mobile Irrigation Lab (MIL) program was developed under the Proposition 84 Agricultural Water Quality Grant Program to work with landowners and farmers to improve water quality by limiting irrigation runoff and decreasing nutrient leaching, energy use, and water use. MIL staff evaluates irrigation systems, pumps, and energy usage at the field level and provides a report of results, including recommendations on how to improve distribution uniformity, energy savings, seasonal irrigation efficiency, and irrigation scheduling. The MIL is equipped to evaluate several types of irrigation systems, including sprinklers, microsprinklers, and drip. Optimizing irrigation systems and their performance can have several benefits. In relation to water quality, potential benefits include: decreased amount of water applied, decreased nutrient leaching, decreased tailwater runoff, decreased fertilizer and/or pesticide applications. A certain amount of cost share funding was available to assist farmers in implementing recommended improvements based on MIL evaluations. The MIL program also includes outreach and educational workshops, both independently and in conjunction with VCAILG meetings.

MIL Program Accomplishments

In 2014, approximately 50 irrigation evaluations were performed on over 1,500 acres, primarily orchards and strawberry grower properties towards the end of the year. This exceeds the grant minimum requirement of 48 evaluations per year. The final average Low Quarter Distribution Uniformity (lqDU) for the 4 farms that are part of the cost share program was 0.94. The lqDU measures how uniformly the water is applied to an area being watered. The higher the lqDU value, the better the performance of the system. The MIL program has a target performance level of 0.85 lqDU. The growers that are part of the cost share program, the watershed their farms are located in, the BMPs implemented, the crop types addressed, and the estimated water use reductions are presented in **Table 30**. Four growers assisted in the cost-share program

resulting in a water use reduction of approximately 200 acre feet per year. Not every farmer participating in the program wishes to seek cost-share funding, though they may improve their system or install moisture meters to assist with irrigation scheduling as a response to the evaluation results. To capture and document these BMPs, MIL staff will continue following-up with program participants and tracking the improvements they make.

The VCRCD participated in continual outreach by hosting two educational events in coordination with VCAILG where over 200 growers attended. VCRCD attended various grower meetings and events where over 500 growers were informed of the MIL program. Involvement in monthly meetings ensured over 2,000 watershed stakeholders were informed about the MIL program and services provided. To advertise MIL services, posters were created and displayed at several locations which include the Farm Bureau, the Agricultural Commissioners' office, United Water District, Casitas Water District, Camrosa Water District, and the Calleguas Municipal Water District as well as businesses which sell irrigation hardware and fertilizer throughout the county. The number of posters displayed throughout Ventura County exceeded the grant requirement of 10 locations.

Table 30. Cost Share Program Summary Information

Watershed	Irrigation BMPs Implemented	Crop Type	Estimated Water Use Reduction (AF/year)
Calleguas Creek	Irrigation system upgrades	Lemon	155
Calleguas Creek	Irrigation system upgrades	Lemon	5.3
Santa Clara River	Micro-irrigation and irrigation water management	Avocado	19.8
Calleguas Creek	Irrigation Water Management	Lemon	18

Natural Resources Conservation Service Planning and Assistance

The Natural Resources Conservation Service (NRCS) is a federal agency with local field offices and staff that work with private landowners providing conservation planning and assistance designed to benefit the soil, water, air, plants, and animals. Planning services are available to anyone and cost share funds are distributed through a competitive approval process to aid in the implementation of conservation practices.

NRCS currently has approximately 80 active contracts addressing resource concerns related to water quality, water quantity, organic transition, wildlife habitat, and streambank protection. Of the funded contracts, 21 are part of the National Water Quality Initiative (NWQI) totaling 16,230 acres and include 2.9 million dollars in payments for BMPs. In addition, 11 of the 21 contracts were completed in the last three years. The remaining contracts are at 25 percent complete, which means there is 75 percent of the money in contract at this time.

To address the various resource concerns on a property, conservation practices (BMPs) are identified and planned. Some of the practices currently under contract for installation between 2012 and 2014 include the following:

- ~790 acres of Nutrient Management (water quality)
- ~4,000 feet of underground outlet (soil and water quality)
- ~23,000 feet of underground drainage (soil erosion and water quality)
- 1,100 feet of windbreak (wind plant health and soil erosion protection)
- 637 feet of structure for water control (water quality/quantity, soil erosion)
- 12,000 plus feet of pipeline for water conveyance (water quality/quantity/soil erosion)
- 95 acres mulching (organic depletion and soil erosion protection)
- 1,900 feet of lined waterway (soil erosion/water quality)
- 4 irrigation reservoirs and 8 irrigation systems (water quality/quantity/soil erosion)
- ~80 acres of conservation/cover crops (soil health/erosion and water quality)
- 13 acres critical area planting (soil health/erosion and water quality)
- 1 ag chemical handling facility (water quality)
- ~1000 acres of Irrigation Water Management (water quality/quantity)

The NRCS did not provide any new information from the last WQMP, but as the NRCS contracts cover multiple years, the information presented above is still relevant.

Adaptive Management Practice Implementation

The available management practices for on-farm implementation are continuing to evolve as new technologies and information becomes available. The necessity of new BMPs can be driven by any, or a combination of the following: cost considerations, need to improve efficiency, market changes, regulatory pressure, problems with current systems, drive to increase yields, desire to improve crop quality, etc. Local agencies and organizations, commodity groups, universities, farmers, and private companies all play a role in expanding on the current knowledge base and providing new BMP research and technologies. Many of these emerging BMPs are developed on farms, creating case-study opportunities that can serve as demonstration sites for other farmers. As the effectiveness of these new BMPs is demonstrated, growers can be expected to adapt their own management strategies to incorporate the latest and most cost-effective options suitable for their crops, locations and cultural practices. The following two tables list some of the current or future BMP implementation and outreach opportunities in Ventura County related to these research and development efforts.

Table 31. Adaptive BMP Implementation

Agency or Organization	Research and BMP Implementation Activities
UCCE - Ventura	Farm Advisor, Oleg Daugovish is doing field trials throughout the County for establishing strawberries using drip tape with minimal or no overhead irrigation (Funding from NSSI/Wal-Mart foundation). UCCE received grants from UC Hansen Trust and UC ANR (Farm Advisors Biscaro and Daugovish are cooperating on this state-wide project in Ventura County) to optimize nitrogen and water use by crops of key importance (celery, strawberry, and caneberries). Local research is also being done regarding the use of cover crops to minimize sediment and associated pollutant movement in tunnel/hoop house fields. Additionally, funding was recently approved for two nutrient related grants. One project will evaluate nitrogen and phosphorus leaching from organic fertilizers. The focus of the second grant is to assess the effectiveness of riparian ornamentals as vegetative filters for nitrogen and phosphorus uptake.
California Strawberry Commission	Employs staff devoted to irrigation and nutrient management training. CSC's training focuses on BMP's related to pressure monitoring, irrigation system design, scheduling and fertigation management. Dozens of companies have participated and implemented recommended many of the recommended practices.
California Celery Research Advisory Board	Currently funding nutrient management trials being performed on farms in Ventura County.
Fox Canyon Groundwater Management Agency	FCGMA developed and has implemented an irrigation allowance index, which restricts groundwater irrigation pumping for all GMA pumpers to the calculated value for efficient water use based on crop type, weather, location, leaching, and frost protection. This was the result of an emergency pumping ordinance adopted by FCGMA in response to continuing drought conditions, which should increase water efficiency by farmers.
UCCE	Michael Cahn and other UC specialists have been conducting trials relating quick nitrogen testing and weather-based irrigation scheduling to optimize fertilization and water management. The CropManage tool that was developed allows farmers to input various farm specific information (*i.e.* crop type and age, irrigation method, and water delivery per hour, quick nitrogen test results) and the program will make recommendations for how long and when to irrigation and how much nitrogen, if any, should be applied. A limited number of crops are currently in the system, but research is underway to expand.
Ventura County Resource Conservation District	The RCD received a grant from the Department of Water Resources to continue the Mobile Irrigation Lab under an Agricultural Water Use and Efficiency program. The grant will fund the program for the next three years.
Ventura County Agricultural Commissioner's Office	Hosts a pesticide container recycling program.
Community Recycling and Local Farmers	Community Recycling and local farmers are collaborating to recycle the agricultural plastic covering strawberry beds and also used in some vegetable fields. Community Recycling estimates they collect approximately 70% of the agricultural plastic in the county. The used plastic is cleaned, processed, and turned into pellets to be used in new products. Research is being done testing the use of recycled plastic in the fields and determining the percent recycled material that will still stretch and maintain the necessary strength.

Table 32. BMP Outreach and Education

Agency or Organization	Outreach and Education
UCCE – Ventura	A Strawberry BMP Manual has been written in Spanish and English. A bilingual Row Crop BMP Manual has been published and printed copies distributed at meetings. Both the strawberry and row crop (vegetable) BMP guidelines are available on the UCCE website: http://ceventura.ucanr.edu/Com_Ag/Veg/Water_96/ for row crops, and http://ceventura.ucanr.edu/files/154573.pdf (English) http://ceventura.ucanr.edu/files/154574.pdf (Spanish) for strawberry. UCCE also hosts various commodity specific education meetings. Workshops have been held throughout the state on nursery nutrient and water management with 76 in attendance at the Santa Paula meeting.
	Research and field trials related to strawberry establishment with drip tape and minimal to no overhead irrigation was discussed at the irrigation field days in Oxnard (74 attendees) and the UCCE centennial symposium (80 attendees), also in Oxnard.
California Strawberry Commission	An education program targeting owners/growers and irrigators is in the works. Owner/growers learn about proper system design, and education for irrigators focuses on irrigation system maintenance and scheduling. The CSC provides information/education in both English and Spanish. CSC provides education classes and field demonstrations every year. The meetings are a way to inform growers about the latest research and technology related to strawberry production. Meetings are typically presented in English and Spanish.
California Avocado Society	CAS holds bimonthly meetings in Ventura. These meetings are relevant to farm management and water quality; pest management and fertilization are two major focuses.
Fox Canyon Groundwater Management Agency	A series of videos have been developed and are accessible to farmers online that detail using the irrigation allowance index as well as crop specific information on irrigation and proper water management.
Ventura County Resource Conservation District	The RCD has applied for additional education funding to continue offering outreach programs related to water quality and BMPs.
VCAILG	Since adoption of the 2010 Waiver, VCAILG and partnering agencies have offered 171 hours of education for its members. Meetings range in content, but focus on regulation (Waiver and TMDLs), water quality monitoring data, and BMPs and resources for improving water quality. The Management Practice Survey is another important tool in providing BMP information to VCAILG members.

COMPLETED TARGETED BMP OUTREACH

The previous WQMPs identified targeted outreach related to preventing irrigation runoff and optimizing irrigation efficiency as a priority. Efforts related to these past WQMP goals are summarized in the following:

- All VCAILG members with farms where dry weather irrigation runoff was observed during Bacteria Study Surveys were contacted directly. These farmers were notified of the observance of runoff and provided photo documentation and maps to pinpoint the location on their property. This outreach occurred prior to the management practice survey notifications being mailed for farms within Tier 1 and 2 priority drainages, as defined in previous WQMPs. The farmers were alerted to the importance of documenting their BMPs with the online survey and encouraged to investigate and implement practices that would minimize runoff during irrigations. All other members with observed runoff coming from their farms were also notified, though not all notifications occurred prior to the survey period.
- As documented in the 2012-13 WQMP, VCAILG members within Tier 1 and 2 drainage sites were sent letters notifying them of the RCD Mobile Irrigation Lab and its services. The letter and accompanying RCD flier elaborate on the program and how irrigation efficiency is an important management strategy for protecting water quality. Contact information for VCAILG members within these priority drainages was provided to the RCD, allowing them to directly engage with the farmers and schedule irrigation evaluations.

Next Steps in the WQMP Process

The WQMP implementation process (**Figure 8**) guides the iterative approach to identify and address water quality benchmark exceedances. It is in this section that the details to achieve the WQMP goals are provided. **Table 33** correlates steps identified in the WQMP implementation process flow chart to specific actions to be taken by VCAILG. Following the table is a more detailed discussion outlining the next steps in the WQMP process.

Table 33. WQMP Implementation Tasks and Timeline

Flow Chart Step	Task	Implementation Actions and Timeline
Gather source information and compile current management practices	Evaluate web-survey data	Analysis of the first two years of web-based survey results are included in this WQMP.
	Compile BMP information from VCRCD MIL and NRCS	Included in this WQMP; update annually as available
	Complete a pesticide use evaluation	Included in this WQMP; update annually
Analyze monitoring data, source information, and current management practice information	***Develop appropriate approaches for spatial comparison of BMP survey data and water quality monitoring data***	***Evaluations will be conducted during the implementation period of this WQMP.***
Develop outreach plan based on monitoring data and survey results	***Create outreach plan***	***Plan will be submitted in the December 2015 WQMP.***
	Contact VCAILG members through a yearly direct mailing with BMP and WQ data results	***A VCAILG water quality newsletter will be sent to members annually to inform members of needed action. Refer to Appendix C for the 2014 newsletter.***
Implement BMPs and track implementation	BMP implementation by VCAILG members	Ongoing
	Tracking of BMPs by collaborating agencies	NRCS and the MIL both provide BMP implementation assistance and funding. NRCS has set application and funding cycles, whereas the MIL accepts cost share requests anytime during the grant period.
	Tracking of BMPs through the web-based management practice survey	VCAILG members will be re-surveyed for properties they own or manage based on the schedule and requirements set forth in the 2015 Waiver.
Evaluate monitoring data for continued benchmark exceedances or improvement trends	Compare monitoring results to standard water quality and TMDL LA benchmarks	Submitted in all Annual Monitoring Reports

Flow Chart Step	Task	Implementation Actions and Timeline
Evaluate BMP implementation to determine next steps	Evaluate the level of new BMP implementation since October 2010	Analysis using data from the first two years of web-based survey results is included in this WQMP.
	Update and revise WQMP as appropriate based on an assessment of progress made and requirements of the 2015 Waiver	Each year monitoring results demonstrate exceedances of water quality benchmarks, a WQMP will be submitted. The next WQMP will include additional analysis of the results of the web-based surveys, an outreach plan based on the new analysis, and begin addressing the requirements of the 2015 Waiver.

Bold italic text corresponds to VCAILG actions that will be completed prior to the submittal of the next WQMP.

This WQMP will be implemented over the next six months, at which time the combined Annual Monitoring Report and WQMP will be submitted. Additionally, it is anticipated that a 2015 Waiver will be adopted with potentially modified requirements and guidance for what should be included in a WQMP. Therefore, WQMP implementation goals for the next six months focus on further evaluation and correlation between the management practice survey results and water quality monitoring data. Efforts related to education and outreach are important aspects of the Waiver and VCAILG's responsibilities as a discharger group; however, an extensive number of opportunities have been offered during the course of the 2010 Waiver. These programs will resume in accordance with the new Waiver that is adopted and may also be guided by the results of the survey and monitoring data analysis.

Appendix A

Constituent-Specific Water Quality Problems and Sources

Appendix 1 of the Waiver details the required elements of a WQMP. One of the elements is the "Identification of likely waste sources, review of possible correlations between sampling conditions (e.g., time and weather), seasonal growing activities, and water quality results." To identify likely waste sources, pollutants or measured parameters were divided into constituent groups. For each group the characteristics of the pollutants and a summary of potential sources are discussed. Water quality benchmark exceedance information by site and for each applicable TMDL is provided in Appendix B.

POLYCHLORINATED BIPHENYLS AND ORGANOCHLORINE PESTICIDES

This constituent group includes polychlorinated biphenyls (PCBs) and organochlorine (OC) pesticides such as chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, and toxaphene. PCBs are organochlorides that were widely used as dielectric and coolant fluids in transformers, capacitors, and electric motors as well as flame retardants, inks, adhesives, paints, pesticide extenders, plasticizers, polyolefin catalyst carriers, surface coatings, wire insulators, and metal coatings. Commercial production of PCBs in the United States began in 1929. By 1974, most domestic uses of PCBs were restricted to nominally closed applications and by 1977, manufacture of PCBs was stopped in the United States because of evidence of negative environmental and human health effects. Chlordane is a pesticide that was first used in 1948 and was banned in 1988. DDT is an insecticide that was first used in 1939 and was banned in the United States in 1972. Dieldrin is an insecticide that came into use in the 1950s and was banned in 1970. Toxaphene is an insecticide containing over 670 chemicals that was first used in the 1940s. The EPA canceled the registrations of toxaphene for most uses as a pesticide or pesticide ingredient in 1982.

PCBs are considered persistent organic pollutants due to their resistance to environmental degradation. Although banned for most uses, PCBs still persist in the environment. PCBs are referred to as legacy pesticides due to the fact that although most uses have been banned for many years, they continue to persist in the environment. OC pesticides are also referred to as legacy pollutants because they have been banned for agricultural use for many years yet continue to persist in the environment. As a result, these pesticides have long-term environmental impacts as they remain present in sediments and bioaccumulate in the food chain.

PCBs and OC pesticides are similar in their tendency to strongly sorb to sediment, silt, and organic matter. Therefore, the primary sources of these constituents are sediment discharges from areas of historic pesticide applications or PCB release sites. PCBs were not used for agricultural applications and are not expected to be discharged significantly from agricultural fields.

ORGANOPHOSPHORUS PESTICIDES

Organophosphorus (OP) pesticides are the class of pesticides that replaced the use of organochlorine pesticides in many cases. Although they do not persist as long in the environment, current applications of the pesticides may cause aquatic toxicity when present in waterbodies above threshold levels. The OP pesticides covered by this WQMP are chlorpyrifos and diazinon.

Chlorpyrifos was introduced in 1965 and was primarily used as a home and garden insecticide until the phase-out of residential uses began in 2000. Chlorpyrifos is still widely applied for agricultural uses. Diazinon is an insecticide that was heavily used in the 1970s and 1980s for

indoor insect control in residential, non-food buildings. Residential use of diazinon was outlawed in 2004, but diazinon is still approved for agricultural uses.

During the 2013-2104 monitoring year, chlorpyrifos application occurred in all of the 15 VCAILGMP monitoring site drainage areas while diazinon application occurred in 3 of the 15. There were 130 pounds of chlorpyrifos and 203 gallons of chlorpyrifos applied within the 15 monitoring site drainage areas. There were 15.5 pounds and 0.1 gallons of diazinon applied within the 3 monitoring site drainage areas. Chlorpyrifos was most heavily applied to lemons, strawberries, and cabbage. Diazinon was primarily applied to onions.

SALTS

Salts are dissolved ions that are transported in water. The salts covered by this WQMP include chloride, sulfate, total dissolved solids (TDS), and boron, though only the first three constituents are being monitored by VCAILG. The primary source of all salts in agricultural discharges is the water supply. The water supply for irrigation is comprised mostly of local ground and surface water, as well as some imported water in certain parts of the county. Some supplies are relatively high in salts and their use for irrigation water concentrates the salts in the soils as plants take up the water and leave the salts on the fields. Other sources of salts, particularly sulfate, include pesticides and fertilizers. Sulfate may be applied directly to crops as the pesticide copper sulfate, and/or as a fertilizer as calcium sulfate.

During dry weather, salts are discharged from agricultural fields as irrigation runoff. Salts are also discharged during wet weather as stormwater runoff; however salt loadings in stormwater runoff tend to be diluted. Other non-agricultural salts sources include: imported water, water softeners that discharge to publicly owned treatment works, wastewater treatment chemicals, atmospheric deposition, urban pesticides and fertilizers, and indoor water use.

CHRONIC TOXICITY

Chronic toxicity is a measure of how suitable sample water would be in supporting aquatic life. This is determined by exposing aquatic organisms to sample water and comparing the effects on the organisms to the effects on similar organisms exposed to a control sample comprised of laboratory control water (modified according EPA to the appropriate test method). A decline in growth, reproduction, or biomass of the organisms in the sample water relative to the organisms in the control sample indicates a toxic effect. Toxicity is a water quality problem that can be caused by numerous pollutants including pesticides, metals, salts, nutrients, pH-related effects, and other pollutants.

NITROGEN

This WQMP covers nitrate-nitrogen, nitrite-nitrogen, ammonia-nitrogen, and the sums of all of these constituents. Nitrogen is an important macronutrient necessary for plant growth and is widely applied to agricultural lands as both organic and inorganic fertilizers. When excessive nitrogen is applied to crops and discharges off the field with irrigation runoff and/or stormwater runoff, or leaches to groundwater it poses a threat to water quality.

METALS AND SELENIUM

Copper, nickel, mercury, and selenium are all naturally occurring trace elements. Depending on their form and concentration, they can cause toxic effects in aquatic life. These constituents are naturally present in agricultural soils and may also be present in these sources: (1) groundwater used for irrigation, (2) imported irrigation water, and (3) local surface water irrigation sources. An additional input pathway for these elements is atmospheric deposition. Currently, copper is the only metal identified as being applied as a pesticide, though mercury was used historically. Trace levels of these constituents may also be present in other pesticides and fertilizers. Losses of these constituents from agricultural areas can occur through plant uptake and crop removal, leaching, and volatilization. However, of concern in regards to water quality is trace element transport to surface waters from erosion and runoff, which can carry sediment-bound and soluble forms of these constituents.

DISSOLVED OXYGEN, TEMPERATURE, AND PH

Dissolved oxygen, temperature, and pH are not pollutants, but rather water quality indicators. Each of these measurements can be influenced by pollutants or physical characteristics of the water body being measured. Factors influencing dissolved oxygen concentrations include volume and velocity of flowing water, water temperature, weather (sunny versus cloudy), time of day (daytime of nighttime), type and number of organisms in a water body, dissolved or suspended solids, nutrients, organic wastes, riparian vegetation, and groundwater inflow. Temperature may vary due to human-induced thermal pollution, the amount of shade on the water body, turbidity, and the confluence of water bodies with differing temperatures. Additionally, water temperature is influenced by the ambient air temperature at the time of sample collection independent of any discharge contributions. To meet the water quality benchmark for pH, the measurement must remain between 6.5 and 8.5. Normal acidity or alkalinity of waterbodies will vary based on natural influences, such as type of soil or bedrock, groundwater influence, etc. However, discharges from anthropogenic sources can alter pH and harm aquatic life, depending on the duration and magnitude of the change.

TRASH

Trash in agricultural areas generally consists of materials used during agricultural production including plastic sheeting, fertilizer/ pesticide containers, tubing, binding materials, metal scraps, and other materials. Trash in agricultural areas also consists of materials related to the activities of farm workers including plastic bottles, plastic bags, cigarette butts, food containers, clothing, and other materials. There are three main pathways for trash entering water bodies: (1) wind or runoff transporting the materials from the fields directly to the water bodies; (2) dumping of materials directly to the water bodies; and (3) trash entering conveyances such as pipes or channels through wind, runoff, or direct dumping and then discharged to the water bodies. Two effective TMDLs address trash and have load allocations included in Appendix 3 of the Waiver: (1) Ventura River Estuary Trash TMDL and (2) Revolon Slough/Beardsley Wash Trash TMDL.

Appendix B

Standard Water Quality and TMDL LA Benchmark Exceedances Data by Site

This appendix provides specific data complementary to the information presented in the Constituent-Specific Water Quality Problems and Sources Section and elaborates upon the summaries of benchmark exceedances that followed the listing of applicable benchmarks. Specifically, this appendix provides information regarding the possible correlation between sampling conditions, seasonal growing activities, and water quality results by presenting the standard water quality and TMDL load allocation benchmark exceedances at each site by watershed. A summary regarding the possible correlation between sampling conditions, seasonal growing activities, and water quality results is provided at the end of the Benchmark Exceedances Section.

BENCHMARK EXCEEDANCES

Calleguas Creek Watershed

01T_ODD3_ARN

Rio de Santa Clara / Oxnard Drain No. 3. The monitoring site is located on an agricultural drain just upstream from the Arnold Road Bridge. Flow from this drain eventually discharges into the western arm of Mugu Lagoon (Calleguas Creek Reach 1). Because the site is tidally influenced, an attempt is made to conduct monitoring at this site approximately one-half hour after low tide. Row crops and sod are the primary crop types in the vicinity of this site.

Table B-1. 01T_ODD3_ARN Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Nutrients					
Nitrate-N	mg/L	10 [1]	***29.96***	NS	***53.94***
Metals					
Dissolved Copper	µg/L	3.1 [2]	NE	NS	***4.08***
Organochlorine Pesticides					
4,4'-DDD	µg/L	0.00084	***0.0054***	NS	***0.0082***
4,4'-DDE	µg/L	0.00059	***0.0152***	NS	***0.0233***
4,4'-DDT	µg/L	0.00059	NE	NS	***0.0056***

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedance
NS = No Sample; site was inaccessible

1. There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L nitrate-N was used for comparison with VCAILG data for this site.
2. Copper benchmark for saltwater applies at this site.

04D_ETTG

This monitoring site is located on an agricultural drain just upstream from its confluence with Revolon Slough, just east of the intersection of Wood Road and Etting Road. Flow from this drain eventually discharges into Calleguas Creek Reach 4 (Revolon Slough). Row crops are the most common crops grown within this site drainage area. Additional crop types include strawberries, other berries (such as raspberries or blueberries), and citrus.

Table B-2. 04D_ETTG Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Nutrients					
Nitrate-N	mg/L	10 [1]	***45.48***	***42.68***	***47.51***
Metals					
Dissolved Copper	µg/L	3.1 [2]	***6.34***	***4.59***	***4.30***
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NE	***0.0214***	NE
4,4'-DDD	µg/L	0.00084	***0.0055***	***0.0069***	NE
4,4'-DDE	µg/L	0.00059	***0.0254***	***0.0449***	***0.0079***
4,4'-DDT	µg/L	0.00059	NE	***0.0099***	NE
Toxaphene	µg/L	0.00075	***0.19796***	***0.61854***	NE
Organophosphorus Pesticides					
Chlorpyrifos	µg/L	0.025	NE	***0.2056***	NE

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedance
1. There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L nitrate-N was used for comparison with VCAILG data for this site.
2. The copper benchmark for saltwater applies at this site.

04D_LAS

This monitoring site is located on an agricultural drain just upstream of its confluence with Revolon Slough just upstream of South Las Posas Road. A tile drain discharge is intermittently pumped into this agricultural drain upstream of the monitoring site. Flow from this drain eventually flows into Calleguas Creek Reach 4 (Revolon Slough). Row crops are the primary crop type along with significant acreage of strawberries being grown in the vicinity of this site.

Table B-3. 04D_LAS Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Nutrients					
Nitrate-N	mg/L	10 [1]	***31.7***	***44.21***	***51.3***
Metals					
Dissolved Copper	µg/L	3.1 [2]	NE	**8.44**	**3.74**
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NE	***0.0152***	NE
4,4'-DDD	µg/L	0.00084	NE	***0.0802***	***0.0086***
4,4'-DDE	µg/L	0.00059	***0.0176***	***0.3517***	***0.0195***
4,4'-DDT	µg/L	0.00059	NE	***0.0114***	***0.0068***
Toxaphene	µg/L	0.00075	***0.1315***	***0.2359***	NE

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedances

1. There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L nitrate-N was used for comparison with VCAILG data for this site.
2. The copper benchmark for saltwater applies at this site.

05D_LAVD

This monitoring site is located on the La Vista Drain just east of La Vista Avenue, north of Hwy 118. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel). The Ventura County Watershed Protection District maintains a stormwater monitoring station just downstream of the VCAILG monitoring site. Citrus, avocados, and berries (other than strawberries) are the major crop types that drain to this monitoring location.

Table B-4. 05D_LAVD Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Metals					
Dissolved Copper	µ/L	21.36 [1]	NS	***44.53***	NS
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NS	***0.0061***	NS
4,4'-DDD	µg/L	0.00084	NS	***0.0332***	NS
4,4'-DDE	µg/L	0.00059	NS	***0.1334***	NS
Organophosphorus Pesticides					
Chlorpyrifos	µg/L	0.025	NS	***0.223***	NS

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NS = No Sample; site was dry
1. The copper benchmark for freshwater applies at this site.

05T_HONDO

This monitoring site is located on Hondo Barranca just downstream of the Hwy 118 Bridge. Hondo Barranca is a tributary to Calleguas Creek Reach 5 (Beardsley Channel). Hondo Barranca drains land planted primarily with citrus and avocado orchards.

Table B-5. 05T_HONDO Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NS	***0.0119***	NS
4,4'-DDD	µg/L	0.00084	NS	***0.0332***	NS
4,4'-DDE	µg/L	0.00059	NS	***0.1334***	NS
4,4'-DDT	µg/L	0.00059	NS	***0.0.0643***	NS
Organophosphorus Pesticides					
Chlorpyrifos	µg/L	0.025	NS	***0.175***	NS

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NS = No Sample; site was dry

06T_LONG2

This monitoring site is located on Long Canyon where it crosses Balcom Canyon Road north of Highway 118. Long Canyon is a tributary to Calleguas Creek Reach 6 (Arroyo Las Posas). The drainage area for this monitoring site consists mostly of citrus and avocado orchards, with small portions used for growing nursery stock, berries, and cut flowers.

Table B-6. 06T_LONG2 Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NS	***0.0151***	NS
4,4'-DDD	µg/L	0.00084	NS	***0.0198***	NS
4,4'-DDE	µg/L	0.00059	NS	***0.1027***	NS
4,4'-DDT	µg/L	0.00059	NS	***0.0511***	NS
Organophosphorus Pesticides					
Chlorpyrifos	µg/L	0.025	NS	***0.1094***	NS

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NS = No Sample; site was dry

Oxnard Coastal Watershed

OXD_CENTR

This is the only VCAILG monitoring site in the Oxnard Coastal Watershed. The site is located on the Central Ditch, which flows under Harbor Boulevard and into McGrath Lake. Water from McGrath Lake is pumped periodically into the ocean to prevent the Central Ditch from backing up and flooding Harbor Boulevard. Strawberries and row crops are the predominant crop types that drain to this site.

Table B-7. OXD_CENTR Benchmark Exceedances for 2013-14

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Nutrients					
Nitrate-N	mg/L	10 [1]	***12.2***	***24.6***	***15.5***
Metals					
Dissolved Copper	µg/L	3.1 [2]	NE	***6.26***	NE
Organochlorine Pesticides					
Total Chlordane	µg/L	0.0059	NE	***0.017***	NE
4,4'-DDD	µg/L	0.00084	NE	***0.1408***	NE
4,4'-DDE	µg/L	0.00059	NE	***0.4019***	NE
4,4'-DDT	µg/L	0.00059	NE	***0.0711***	NE
Toxaphene	µg/L	0.00075	***0.089***	***0.27***	NE

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedance
1. There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L nitrate-N was used for comparison with VCAILG data for this site.
2. The copper benchmark for freshwater applies at this site.

Santa Clara River Watershed

S02T_ELLS

This monitoring site is located on Ellsworth Barranca just downstream of the Telegraph Road Bridge. Ellsworth Barranca drains the Aliso Canyon area and is a tributary to Santa Clara River Reach 2. Citrus and avocados are the primary crop types associated with this site.

Table B-8. 02T_ELLS Benchmark Exceedances for 2013-14

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
General Water Quality					
Chloride	mg/L	150	NS	***235***	NS
Organochlorine Pesticides					
Total Chlordane	µg/L	0.0059	NS	***0.041***	NS
4,4'-DDE	µg/L	0.00059	NS	***0.079***	NS
Organophosphorus Pesticides					
Chlorpyrifos	µg/L	0.00075	NS	***0.06***	NS

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NS = No Sample; site was dry

S02T_TODD

This monitoring site is located on Todd Barranca upstream of Hwy 126. Todd Barranca drains the Wheeler Canyon area and is a tributary to Santa Clara River Reach 2. Citrus and avocados are the primary crop types associated with this site.

Table B-9. S02T_TODD Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
General Water Quality					
TDS	mg/L	1200	***2110***	NE	***2450***
Chloride	mg/L	150	***170***	NE	NE
Sulfate	mg/L	600	***1480***	NE	***1130***
Nutrients					
Nitrate-N	mg/L	10	NE	NE	***14.9***
Organochlorine Pesticides					
Toxaphene	µg/L	0.00075	**0.05956**	NE	NE

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedance

S03T_TIMB

This monitoring site is located on Timber Canyon Creek just upstream of Hwy 126, east of Santa Paula. Timber Canyon Creek is a tributary to Santa Clara River Reach 3. Drainage from this site is mostly from avocado and citrus orchards.

Table B-10. S03T_TIMB Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
General Water Quality					
TDS	mg/L	1200	NS	***3170***	NS
Chloride	mg/L	150	NS	***304***	NS
Sulfate	mg/L	600	NS	***1820***	NS

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Sample; site was dry

S03T_BOULD

This monitoring site is located on Boulder Creek just upstream of Hwy 126, west of Fillmore. Boulder Creek is a tributary to Santa Clara River Reach 3. Citrus, avocados, and nurseries are the primary crop types associated with this site.

Table B-11. S03T_BOULD Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Nutrients					
Nitrate-N	mg/L	5	NS	***14.5***	NS
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NS	***0.0165***	NS
4,4'-DDE	µg/L	0.00059	NS	***0.0132***	NS
4,4'-DDT	µg/L	0.00059	NS	***0.0164***	NS

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NS = No Sample; site was dry

S03D_BARDS

This monitoring site is located near the end of the agricultural drain that runs parallel to Bardsdale Avenue in Bardsdale. The drain is located on the south side of the Santa Clara River and eventually discharges into Santa Clara River Reach 3. Drainage to this site is mostly from citrus orchards with small proportions of the area used for avocados and row crops.

Table B-12. S03D_BARDS Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
Nutrients					
Nitrate-N	mg/L	5	NS	***9.2***	NE
Organochlorine Pesticides					
Total Chlordane	µg/L	0.00059	NS	***0.0162***	NE
4,4'-DDD	µg/L	0.00084	NS	***0.0067***	NE
4,4'-DDE	µg/L	0.00059	NS	***0.0574***	***0.0219***
4,4'-DDT	µg/L	0.00059	NS	***0.03***	***0.0275***

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedance
NS= No Sample; site was dry

S04T_TAPO

This monitoring site is located on Tapo Creek near the Ventura / Los Angeles County line, south of Hwy 126 and the Santa Clara River. Tapo Creek is a tributary to Santa Clara River Reach 4. Citrus, row crops, and nursery stock are grown in the vicinity of this monitoring site.

Table B-13. S04T_TAPO Benchmark Exceedances for 2013-2014

Constituent	Units	Benchmark	Event 19 Dry 8/22/2013	Event 20 Wet 2/28/2014	Event 21 Dry 5/29/2014
General Water Quality					
TDS	mg/L	1300	***2660***	NE	***2730***
Chloride	mg/L	100	***260***	NE	***190***
Sulfate	mg/L	600	***1620***	NE	***1260***
Nutrients					
Nitrate-N	mg/L	5	***11.92***	NE	***21.85***
Organochlorine Pesticides					
Total Chlordane	µg/L	0.0059	NE	***0.0528***	NE
4,4'-DDE	µg/L	0.00059	NE	***1.3075***	NE

Concentrations in ***bold italics*** indicate an exceedance of a water quality benchmark applicable to this site for the specified constituent.
NE = No Exceedance

Ventura River Watershed

VRT_THACH

This monitoring site is located on Thacher Creek just upstream of Ojai Avenue in Ojai. Thacher Creek is a tributary of San Antonio Creek, which is a tributary of the Ventura River. Avocados and citrus are the predominant crop types associated with this site.

This site was dry during all three monitoring events for 2013-2014. Therefore, no water quality benchmark exceedances occurred.

VRT_SANTO

This monitoring site is located on San Antonio Creek just upstream of Grand Avenue in Ojai. San Antonio Creek is a tributary of the Ventura River. Citrus and avocados are the predominant crop types associated with this site.

This site was dry during all three monitoring events for 2013-2014. Therefore, no water quality benchmark exceedances occurred.

POSSIBLE CORRELATIONS BETWEEN SAMPLING CONDITIONS, SEASONAL GROWING ACTIVITIES, AND WATER QUALITY RESULTS

For the Calleguas Creek Watershed, in the lower watershed, there does not appear to be a correlation between weather and water quality exceedances as there were exceedances of the benchmarks for nutrients, metals, and organochlorine pesticides during dry and wet weather. For the upper watershed sites, it is not possible to make a correlation between weather and exceedances as the sites only had flow during the wet weather monitoring event. There does not appear to be a correlation between season and growing activities, as a variety of crops are grown in the various drainage areas with differing growing activities and practices.

For the Oxnard Coastal Watershed, it is difficult to identify any correlations as there is only one monitoring site in the watershed. However, there appears to be a correlation between wet weather and organochlorine pesticide concentrations greater than the applicable water quality benchmark, specifically total chlordane, 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT. The other pesticide with benchmark exceedances was toxaphene, with detected levels greater than the water quality benchmark during the first dry and storm events. The nitrate benchmark was exceeded during all three events. There does not appear to be a correlation between seasonal growing activities as the types of crops in the drainage area do not vary highly between seasons.

For the Santa Clara River Watershed, all sites had benchmark exceedances during the 2013-2014 monitoring year. There appears to be a correlation between weather and several constituent classes. During dry weather, there were exceedances of general water quality and nutrient water quality benchmarks; however, no exceedances of these water quality benchmarks occurred during wet weather. In addition, there were exceedances of several OC pesticides water quality benchmarks during wet weather, but not during dry weather.

For the Ventura River Watershed, water was not present for sampling at the two sites during any of the 2013-2014 monitoring events so a correlation cannot be made.

TMDL BENCHMARK EXCEEDANCES

Calleguas Creek Watershed and Mugu Lagoon Metals and Selenium TMDL

The interim load allocations are being met in the receiving waters for all metals constituents except for selenium in Revolon Slough (04_WOOD site). It has been noted in the current and previous CCW TMDL annual reports that rising groundwater is a large background source of selenium in the Revolon Slough subwatershed. There are two agricultural land use sites located in this subwatershed: (1) 04D_WOOD and (2) 05D_SANT_VCWPD. The selenium monitoring results from the receiving water site and the two agricultural land use sites are provided below (**Table B-14**). Of the two agricultural land use sites, 05D_SANT_VCWPD is located the furthest upstream in the subwatershed and has significantly higher selenium concentrations than 04D_WOOD.

Table B-14. Revolon Slough Receiving Water and Agricultural Land Use Monitoring Sites Selenium Data

Site ID [1]	Dry Weather Events & Dates				
	Interim	39	40	41	43
	LA	Aug-13	Nov-13	Feb-14	May-14
04_WOOD	6	**17.72**	**17.77**	**20.98**	**20.98**
04D_WOOD	6	NS	2.5	NS	NS
05D_SANT_VCWPD	6	**46.5**	**62.6**	**53.0**	**76.6**

NS = No Sample; site was dry

1. 04_WOOD is the receiving water site; 04D_WOOD and 05D_SANT_VCWPD are both agricultural land use sites further upstream of the receiving water monitoring location.

Calleguas Creek Watershed Nitrogen Compounds TMDL

Table B-15 shows the monitoring data from CCWTMP agricultural land use monitoring sites that exceeded the applicable load allocation. Monitoring sites located in the lower part of the watershed consistently exceed the nitrogen LAs, whereas sites in the upper reaches are typically below the allocation. **Table B-16** shows a comparison of Calleguas Creek Watershed VCAILGMP sites exceedance data. The single CCWTMP site and three VCAILGMP monitoring sites without load allocation exceedances are not included in the tables below.

Table B-15. CCWTMP Agricultural Land Use Monitoring Sites Nitrate-N + Nitrite-N Data

Site	Constituent	Allocation [1] (mg/L)	Event 39 Dry Aug-2013	Event 40 Dry Nov-2013	Event 41 Dry Feb-2014	Event 42 Wet Feb-2014	Event 43 Dry May-2014
01T_ODD2_DCH	Nitrate-N + Nitrite-N	9	***53.3***	***69.2***	***71.1***	***24.3***	***63.3***
02D_BROOM	Nitrate-N + Nitrite-N	9	NS	***48.1***	***64.6***	0.07	***52.9***
04D_WOOD	Nitrate-N + Nitrite-N	9	NS	***27.2***	NS	***51.7***	NS
05D_SANT_VCWPD	Nitrate-N + Nitrite-N	9	***32.6***	***37.5***	***33.9***	***9.7***	***33.8***
07D_HITCH_LEVEE_2	Nitrate-N + Nitrite-N	9	NS	NS	NS	***50.4***	***34.1***
9BD_GERRY	Nitrate-N + Nitrite-N	9	NS	NS	NS	2.5	***9.9***

Concentrations in ***bold italics*** indicate the concentration was greater than the load allocation applicable to this TMDL.
NS = No Sample; site was dry.
1. The load allocation is the sum of nitrate-nitrogen + nitrite-nitrogen.

Table B-16. Nitrogen Load Allocation Compared to CCW VCAILGMP Site Data

Site	Constituent	Allocation [1] (mg/L)	Event 19 Dry Aug-2012	Event 20 Wet Jan-2013	Event 21 Dry May-2013
01T_ODD3_ARN	Nitrate-N	9	***30.0***	NS	***53.9***
04D_ETTG	Nitrate-N	9	***45.5***	***42.7***	***47.5***
04D_LAS	Nitrate-N	9	***31.7***	***44.2***	***51.3***

Concentrations in ***bold italics*** indicate the concentration was greater than the load allocation applicable to this TMDL.
NS = No Sample; site was inaccessible.
1. The load allocation is the sum of nitrate-nitrogen + nitrite-nitrogen.

Calleguas Creek Watershed Boron, Chloride, Sulfate, and TDS (Salts) TMDL

Interim load allocations for salts constituents are currently being met at all sites, with the exception of boron at 04_WOOD representing the Revolon Slough subwatershed. There is one agricultural land use site where salts are measured upstream of the compliance site. The results for boron from the 04D_WOOD agricultural land use site alongside the receiving water data are presented in **Table B-17**. When comparing the receiving water and land use data for boron, it is important to keep in mind that quarterly dry weather grab samples are collected at 04D_WOOD as compared to monthly dry weather means reported for 04_WOOD, generated from daily averages of five-minute sensor data. During the August and May quarterly events, the agricultural land use site 04D_WOOD was dry. Grab samples collected for boron in November and February were below the interim LA.

Table B-17. Boron Monitoring Data (mg/L) in Revolon Slough

Site ID	Site Type	Interim LA	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14
04_WOOD [1]	Receiving Water	1.8	***1.89***	***1.91***	***1.98***	1.52	1.74	1.75	1.73	***1.81***	***1.86***	***1.81***	1.79	***1.93***
04D_WOOD [2]	Ag	1.8		NS			1.2			NS			NS	

Concentrations in ***bold italics*** indicate the concentration was greater than the load allocation applicable to this TMDL.
NS = No Sample; site was dry.
1. Data presented are monthly means
2. Data presented are quarterly dry weather grab samples

Santa Clara River Nitrogen Compounds TMDL

Table B-18 lists the VCAILGMP monitoring sites located within the Santa Clara River Watershed that exceeded the nitrogen load allocation. In addition to the two sites with nitrogen exceedances, four additional sites did not exceed the nitrogen load allocation.

Table B-18. Nitrogen Load Allocations Compared to SCR VCAILGMP Site Data

Site	Constituent	LA [1] (mg/L)	Event 19 Dry Aug-2013	Event 20 Wet Feb-2014	Event 21 Dry May-2014
S02T_TODD	Ammonia-N + Nitrate-N	10	NE	NE	***14.98***
S03T_BOULD	Ammonia-N + Nitrate-N	10	NS	***16.04***	NS
S04T_TAPO	Ammonia-N + Nitrate-N	10	***11.92***	NE	***21.88***

Concentrations in ***bold italics*** indicate the concentration was greater than the load allocation applicable to this TMDL.
NE = No Exceedance
NS = No Sample; site was dry.
EST = Estimated concentration; ammonia-N below reporting limit
1. Nitrite-N concentrations are not monitored as part of the VCAILGMP, however, levels of nitrite are typically insignificant compared to the other nitrogen compounds that are measured.

Appendix C

Outreach Materials

VENTURA COUNTY
Agricultural Irrigated Lands Group

Newsletter Volume 6, No. 1
August 2014

Understanding your 2014-2015 billing invoice

Welcome to this edition of the Ventura County Agricultural Irrigated Lands Group newsletter. We hope the information in these pages will help you better understand how the program works, and keep you up to date on program activities.

This newsletter accompanies your member invoice for the 2014-2015 fiscal year. If you were enrolled in the program last year, the formatting of this year's invoice will look familiar.

As was the case last year, all Total Maximum Daily Load compliance costs are included in the VCAILG billing. In previous years, the Calleguas Creek TMDL charges were billed separately and payment was considered voluntary, as they were not a component of the Conditional Waiver program. The Regional Board, however, has made the waiver the legal compliance mechanism for all TMDLs addressing agricultural runoff in Ventura County. Payment of those TMDL assessments now is mandated by the VCAILG participation agreement.

In This Issue

The total VCAILG program budget for 2014-2015 is $1,774,801. Last year's total was $1,313,657. The increase is 35 percent. The invoiced amount will be $1,345,921, reflecting application of $428,880 in carryover funds as a credit against projected 2014-2015 expenditures. As was the case last year, the FBVC administrative fee is set at $250,000.

The year-to-year increase is a bit misleading. Last year's program budget was smaller than usual, due to issues related to accounting by the fiscal agent for the Calleguas TMDL program, which allowed a surplus to build up in that account. That surplus reduced last year's assessment but has now been expended.

As before, the VCAILG assessments will be based exclusively on the costs of monitoring, reporting, mitigation, state board fees and Farm Bureau's administrative fee. Farm Bureau will absorb all direct and indirect costs associated with program administration and management, including employee salaries and benefits, printing and postage, meetings, accounting fees, travel and bank charges, and office overhead.

Per-acre assessment history

Watershed	2010	2011	2012	2013	2014
Calleguas	$29.28	$17.53	$23.59	$19.68	$24.54
Santa Clara	$12.06	$7.07	$7.40	$10.35	$7.78
Ventura	$23.73	$10.03	$8.84	$10.93	$11.79
Revolon	$30.39	$18.25	$24.64	$20.54	$25.44
McGrath	$21.70	$4.92	$8.02	$11.81	$8.35
CI Harbor	$13.42	$4.92	$6.99	$9.75	$7.34
Coastal	$8.93	$4.92	$6.99	$9.75	$7.08

Here is a brief description of the charges on your invoice:

VCAILG management and reporting: This represents the cost of services provided by our primary consulting firm, Larry Walker Associates, to manage the data collection and analysis, and to file all required reports and other documents with the state. This cost is shared equally across all seven watersheds.

Ag Waiver monitoring: This is the cost of collecting and analyzing water-quality samples as required by the Conditional Waiver. It varies by watershed, depending on what kinds of pollutants have been found there and the number of monitoring sites.

State fee: The Water Resources Control Board imposes this fee to help recover the cost of administering regulatory programs.

Farm Bureau Administrative Fee: Farm Bureau of Ventura County manages the VCAILG program, and the Board of Directors sets this fee each year at a level intended to recover the full direct and indirect costs of program management and to generate funds for other programs benefitting the agricultural community.

TMDL Monitoring and Implementation: TMDLs are additional water-quality regulations that require additional monitoring. These costs vary by watershed, depending on what kinds of pollutants have been found there and the number of monitoring sites.

Program overview: Cooperation is high, but problems persist

VCAILG was established in 2006 to enable growers to comply with new water quality regulations. There is just over a year to go before the Conditional Waiver comes up for renewal in October of 2015 and here is where we stand.

As a reminder, what is being "waived" is a discharge permit that would require edge-of-field monitoring. The "conditions" of the waiver are fairly straightforward: either meet the water quality objectives or implement and document new Best Management Practices, BMPs, where there are still problems. We are also required to attend eight hours of educational classes and conduct a study to determine whether farms are a source of bacteria in local waterways.

We have been collecting water-quality data since 2007. This past year, as we all know, has been exceptionally dry, resulting in fewer runoff samples being collected to monitor. With fewer samples we detected fewer problems. There was only one storm after which to sample runoff, and fewer sites had flow during irrigation for sampling than in previous summers.

The trends we have seen in the past continue. Namely, monitoring sites in areas planted mainly in berries or row crops have

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runoff high in nitrogen following irrigation and after storms, whereas orchards show either no runoff or are meeting the regulatory standard of fewer than 10 parts per million for nitrate. We continue to see low levels of some pesticides at our monitoring sites.

Documenting BMPs is required

Because we have not achieved our water quality objectives consistently, and a wet year will most likely produce more runoff than we have seen this year, our Conditional Waiver requires that BMPs be implemented and documented. In last year's newsletter we mentioned the development of a web-based survey of recently implemented BMPs. We invited growers to complete the survey earlier this year, and response was good: More than 60 percent of the county's irrigated acres is represented by the survey responses we have received.

If you have not completed the survey, you soon will be receiving a letter notifying you of that fact and providing instructions for logging into the website. Even if you have completed the survey, you will most likely be asked to complete another survey in coming years since BMP implementation and documentation is an iterative process. Until all water-quality objectives are met, especially in areas with high-nitrogen-demand crops such as berries and vegetable, growers must continue to make improvements in irrigation and nutrient management.s

Fortunately, improvements that address water-quality impairments go hand-in-hand with optimizing inputs of fertilizer and irrigation water. The severe drought is stressing local water supplies, so finding new ways to irrigate more efficiently is on most farmers' minds. Irrigation and nutrient management are the first two categories of BMPs, so your survey responses should reflect your efforts to manage these inputs.

Bacteria Study

The Conditional Waiver also requires that we do a bacteria study to determine whether farmland is contributing to high bacteria counts at local beaches. Sampling will continue in October 2014 and also during one storm event during the 2014-2015 wet season. The sampling uses driving surveys to collect edge-of-field samples during wet and dry weather. In areas where irrigation runoff is observed, we will be contacting farmers to help locate potential problems and provide assistance.

Educational program

VCAILG members have shown their commitment to the educational process with 73 percent of our members having satisfied the eight-hour requirement and 42 percent attending more than eight hours of classes. To date, VCAILG has provided 45 educational opportunities, offering more than 149 hours of workshops. There will be more opportunities for members to gain educational hours through courses approved for VCAILG credit in the coming months. Announcements of future meetings will be sent by email. You can also call the Farm Bureau office for a list of upcoming approved classes.

Looking forward to 2015

Once we have completed the next year of monitoring, we will have enough samples to do a comparative analysis of the results from the first five years of the Conditional Waiver and the second five-year period. A group of master's students from UCSB is working on a statistical analysis of BMP implementation, BMP costs, and the water-quality data to help answer the question of whether or not we are making progress and at what cost.

The most important thing VCAILG members can do in the coming year is to continue to manage water and fertilizer inputs to ensure that the plants are getting the right amount of fertilizer, where they need it, and no more. If these efforts are made and documented, and the results begin showing up in our water-quality monitoring, it will strengthen our hand as we negotiate next year with the Regional Water Quality Control Board to renew this program in its current form when it expires in October 2015.

VCAILG is administered by the Farm Bureau of Ventura County.

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Newsletter compiled by John Krist and Dale Zurawski.

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Notice sent March 30, 2015.

VENTURA COUNTY
Agricultural Irrigated Lands Group

The following information is provided as a service to VCAILG members.

Landowners to receive funding to improve water quality

The USDA Natural Resources Conservation Service (NRCS) in California will again offer expanded financial assistance to agricultural producers to improve water quality in the Calleguas Creek Watershed. This is the fourth year that the NRCS National Water Quality Initiative is providing accelerated assistance to landowners in this watershed.

"Water continues to be one of California's most imperiled resources due to our ongoing drought and NRCS continues to team with farmers and ranchers to take the necessary steps to protect local water quality and supply," said Carlos Suarez, NRCS California state conservationist.

Using funds through the Environmental Quality Incentives Program (EQIP), NRCS will provide financial and technical assistance to farmers to install conservation practices to protect water quality and assist in complying with regulations. Funded conservation practices farmers may choose include drainage/ irrigation water management, nutrient management, structures for water control and vegetative practices that absorb pesticides and capture nutrients from the ditches.

The Calleguas Creek Watershed covers 343 square miles in Ventura County and includes the Arroyos Simi and Las Posas, Conejo Creek and the Revlon Slough. These tributaries form Calleguas Creek and empty into the Mugu Lagoon, which is a system of salt-water marshes, tidal pools and duck ponds, with a bay adjoining the Pacific Ocean. The watershed has supported a thriving agricultural industry for over a century with strawberries as the number one crop, followed by celery, raspberries, lemons and avocados.

Interested applicants are encouraged to submit an application as soon as possible for consideration.

Interested farmers and ranchers in Ventura County should contact Dawn Afman at (805) 984-2358, Ext 101.

VENTURA COUNTY
Agricultural Irrigated Lands Group

PO Box 3160, Ventura, CA 93006
805-289-0155 / Fax 805-658-0295

February 18, 2015

Dear VCAILG Member:

You are receiving this letter because we want to help you comply with state water-quality regulations. After eight years of successful effort to monitor water quality and to educate growers about their role in protecting it, the Ventura County Agricultural Irrigated Lands Group (VCAILG) is in its second year using the web-based survey to document best management practices (BMPs). These BMPs are steps growers can take to modify their management activities and strategies to improve water quality in the most cost-effective manner possible.

We are required to provide this documentation to state regulators, and we believe the online survey is the quickest and easiest way to gather the necessary information. All VCAILG members are being asked to complete the survey. Last year's survey was used to determine the baseline level of BMP implementation; through this and future updates, we will document additional improvements. Your participation is essential if we are to satisfy this legal obligation on your behalf.

Please complete the survey by **Monday, March 16, 2015**. We are sending this request to landowners as well as growers. If you own a parcel but do not actively farm it, please communicate with your grower or growers and make sure they complete the survey for your property. Although we strongly encourage you to complete the survey online, we can provide you a hard copy upon request. You would then be responsible for filling it out and returning it to the Farm Bureau.

The website address and your unique login information are provided on the following page. The survey website includes a page of answers to Frequently Asked Questions, which provides additional information about the survey and explains how to complete it. Thank you for your continued cooperation and participation in VCAILG.

Sincerely,

Edgar Terry
Steering Committee Chairman
Ventura County Agricultural Irrigated Lands Group

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Agricultural Irrigated Lands Group

PO Box 3160, Ventura, CA 93006
805-289-0155 / Fax 805-658-0295

February 23, 2015

Dear VCAILG Member:

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805-289-0155 / Fax 805-658-0295

Grower Survey of Best Management Practices (BMPs)
Website Instructions

Website address: **www.vcailg–survey.org**

Click "Start a new survey"

Login with User Name: _____

VCAILG Number: _____

Follow the website prompts and instructions to verify the parcels you farm, crop acreage, and best management practices. Where applicable, the information provided during last year's survey has been saved and you will only need to verify or update, as appropriate. If you farm under multiple VCAILG ID numbers, you will receive separate website instructions with user names for each VCAILG number. If you have not received website login information for all your VCAILG ID numbers, please contact Larry Walker Associates using the contact information provided below.

Owners: Complete the survey for all the parcel(s) and acres you farm or manage. If you have a grower or growers, communicate with them to ensure they complete the survey for the parcel(s) and acres they farm on your behalf.

Growers: Complete the survey for the owner(s) whose property you farm. Be sure to communicate with the appropriate owner(s) and ensure you are only filling out the survey for the acres you are farming.

If you have problems logging in or have website issues contact:

Mike Marson or Adriana Stovall
Larry Walker Associates
805-585-1835
vcailgsurvey@LWA.com

Notes: You do not have to complete the entire survey in one session. A SAVE button is located at the bottom of each page. After saving your work you may logout and then return at a later time. Your survey is not complete until you click the "Submit Survey" button at the end of Section 4. **Please remember to complete your survey by Monday, March 16, 2015.**

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