San Joaquin County and Delta Water Quality Coalition

Lead Agency:
San Joaquin County Resource Conservation District

May 1, 2009

Chris Jimmerson
Irrigated Lands Conditional Waiver Program
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Dear Chris,

The San Joaquin County and Delta Water Quality Coalition is submitting the 2008 irrigation season Semi-Annual Monitoring Report for review by the Central Valley Regional Water Quality Control Board as required by the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Resolution Order No. R5-2003-0105, Monitoring and Reporting Program Order No. R5-2005-0833, amended by Monitoring and Reporting Program Order No. R5-2006-0053 and Monitoring and Reporting Program Order No. R5-2006-0077.

The attached documents report on the Coalition monitoring program for the period of April 1, 2008 to September 30, 2008 and covers activities associated with the 2008 irrigation season monitoring, reporting, outreach and education.

In every aspect, the Coalition seeks the best quality in its monitoring program by using the most scientifically reliable field and laboratory protocols, ensuring complete quality control and quality assurance of the data received from laboratories, and reporting on that data accurately and punctually to both the CVRWQCB and to the members of the Coalition. The Coalition and its technical staff process and review an immense quantity of data and provide a large number of reports in a timely manner to the CVRWQCB. Requirements of the MRP were met with a few exceptions which are described in the attached SAMR. Sampling occurred during all six months of the irrigation season and all data generated are an accurate reflection of conditions in the Coalition region. None of the few exceptions affected the overall completeness, accuracy, or precision of the data. Consequently, the conclusions and recommendations and the Coalition's outreach program are unaffected by these exceptions.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for violations.

This letter will be submitted with an original signature when the printed SAMR is submitted to the Regional Board.

Submitted respectfully,

Michael L. Johnson
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Michael L. Johnson, LLC

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San Joaquin County and Delta Water Quality Coalition

Semi-Annual Monitoring Report

March 1, 2009

Prepared by
Michael L. Johnson LLC

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List of Acronyms

BMP	Best Management Practice
BOD	Biological Oxygen Demand
BU	Beneficial Use
CDPR	California Department of Pesticide Regulation
CEDEN	California Environmental Data Exchange Network
COC	Chain of Custody
CURES	Coalition for Urban and Rural Environmental Stewardship
CVRWQCB	Central Valley Regional Water Quality Control Board
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DF	Dilution factor
DFG	California (Department of Fish and Game)
DHS	(California) Department of Health Services
DI	Deionized
DO	Dissolved Oxygen
DQO	Data Quality Objective
DWR	(California) Department of Water Resources
E	Environmental sample
EC_{50}	Effective Concentration of 50% of the measured endpoint
EPA	Environmental Protection Agency
FB	Field Blank
FD	Field Duplicate
HDPE	High density polyethylene
ILRP	Irrigated Land and Regulatory Program
IPM	Integrated Pesticide Management
IRIS	Integrated Risk Information System
K_{oc}	Organic Carbon Partitioning Coefficient
LABQA	Laboratory Quality Assurance
LC_{50}	Lethal Concentration at 50% mortality
LCS	Laboratory Control Spike
MCL	Maximum Contaminant Level
MLJ-LLC	Michael L. Johnson, LLC
MPN	Most Probable Number
MRP	Monitoring and Reporting Program Order No. R5-2005-00833
MS	Matrix Spike
MUN	Municipal and Domestic Supply (beneficial use)
NA	Not Applicable
ND	Not Detected
NiCd	Nickel-cadmium

NM	Normal Monitoring
NONAG	The sample was provided by a project other than the Coalition to the laboratory and was included in the QC report from the laboratory to meet their QC requirements.
OP	Organophosphate
PCA	Pesticide Control Advisor
pH	Power of Hydrogen
PR	Percent Recovery
PTFE	Polytetraflouroethylene (Teflon™)
PUR	Pesticide Use Report
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RfD	Reference Dose
RL	Reporting Limit
RPD	Relative Percent Difference
RS	Resample
SAMR	Semi-Annual Monitoring Report
SC	Specific Conductance
SG	Statistically significantly different from control; Greater than 80% threshold
SJCDWQC	San Joaquin County & Delta Water Quality Coalition
SL	Statistically significantly different from control; Less than 80% threshold
SOP	Standard operating procedure
SPE	Solid Phase Extraction
SWAMP	Surface Water Ambient Monitoring Program
TDS	Total Dissolved Solids
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TRS	Township, Range, Section
UC	University of California
USEPA	United States Environmental Protection Agency
VOA	Volatile Organic Analyte
WER	Watershed Evaluation Report
WQG	Water Quality Guidelines
WQTL	Water Quality Trigger Limit

List of Units

cfs	cubic feet per second
L	Liter
lbs	pounds
mg	milligram
NTU	Nephelometric Turbidity Units
ppm	parts per million
sec	second
TUa	Toxic Unit (acute)
TUc	Toxic Unit (chronic)
µg	microgram

List of Terms

Agricultural Commissioner – County Agriculture Commissioner.

ArcGIS – Geographic Information Systems mapping software.

Central Valley – California Central Valley.

Coalition –San Joaquin County and Delta Water Quality Coalition.

Coalition/SJCDWQC region – the region within the Central Valley that is monitored by the San Joaquin County and Delta Water Quality Coalition.

constituent of concern – any constituent that is the focus of monitoring.

drainage –water that moves horizontally across the surface or vertically into the subsurface from land.

landowners – one or more persons responsible for the management of the irrigated land.

non ag waiver QA sample – sample results from another project other than the Coalition included to meet laboratory QC requirements.

Regional Board – Central Valley Regional Water Quality Control Board.

site subwatershed – starting from the sampling site, all water bodies that drain, directly or indirectly, into the water body before the point where sampling occurs.

special study – a study conducted outside of normal monitoring activities that involves monitoring specific constituents in an effort to determine the mechanism responsible for the exceedances.

subwatershed – the topographic perimeter of the catchment area of a stream tributary. (EPA terms of environment: (http://www.epa.gov/OCEPAterms/sterms.html).

Waiver – Central Valley Regional Water Quality Control Board Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands, Order No. R5-2006-0077, amending Order No. R5-2006-0053.

water body –standing or flowing water of any size that may or may not move into a larger body of water, including lakes, reservoirs, ponds, rivers, streams, tributaries, creeks, sloughs, canals, laterals and drainage ditches.

watershed – the land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point. (EPA terms of environment: http://www.epa.gov/OCEPAterms/wterms.html).

Executive Summary

This document is being submitted by the San Joaquin County and Delta Water Quality Coalition (SJCDWQC or Coalition) to the Central Valley Regional Water Quality Control Board (CVRWQCB or Regional Board) as required by the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Monitoring and Reporting Program Order No. R5-2006-0077 (hereafter referred to as the Irrigated Land Regulatory Program or ILRP).

This report covers monitoring conducted between the months of April 2008 and September 2008, during the irrigation season. The irrigation season sampling is designed to characterize the discharge from irrigated agriculture as a result of runoff from irrigated lands. Sampling during the irrigation season generally occurs once per month per site, or twice per month if a site's management plan specifies additional monitoring. Irrigation season sediment samples were collected during the month of August. The Coalition was able to collect sediment samples on August 13, 2008.

During the irrigation season of 2007, the Coalition initiated additional monitoring as part of the SJCDWQC Management Plan's strategy to identify contaminant sources and evaluate effectiveness of newly implemented management practices. This additional monitoring included monitoring for a constituent under a management plan twice during a month for which that constituent exceeded a water quality trigger limit (WQTL). In 2008, for locations where exceedances continued to occur for a second year, the Coalition sampled upstream. All upstream site subwatershed delineations including land use information are included in the SJCDWQC Management Plan.

Field data were recorded during each sampling event, and ambient water samples were analyzed for pesticides, fecal indicator bacteria, metals, inorganic and organic parameters, as well as toxicity to three test species: *Ceriodaphnia dubia, Pimephales promelas*, and *Selenastrum capricornutum*. During sediment sampling events, field parameters were measured and sediment samples were collected for an analysis of toxicity to *Hyalella azteca*. All water and sediment sample analyses were conducted according to specifications in Table 1 of the Monitoring and Reporting Program Order No. R5-2005-0833 for Coalition Groups under Resolution No. R5-2003-0105 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (MRP). Follow-up sampling to test for persistence of toxicity occurred within 48 hours from the time the laboratory reported toxicity.

Including both normal monitoring and Management Plan Monitoring during the 2008 irrigation season, 46 organic pesticide exceedances of water quality triggers occurred, 27 of which involved chlorpyrifos. Other pesticides that exceeded water quality triggers in water samples included carbofuran (3), DDE/DDD/DDT (5), dieldrin (3), dimethoate (1), disulfoton (3), malathion (2), methyl parathion (1), and thiobencarb (1). The thiobencarb exceedance was from rice and was referred to the Rice Coalition for follow-up. Water column toxicity was

experienced in samples 48 times (not including field duplicates when the original sample was toxic); 39 of the samples were toxic to *Selenastrum capricornutum* and 10 were toxic to *Ceriodaphnia dubia*. Five sediment samples were toxic to *Hyalella azteca*. TIEs were performed on five samples toxic to *Ceriodaphnia* and 23 samples toxic to *Selenastrum*. Toxicity was not persistent in one TIE for *Ceriodaphnia* and nine TIEs for *Selenastrum* thus the cause of the toxicity could not be determined. All four TIEs for *Ceriodaphnia* indicated that OP pesticides were responsible for the toxicity. Of the completed TIEs for *Selenastrum*, two indicated that non polar organics alone were responsible for the toxicity, seven TIEs indicated that cationic chemicals (metals) were responsible, and seven TIEs indicated that both non polar organics and cationic chemicals were responsible for the toxicity. There were 84 exceedances of the DO water quality trigger (7.0 mg/L), 12 exceedances of pH (showing high/basic pH levels), 48 exceedances of the specific conductance (SC) water quality trigger, and 30 exceedances of the TDS water quality trigger. There were 29 exceedances of the *E. coli* water quality trigger and 20 exceedances of metals involving copper, arsenic, and lead.

For each sampling period in which chemicals, metals or toxicity were detected, all reported pesticide use data for one to six months prior to sampling (depending on the exceedance) were collected for the specific site subwatersheds based on Township-Range-Section (TRS). PUR data were used to identify potential sources of the exceedances. Where exceedances in consecutive monitoring periods require pesticide use reports, only the additional pesticide use from the date of the previous exceedance are provided for the later exceedance. If there were no applications within the specified PUR collection period, PUR data for an additional month prior were reviewed. If no applications were made during this additional month, the last application was noted. Cyanazine, dieldrin, endrin, DDT and DDE exceedances are not queried since there are no registered products that contain these chemicals. Nitrate/nitrite exceedances are not listed since the use of these products is not reported.

Outreach and education activities continue to be a central component of the Coalition monitoring program. Monitoring results were presented to growers at Coalition meetings held throughout the region to provide subwatershed trends and water quality problems, as well as best management practices (BMPs) that have been proven to eliminate these problems. A Coalition website contains information for Coalition members and growers including a general description of the Coalition's mission and member information, recommended BMPs, a schedule of Coalition meetings and presentations, Coalition news and newsletters, maps of sample sites and site subwatersheds, and numerous links to other sources of relevant information (http://sjdeltawatershed.org/). In addition, the Coalition has developed a relational database to identify parcels/owners/crops and allow more rapid communication with individuals potentially responsible for exceedances.

The Coalition is in the process of documenting implementation of management practices in the Coalition region. This is being done by asking growers to complete a management practices survey if they operate in watersheds under Management Plans. Data obtained from general surveys sent to members of the Coalition have been summarized to a parcel level and a General Survey Summary Report was submitted to the Regional Board on December 31, 2008.

The Coalition continues to focus outreach in priority subwatersheds. These include Duck Creek @ Hwy 4, Lone Tree Creek @ Jack Tone Rd, and Unnamed Drain to Lone Tree Creek @ Jack Tone Rd. As part of the Prop 50 project, Coalition and UC Cooperative Extension representatives conducted an East County Codling Moth Pheromone Mating Disruption Study in Contra Costa County which compared using pheromone mating disruption of codling moths to standard practice of using organophosphate and pyrethroid insecticides. Two initial meetings were held on April 9 and 25, 2008 for the six walnut growers representing 300 acres participating in the experiment. Grower outreach meetings to address Coalition-wide exceedances of WQTLs were held on May 1 and 2, 2008 in Stockton and Tracy. The meetings included presentations on water quality data from the 2007 irrigation season, management practices to address common water quality exceedances in reference to the upcoming irrigation season, and reminders of grower responsibility and expectations. Crop-specific grower outreach meetings were held on July 15 and 16, 2008 in the Lone Tree Creek site subwatershed area. These meetings addressed recent water quality exceedances and reviewed best management practices specific to Lorsban (chlorpyrifos) and copper applications. Coalition representatives presented information to 18 alfalfa, corn and tomato growers on July 15, followed by 27 walnut and grape growers attending on July 16.

Grower meetings are often followed by individual discussions of monitoring results and management practices that may help prevent future problems. Follow-up discussions have led to implementation of management practices by growers, especially in site subwatersheds where exceedances have occurred more than once for a particular pesticide. The Coalition is developing ways to track implementation of new management practices and will focus on priority subwatersheds (Lone Tree Creek, Duck Slough, and Unnamed Drain to Lone Tree Creek) during 2008 and 2009. This information will be included in the update to the SJCDWQC Management Plan which will be submitted in April, 2009.

Conclusions from Coalition monitoring are:

- The outreach strategy used to date (large group meetings) has not been as effective as necessary to reduce exceedances of WQTLs. Exceedances from many of the manageable pesticide applications such as chlorpyrifos have not been eliminated, and toxicity to *Selenastrum, Ceriodaphnia,* and *Hyalella* remain common.
- The problematic constituents from past years' monitoring remain the primary exceedances experienced in the Coalition region.
- Dairies may play a larger role in causing exceedances of numerous constituents than previously thought.

Introduction

This document is being submitted by the San Joaquin County and Delta Water Quality Coalition (SJCDWQC or Coalition) to the Central Valley Regional Water Quality Control Board (CVRWQCB or Regional Board) as required by the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Resolution No. R5-2003-0105 (Order), Monitoring and Reporting Program Order No. R5-2005-0833, amended by Monitoring and Reporting Program Order No. R5-2006-0053 and Monitoring and Reporting Program Order No. R5-2006-0077 (hereafter referred to as the Irrigated Land Regulatory Program or ILRP). The document reports on the Coalition monitoring program and covers activities associated with the 2008 irrigation season monitoring, reporting, outreach and education.

Data that are too substantial to include in the body of this report are located in separate appendices. Where appropriate, Semi-Annual Monitoring Report (SAMR) sections cite the appendices relevant to that section.

Description of Watershed

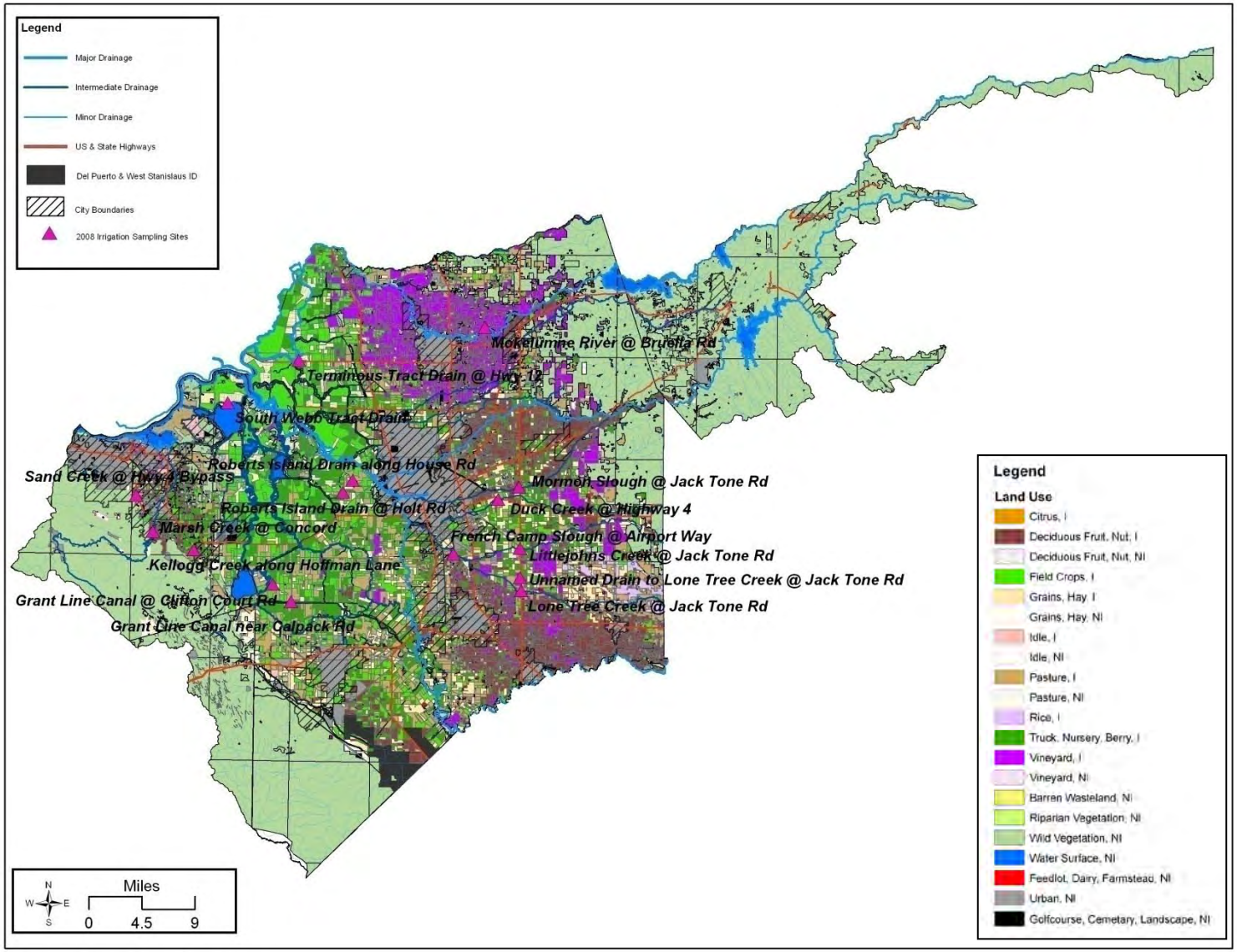
The Coalition region includes parts of San Joaquin, Contra Costa, Alameda, and Calaveras counties and comprises approximately 1,057,350 acres of which 548,362 (52%) are considered irrigated agriculture (Figure 1). The County Agricultural Commissioner's offices for San Joaquin, Contra Costa, Alameda and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

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

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

and ditches that convey water to one of the larger rivers or intermediate creeks/sloughs or are used to drain Delta islands. Figure 1 is a map of the agricultural lands in the Coalition region. The area shown in Calaveras County is the Upper Mokelumne and Upper Calaveras subwatersheds. Irrigated agriculture is located only in western Calaveras County and consequently the entire county is not shown on this map. The map provided in Figure 1 is in jpg format and consequently does not support a reasonable level of detail. More detailed maps are provided in the SJCDWQC Watershed Evaluation Report (WER) which was submitted March 16, 2007.

Figure 1. Agriculture lands in the SJCDWQC area.



Land Use

Irrigated agriculture is the predominant land use in the Coalition area. Of the approximate total 1,057,350 acres in the Coalition, irrigated agriculture comprises 52% (548,362 acres). There is a discrepancy between the Department of Water Resources (DWR) land use statistics and the County Agricultural Commissioner's land use statistics. Because the County Agricultural Commissioner's statistics are more recent, the Coalition uses those for the overall total of irrigated agriculture, but individual land use totals are from DWR. Wild vegetation covers 220,585 acres (20.9%) of the Coalition area and includes land cover classes such as natural riparian areas, parks, and open rangeland. Non-irrigated land uses cover 189,102 (17.9%) acres and include primarily urban land uses with some acreage in feedlots and impoundments. The remaining acres outside of the Coalition area in San Joaquin County are the Del Puerto or West Stanislaus Irrigation Districts or are urban lands. Land use data for Alameda County is based on an aerial survey by DWR in 1993 and described agricultural lands only in the general terms of cropped (irrigated) or fallow (non-irrigated).

The impact of urban land use on water quality may be equal to the effects from agricultural land use, especially due to the rapid and ongoing growth of urban centers. The rapid growth of cities such as Lodi, Stockton, Lathrop, and Manteca on the east side of the Delta and Antioch, Sand Hill, Knightsen, and Brentwood on the west side of the Delta are consuming large amounts of irrigated agricultural land. Land designated as agricultural only a few years ago, is now covered in housing developments and shopping malls.

A variety of crops are grown within the Coalition boundaries (Table 1) and different crops are often found in regions specific to microclimate, soil type, and local farming history. A more detailed discussion of crop type is provided in the site subwatershed descriptions. In general, agriculture varies geographically as one travels from the Delta to the eastern edge of the Coalition. The peat rich Delta soils and the loamy soils of the Coalition area, combined with the regions more temperate climate, make it ideal for field and vegetable crops such as asparagus, alfalfa, feed corn, peppers, sugar beets and tomatoes, orchard crops i.e. pears, cherries, and apricots, as well as turf farms and nurseries. In the east portion of the Coalition, deciduous orchards (primarily almonds and walnuts) and wine grapes (Lodi-Woodbridge area) are the dominant crops. There are also large acreages of irrigated pasture and numerous dairy farms in the southern portion of the Coalition.

Table 1. Crops grown in the SJCDWQC region.

Crop list was assembled from the CDPR database for 2004. An "X" in the month column indicates that a pesticide application was made on that crop during that month. Since detailed land use data is not available for the portion in Alameda County, a crop list is not provided for this County.

County Name	Crop	January	February	March	April	May	June	July	August	September	October	November	December
Contra Costa													
	Alfalfa (forage - fodder) (alfalfa hay)	X	X	X	X		X		X	X	X	X	X
	Apple	X		X	X	X	X	X	X			X	X
	Apricot	X	X	X	X	X			X		X	X	X
	Artichoke (globe) (all or unspec)				X								
	Asparagus (spears, ferns, etc.)	X	X	X	X	X	X	X	X		X		
	Barley, general	X											
	Beans, succulent (other than lima)								X	X			
	Cherry	X	X	X	X	X	X	X	X		X	X	X
	Corn (forage - fodder)				X	X	X	X	X				
	Corn, human consumption	X	X	X	X	X	X	X	X	X	X		
	Forage - fodder grasses (all or unspec) (hay)		X	X									
	Grapes			X	X	X	X	X				X	X
	Grapes, wine	X	X	X	X	X	X	X	X	X	X	X	X
	Melons			X	X			X	X				
	Nectarine	X	X	X	X	X			X		X	X	X
	N-grnhs grwn cut flwrs or greens	X	X	X	X	X	X	X	X	X	X		X
	N-grnhs grwn plants in containers	X	X	X	X	X	X	X	X	X	X	X	X
	N-outdr container/fld grwn plants	X	X	X	X	X	X	X	X	X	X	X	X
	N-outdr grwn cut flwrs or greens						X						
	Oats (forage - fodder)		X	X									
	Oats, general	X											
	Olive (all or unspec)					X	X	X	X	X	X		X
	Onion (dry, spanish, white, yellow, red, etc.)			X	X					X		X	
	Orchards (fruit/nut etc)				X				X	X		X	X
	Pastures (all or unspec)	X	X	X			X						
	Peach	X	X	X	X	X	X		X	X	X	X	X
	Pear	X				X		X					
	Peppers (fruiting vegetable), (bell,chili, etc.)			X	X								
	Plum (includes wild plums for human consumption)	X	X	X		X						X	X
	Potato (white, irish, red, russet)		X	X		X	X	X	X	X			

County Name	Crop	January	February	March	April	May	June	July	August	September	October	November	December
	Pumpkin									X			
	Ryegrass, perennial (forage - fodder)		X	X									
	Soil application, preplant-outdoor (seedbeds, etc.)	X		X								X	
	Sorghum/milo general						X						
	Squash (all or unspec)				X			X	X	X		X	
	Strawberry (all or unspec)			X				X					
	Tomato			X	X	X	X	X	X	X	X		
	Tomatoes, for processing/canning	X		X	X	X	X	X					
	Walnut (english walnut, persian walnut)	X		X	X	X	X	X	X	X	X	X	X
	Wheat (forage - fodder)	X	X	X									
	Wheat, general	X	X		X	X							
San Joaquin													
	Alfalfa (forage - fodder) (alfalfa hay)	X	X		X			X	X				X
	Almond	X	X		X			X	X				X
	Apple	X	X		X			X	X				X
	Apricot	X	X		X			X	X				X
	Asparagus (spears, ferns, etc.)	X	X		X			X	X				X
	Barley (forage - fodder)	X											
	Barley, general	X	X										
	Basil (bush, garden, sweet)				X				X				
	Beans (all or unspec)				X			X	X				
	Beans, dried-type	X	X		X			X	X				X
	Beans, succulent (other than lima)				X			X	X				
	Beets, general												X
	Blueberry	X											
	Broccoli				X				X				X
	Cabbage							X	X				
	Cantaloupe								X				
	Carrots, general	X	X		X			X					
	Cauliflower	X	X		X								
	Celeriac (celery root)							X					X
	Celery, general							X	X				X
	Cherry	X	X		X			X	X				X
	Chestnut								X				X
	Christmas tree plantations	X			X				X				
	Clover (all or unspec) (forage - fodder)												X
	Corn (forage - fodder)	X	X		X			X	X				X
	Corn, human consumption	X	X		X			X	X				
	Cotton, general				X			X	X				
	Cucumber (pickling, chinese, etc.)							X	X				
	Endive (escarole)								X				

County Name	Crop	January	February	March	April	May	June	July	August	September	October	November	December
	Forage - fodder grasses (all or unspec) (hay)	X	X					X					X
	Grapes	X	X		X			X	X				X
	Grapes, wine	X	X		X			X	X				X
	Kiwi fruit	X	X										
	Lettuce, leaf (all or unspec)		X						X				X
	Melons				X			X	X				
	Nectarine	X	X		X			X	X				X
	N-grnhs grwn cut flwrs or greens		X					X	X				
	N-grnhs grwn plants in containers	X	X		X			X	X				X
	N-grnhs grwn trnsplnt/prpgtv mtrl	X	X		X				X				X
	N-outdr container/fld grwn plants	X	X		X			X	X				X
	N-outdr grwn trnsplnt/prpgtv mtrl				X			X	X				
	Nut crops, nut trees (all or unspec)		X										
	Oats (forage - fodder)	X	X					X					X
	Oats, general	X	X		X								X
	Olive (all or unspec)	X			X			X	X				
	Onion (dry, spanish, white, yellow, red, etc.)	X	X		X			X	X				
	Onions (green)	X	X		X								X
	Parsley (leafy vegetable)		X					X	X				X
	Pastures (all or unspec)	X	X						X				X
	Peach	X	X		X			X	X				X
	Pear	X	X		X			X	X				X
	Pecan		X		X				X				X
	Peppers (fruiting vegetable), (bell,chili, etc.)		X		X			X	X				
	Persimmon	X			X								
	Pistachio (pistache nut)	X	X		X								
	Plum (includes wild plums for human consumption)	X	X		X			X	X				X
	Potato (white, irish, red, russet)				X			X	X				
	Pumpkin				X			X	X				
	Rice (all or unspec)				X			X					
	Rye (all or unspec)		X										
	Ryegrass, perennial (forage - fodder)	X											
	Safflower, general		X		X				X				X
	Sorghum/milo general							X	X				
	Squash (all or unspec)		X					X	X				
	Squash (summer)								X				
	Squash (winter) (hubbard squash, calabaza, etc.)							X	X				
	Stone fruits (all or unspec)		X		X								

County Name	Crop	January	February	March	April	May	June	July	August	September	October	November	December
	Strawberry (all or unspec)				X			X	X				
	Sudangrass (forage - fodder) (sorghum sudanese)							X	X				
	Sugarbeet, general							X					
	Tomato	X	X		X			X	X				X
	Tomatoes, for processing/canning	X	X		X			X	X				X
	Vegetables (all or unspec)				X								
	Walnut (english walnut, persian walnut)	X	X		X			X	X				X
	Watermelons				X			X	X				
	Wheat (forage - fodder)	X	X										
	Wheat, general	X	X		X			X					X

Climate

Summer temperatures are usually hot in the upper portions of the Valley, ranging from the mid 80's to mid 90's (^{o}F) for average high temperatures and the mid to upper 50's for average summer low temperatures. In the summer, the Delta and vicinity are subject to pulses of cool coastal air that can provide relief from summertime highs and allow for the farming of crops requiring temperatures. The upland areas are slightly cooler at night but generally remain hot throughout the summer. In the winter, temperatures are usually moderate in the Valley with average high temperatures in the mid to upper 50's and average low temperatures in the low 40's. Freezing, although less likely in the Delta region, does occur preventing the farming of perennial crops susceptible to frost. Annual precipitation on the valley floor in the Coalition area is variable, averaging 14-16 inches per year (City of Stockton). The southwestern portion of the Coalition region is in a rain shadow area and receives approximately half the rainfall of the rest of the Coalition region. Rainfall occurs predominantly during the winter and is heterogeneously distributed throughout this period (typical for a Mediterranean climate). Winter seasons are characterized by several small storms with one or two major events (increased rain due to several larger storms) providing the bulk of the precipitation. December, January and February are historically the months with greatest precipitation. There appears to be no discernible pattern as to when during the winter these large storms occur.

Soils

Soils maps reveal a complicated mosaic of soil types in the Coalition area. Generally, the Coalition area outside the Delta has sandy, well-drained soils. Soil type combines with other factors such as slope, soil saturation, rainfall/irrigation water amount, and drainage patterns to control runoff. Soils in the Delta contain high peat content and many Delta islands are now below sea level, a condition that has led to an intricate system of drains and pumps in this region. ArcGIS soils coverages have been provided previously and will not be provided as part of this document.

Hydrology

As previously indicated, there are several main rivers that cross the Coalition area from east to west. These rivers have complex hydrologic systems due to both seasonal influence of precipitation and management systems for water use (reservoirs, basin transfers, hydropower, municipal and irrigation supply, and anadromous fisheries). In general, flows are greatest during the winter and spring due to wintertime precipitation and subsequent springtime snowmelt. Summertime flows are now greater than they have been in the past due to reservoir releases during the dryer months of the year. The numerous small creeks that have their headwaters in the foothills and western portion of the Sierra Nevada Mountain Range are primarily ephemeral and historically have had no flow from early summer through the first rains of the winter. Current flow occurs as a result of irrigation return.

The drainages described in each site subwatershed include the main tributaries and the intermediate to small sized water bodies where in general water flow is maintained throughout the year. The exception to this is that flows may be lacking in the late summer and early autumn prior to the onset of the winter rains.

There is an increased propensity for runoff with increased slope, soil water saturation, and volume of water. These conditions arise primarily due to large amounts of rainfall and are more likely in the relatively greater sloped valley margins. During the winter, runoff is drained through the myriad of creeks, rivers and drains for flood management and may be subject to efforts of larger geographic flood control programs. Runoff can also occur during the irrigation season if water entering the field is greater than the amount that can infiltrate the soil.

In Delta islands, water is pumped in and out of supply and drainage canals. Ordinarily, drains pumping water off the islands could be turned off thus eliminating runoff. This cannot occur because water is continually entering the islands through groundwater recharge (essentially seepage from the greater in elevation water source on the river side of the levee) thus requiring off-island draining.

Valuable Aquatic Resources

Aquatic resources for water bodies within the Coalition area have been defined in part as those assigned as beneficial uses (BU) by the CVRWQCB. Using the tributary rule, BUs are applied to tributaries based on the currently assigned BU of the major downstream receiving water body (Table 2). Important aquatic resources exist in the Coalition area, including municipal and agricultural water use, cold water and warm water stream aquatic habitat, wetlands and fisheries resources. Wetlands are associated with riparian areas along many of the water bodies in the region. Several fisheries are considered important in the Coalition area including steelhead trout and Chinook salmon.

Steelhead trout (*Oncorhynchus mykiss*) were common in the region prior to the construction of the dams on all of the major tributaries of the San Joaquin River. Once the dams were constructed, historic spawning grounds were eliminated and with them, most of the wild salmonids in the Valley. Currently, no permanent steelhead stocks exist in the drainages of the Valley despite occasional reports of fish in the Tuolumne and Merced Rivers.

Chinook salmon (*Oncorhynchus tshawytscha*) are present in the San Joaquin River system and are found in all major tributaries in the region. All of the major tributaries are considered to be impaired for salmonid spawning and/or migration habitat as is the main stem of the San Joaquin River (Table II-1 of the Sacramento/San Joaquin River Basin Plan). A large hatchery exists on the Mokelumne River to supplement salmon populations impacted by the Comanche Reservoir.

Table 2. Site subwatershed drainage and beneficial uses.

Major rivers to which each site subwatershed drains and the beneficial use for each of the major river reaches.

Site subwatershed (site name)	Immediate Downstream River	Beneficial Use of Immediate Downstream River*
Mokelumne River @ Bruella Rd	Mokelumne River (Comanche Reservoir to Delta reach)	2, 3, 7-15
Duck Creek @ Highway 4	Sacramento San Joaquin Delta ("Beneficial uses vary throughout the Delta and will be evaluated on a case-by-case basis"--wording from the Central Valley Region Basin Plan)	1-5, 7-13, 15, 16
French Camp Slough @ Airport Way		
Grant Line Canal @ Clifton Court Rd		
Grant Line Canal near Calpack Rd		
Kellogg Creek along Hoffman Lane		
Littlejohns Creek @ Jack Tone Rd		
Lone Tree Creek @ Jack Tone Rd		
Marsh Creek @ Concord Ave**		
Mormon Slough @ Jack Tone Road		
Mosher Creek @ North Alpine Rd		
Roberts Island Drain @ Holt Rd		
Roberts Island Drain along House Rd		
South Webb Tract Drain		
Terminous Tract Drain @ Hwy 12		
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd		

* **Beneficial Use code list:**
1 - Municipal and Domestic Supply
2 - Agriculture Supply (irrigation)
3 - Agriculture Supply (stock watering)
4 - Industrial Process Supply
5 - Industrial Service Supply
6 - Hydropower Generation
7 - Water Contact Recreation
8 - Non-contact Water Recreation
9 - Warm Freshwater Habitat
10 - Cold Freshwater Habitat
11 - Migration of Aquatic Organisms (warm)
12 - Migration of Aquatic Organisms (cold)
13 - Spawning, Reproduction, and/or Early Development (warm)
14 - Spawning, Reproduction, and/or Early Development (cold)
15 - Wildlife Habitat

** Marsh Creek has been assigned only recreational beneficial uses

Figure 2. Site subwatershed size designation showing only 2008 irrigation site subwatersheds in the Coalition region.

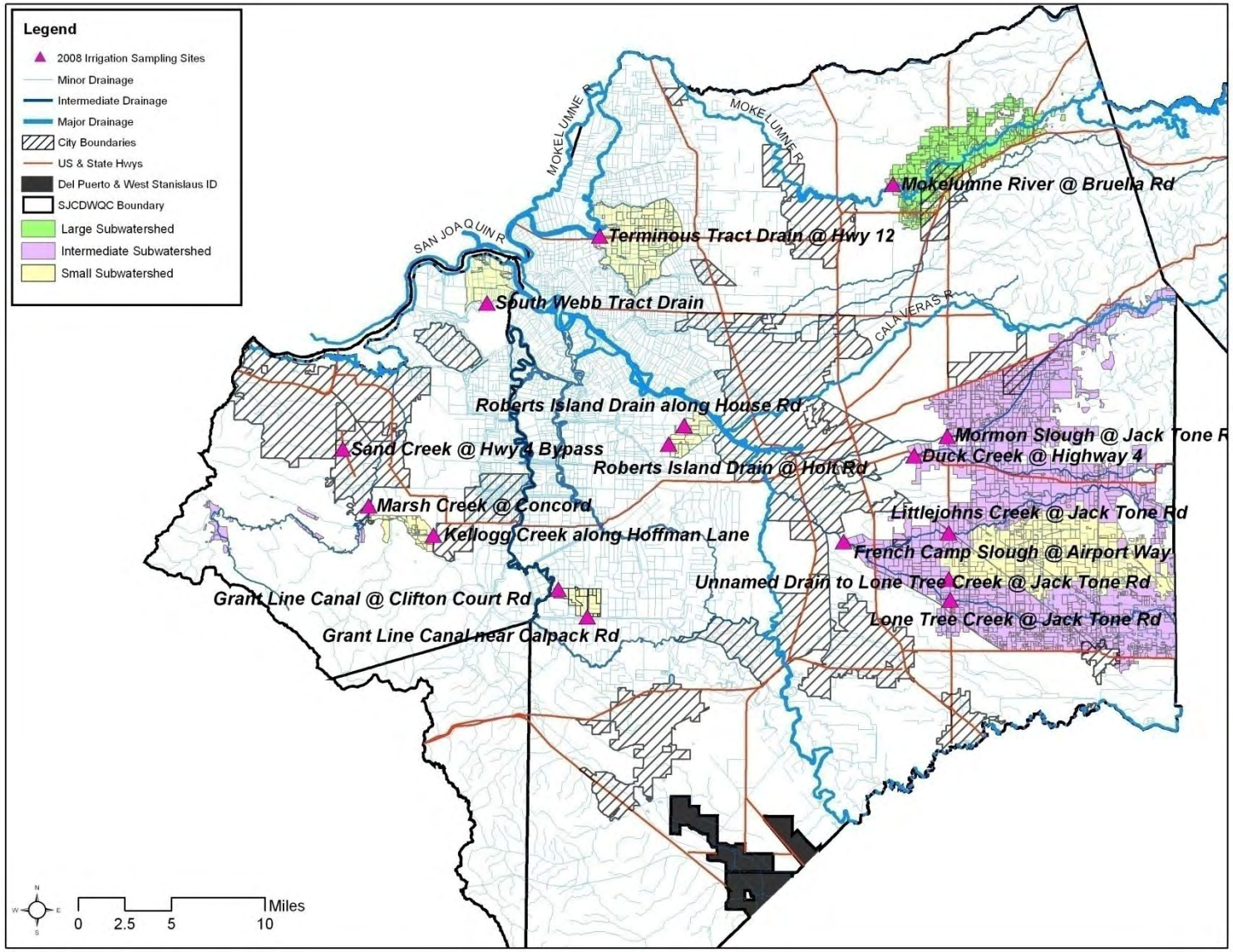


Figure 3. Site subwatershed size designation – Contra Costa County.

The legend for this map is provided in Figure 2 above.

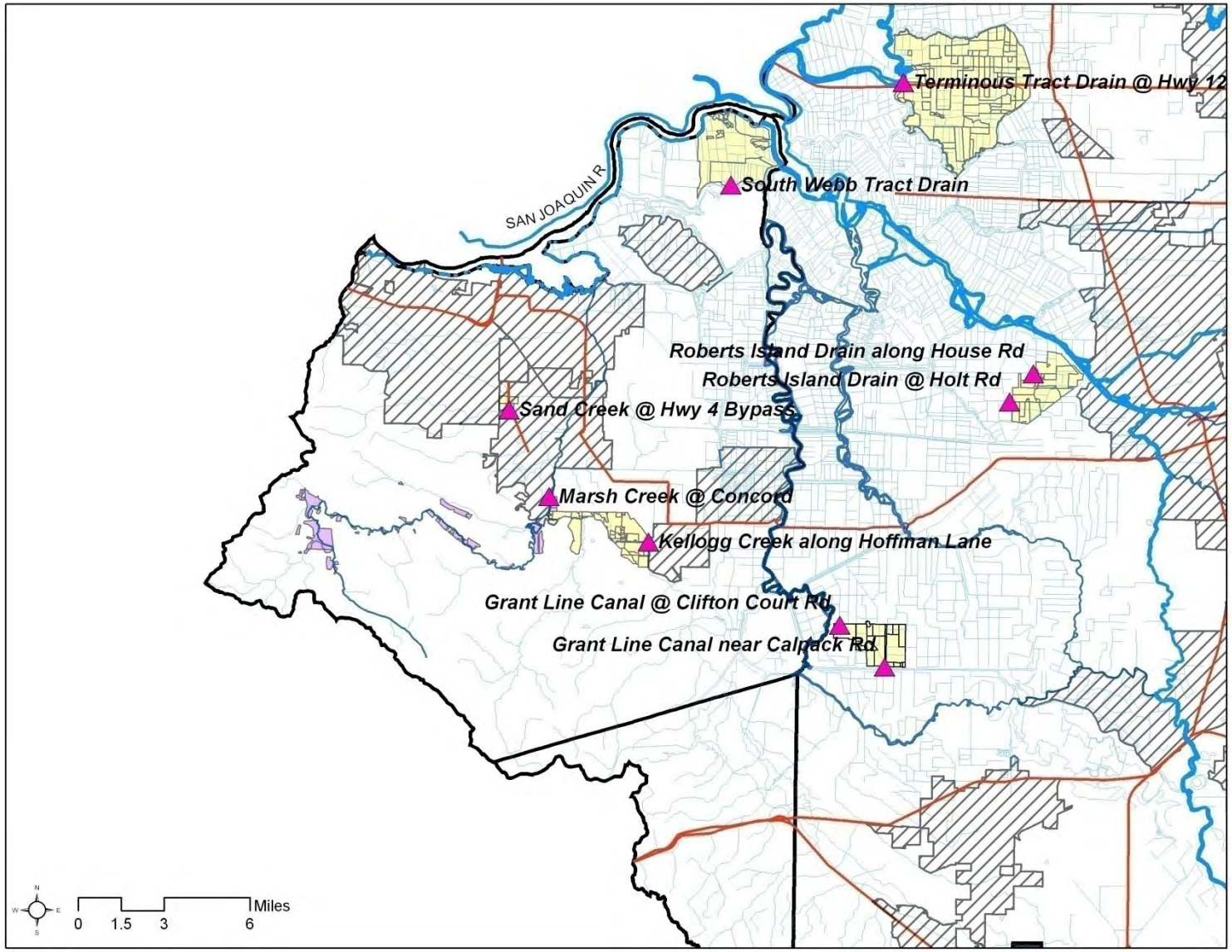


Figure 4. Site subwatershed size designation – northern San Joaquin County.

The legend for this map is provided in Figure 2 above.

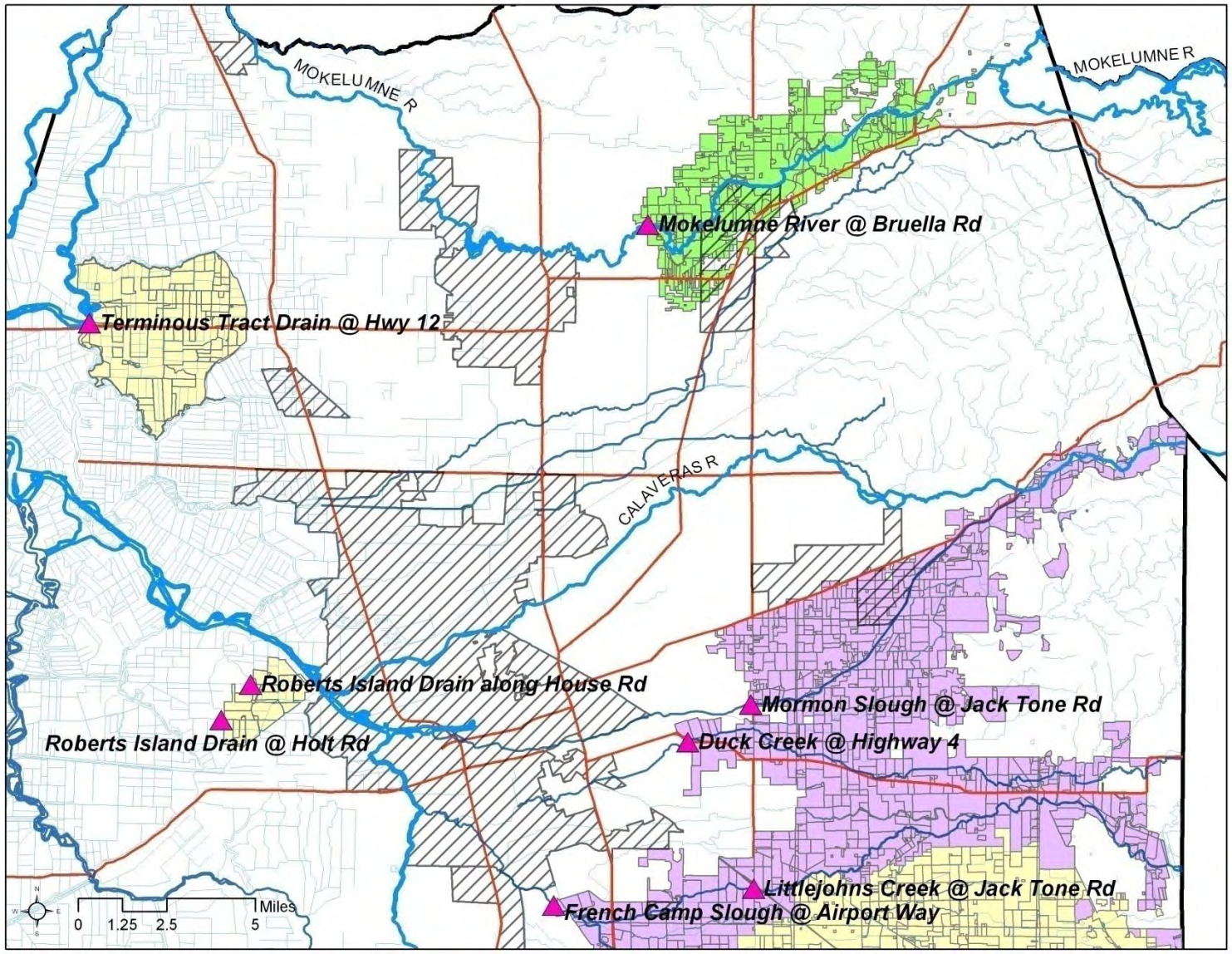
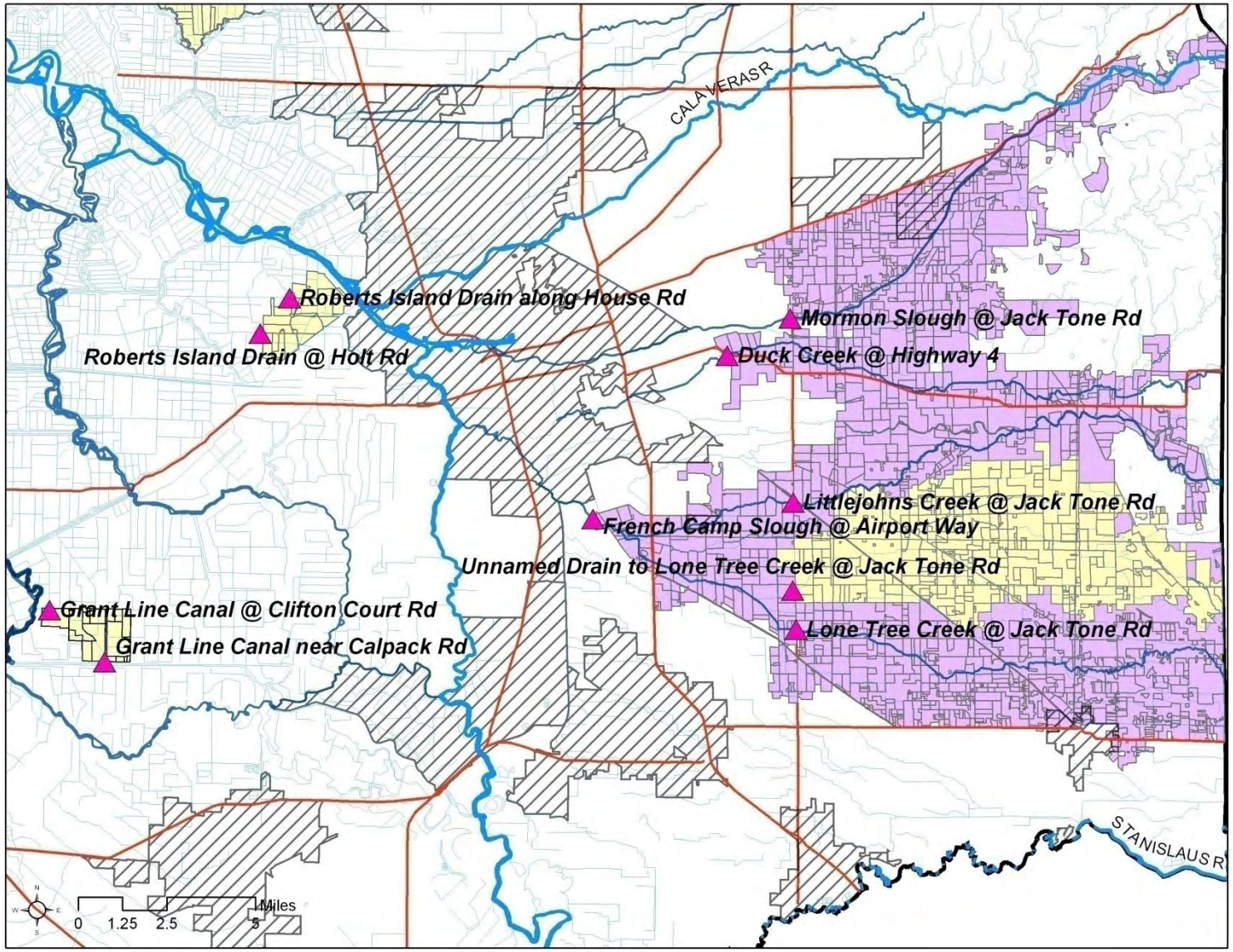


Figure 5. Site subwatershed size designation – southern San Joaquin County.

The legend for this map is provided in Figure 2 above.



Monitoring Objectives

History of Coalition Monitoring

Coalition ambient water and sediment quality monitoring has been conducted in the SJCDWQC region since the inception of the Irrigated Lands Regulatory Program (ILRP) in 2003. Each year both the number of sites monitored and the constituents analyzed have grown. In 2004 samples were collected from six sites and were sent to laboratories to test for nine total constituents/analytes as well as toxicity testing. By 2007, 15 monitoring sites were sampled and over 50 total analytes tested in addition to toxicity. In addition, the Coalition has conducted upstream sampling in 2005, 2007, and 2008 to help determine sourcing. Table 3 illustrates the sites monitored during each of the storm and irrigation seasons across years of sampling.

Table 3. Sample sites and years monitored.
A blank cell indicates that no sampling occurred at that site during the specified season.

StationName	2004	2005		2006		2007		2008	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Calaveras River @ Belota Intake	x								
Delta Drain- Terminous Tract off Glasscock Rd		x	x	x					
Delta Drain- Terminous Tract off Guard Rd		x	x	x					
Duck Creek @ Drais Rd[1]									x
Duck Creek @ Hwy 4	x				x	x	x	x	x
French Camp Slough @ Airport Way		x	x	x	x	x	x	x	x
Grant Line Canal @ Clifton Court Rd		x	x	x	x	x	x	x	x
Grant Line Canal near Calpack Rd		x	x	x	x	x	x	x	x
Kellogg Creek @ Hwy 4		x	x	x					
Kellogg Creek along Hoffman Ln			x	x	x	x	x	x	x
Littlejohns Creek @ Escalon-Bellota Rd[1]									x
Littlejohns Creek @ Jack Tone Rd	x	x	x	x	x	x	x	x	x
Lone Tree Creek @ Brennan Rd[1]			x	x					x
Lone Tree Creek @ Jacktone Rd	x	x	x	x	x	x	x	x	x
Lone Tree Creek @ Valley Home Rd[1]									x
Marsh Creek @ Balfour Ave		x	x	x					
Marsh Creek @ Concord Ave			x	x	x	x	x	x	x[2]
Marsh Creek @ Marsh Creek Rd Upper[1]							x		
Marsh Creek @ Marsh Creek Rd Lower[1]							x		
Mokelumne River @ Bruella Rd	x	x	x	x	x	x	x	x	x
Mokelumne River @ Fish Hatchery[1]			x						
Mormon Slough @ Jack Tone Rd					x	x	x	x	x

StationName	2004	2005		2006		2007		2008	
	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation	Storm	Irrigation
Potato Slough @ Hwy 12	x	x	x	x					
Roberts Island Drain @ Holt Rd					x	x	x	x	x
Roberts Island Drain along House Rd					x	x	x	x	x
Sand Creek @ Hwy 4 Bypass					x	x	x	x	x
South Webb Tract Drain									x[3]
Terminous Tract Drain @ Hwy 12		x	x	x	x	x	x	x	x
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd					x	x	x	x	x
Unnamed Drain to Lone Tree Creek @ Wagner Rd[1]									x

[1]Upstream sampling of normal monitoring locations conducted for source identification.
[2]Monitored April-August, then replaced by South Webb Tract Drain
[3]Monitored September only; replaced Marsh Creek @ Concord Ave

Irrigation Season Monitoring 2008

Monitoring Characterization

Normal Monitoring

This report covers monitoring conducted between the months of April 2008 and September 2008, during the irrigation season. The irrigation season sampling is designed to characterize the discharge from irrigated agriculture as a result of runoff from irrigated lands. Sampling during the irrigation season generally occurs once per month per site, or twice per month if a site's management plan specifies additional monitoring.

Irrigation season sediment samples were collected during the month of August. The Coalition was able to collect sediment samples on August 13, 2008.

Management Plan Monitoring

During the irrigation season of 2007, the Coalition initiated additional monitoring as part of the SJCDWQC Management Plan's strategy to identify contaminant sources and evaluate effectiveness of newly implemented management practices. This additional monitoring included monitoring for a constituent under a management plan twice during a month for which that constituent exceeded a water quality trigger limit (WQTL). In 2008, for locations where exceedances continued to occur for a second year, the Coalition sampled upstream. For more details on the process and schedule of Management Plan Monitoring in the SJCDWQC, see the Management Plan document submitted September 30, 2008 to the Regional Board. All upstream site subwatershed delineations including land use information is included in the SJCDWQC Management Plan.

Monitoring Objectives

The objectives of the SJCDWQC monitoring program are to:

- Determine the concentration and load of waste in discharges to surface waters.
- Evaluate compliance with existing narrative and numeric water quality objectives to determine if implementation of additional management practices is necessary to improve and/or protect water quality.
- Assess the impact of waste discharges from irrigated agriculture to surface water.
- Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality in watersheds within the coalition region.
- Determine the effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality.

In order to achieve the objectives listed above, the SJCDWQC monitored water quality at 15 sites for normal monitoring in the Coalition region during the 2008 irrigation season. The Coalition monitored an additional five upstream locations for Management Plan Monitoring. The Coalition sampled for numerous water quality variables and constituents including 39 pesticides, *E. coli*, physical parameters (total dissolved solids, color and turbidity), eight metals, total organic carbon, nutrients, field parameters (dissolved oxygen, pH, electrical conductivity), water toxicity to three test species including *Ceriodaphnia dubia*, *Pimephales promelas* and *Selenastrum capricornutum,* and sediment toxicity to *Hyalella azteca*. Monitoring constituents are established by the MRP (Order No. R5-2005-0833) and are discussed in more detail below.

Only one site (Marsh Creek @ Concord Ave) was not sampled due to dry conditions on August 12, 2008 (documented in the section on Precision and Accuracy). This site was documented by photographs which are available on request. Sediment sampling occurred on August 13, 2008, for which Marsh Creek @ Concord Ave was dry as well. All other sites had contiguous water and were sampled and analyzed for sediment toxicity.

Pesticides and Toxicity

Pesticides can enter the water column or sediment as a result of applications that occur during the winter including dormant and pre-emergent sprays. Runoff from fields can move sediment and chemicals to surface waters. Water collected for chemical analysis can identify those chemicals and concentrations can be compared to numeric and narrative water quality trigger limits to determine if exceedances have occurred. Toxicity testing is complementary to chemical analyses and can provide an independent and more direct assessment of the level of impairment in the water body. The objective of the Coalition is to use the toxicity testing along with water chemistry to assess the impact of discharges from irrigated agriculture on waterbodies in the Coalition region.

Nutrients and Physical Parameters

Excessive nutrients can cause eutrophication of surface waters as well as elevated TOC, color content, and turbidity. All of these factors can independently cause impairment of surface

waters. However, sources of nutrients, organic carbon, and low DO are difficult to determine. The Coalition's objective is to determine if exceedances are occurring and to determine if potential sources can be identified through analysis of monitoring data. If current monitoring data are not sufficient, the Coalition may conduct further investigations to identify sources. Such investigations may include special studies where they are determined to be cost effective. By understanding the sources of constituents responsible for the exceedances, the Coalition can properly recommend management practices to address nutrient and physical parameter exceedances.

Field Parameters

Much like physical parameters, exceedances of water quality triggers for pH, DO, and SC are difficult to track to sources. All of these parameters are non-conserved meaning that they can increase or decrease in concentration as water moves downstream. These parameters are the responses to processes occurring in the water column and sediment and can vary diurnally. As with nutrients and physical parameters, the Coalition's objective is to determine if exceedances are occurring, and to investigate potential sources through analysis of monitoring data and special studies, where cost effective. For example, the Coalition collected additional samples for biological oxygen demand (BOD) during 2007 to better understand the causes of low DO. By understanding the sources of constituents that may affect field parameters, the Coalition can properly recommend management practices to address the exceedances.

E. coli

E. coli inhabits the intestinal tracts of animals and is voided in fecal material. *E. coli* may persist in the presence of oxygen in the environment for periods of time after being voided. The bacteria are also known to reproduce and magnify in the environment. However, conditions under which this occurs are not well understood and require additional research. Any species of vertebrate that voids feces can contribute *E. coli* to surface waters, including humans, domesticated animals such as pets (dogs and cats primarily), cows and chickens, waterfowl (ducks and geese), raccoons, otters, ground squirrels, feral pigs, and in some locations deer. Consequently, there may be a large amount of bacteria in any environmental sample that is collected.

E. coli from humans can enter aquatic systems from leaky septic systems, leaky sanitary sewer lines, improperly treated discharge from waste water treatment plants, application of biosolids to agricultural land, and direct inputs from individuals who defecate in or near water bodies. Input from cows can occur from dairies, grazing in irrigated pastures, and various manure sources. *E. coli* from chickens can enter from poultry operations or manure sources. Irrigated agriculture is responsible for management if *E. coli* contamination occurs due to irrigated pasture or manure applications for fertilizer.

Metals

The Coalition samples for four basic classes of metals; 1) those that are naturally elevated because of underlying geologic materials (boron, selenium), 2) those that are applied by agriculture (copper, zinc, nickel), 3) those that may be legacy pesticides but also have numerous nonagricultural sources (lead, arsenic), and 4) those that are found solely as a result of nonagricultural anthropogenic sources (cadmium). These categories are not mutually exclusive and in fact, all metals belong to the first category. For example, nickel is a plant micronutrient that may be incorporated into fertilizer mixes, although normally there is a sufficient quantity of nickel in soils to supply the needs of crops. As a result, although it may be applied by agriculture, exceedances would be expected primarily as a result of natural weathering of soils.

Natural weathering of geologic materials can release to surface waters other metals and metalloid elements such as selenium, arsenic, and boron. Selenium salts are naturally elevated in the parts of the southwestern San Joaquin Valley and are transported during storm and irrigation runoff to surface waters in other parts of the valley. These salts are so problematic that there is a prohibition of discharge of irrigation return flows in some locations. Boron is naturally elevated particularly in the coastal mountain ranges and runoff brings boron from these mountains to the Valley floor. Arsenic appears also to be naturally elevated in several locations in the Valley. Zinc and nickel are also found in soils and can be found in surface waters at levels that reflect background concentrations. Both of these elements can be applied by agriculture as well, and the difference between applications and natural weathering must be understood to properly manage the amounts reaching surface waters. Understanding background levels of these elements will be an important task for the Coalition when trying to understand the impacts of agricultural inputs to surface waters.

While all other metals can be released as a result of the weathering of geologic materials, elevated levels of most metals are a result of anthropogenic inputs. Lead was used as a pesticide during the last century but was used in smaller and smaller amounts over the last several decades before being prohibited in the 1990s. Lead was also used in gasoline until the early 1980s when it was replaced by other fuel oxygenates, and lead-based paint was routinely used until the latter parts of the last century. Lead is also a component of batteries and is the material in solder in numerous electronic devices including televisions, computers, and cell phones. These sources can be distinguished through sophisticated analytical tests that are beyond the capabilities of the Coalition. Copper is routinely used by agriculture on a number of crops and could be found in surface waters as a result of applications. Additional sources include road surfaces where wearing of brake pads can result in substantial loading to surface waters.

Because fertilizer applications and the micronutrient constituents included in the mix are not reported, there is no way the Coalition can distinguish between natural and anthropogenic sources with monitoring data. Several of these metals can be identified to source using sophisticated analytical equipment and techniques, but these tests are beyond the capabilities of the Coalition.

Sampling Site Descriptions

The site names, codes and locations of all sites monitored during the 2008 irrigation season are provided in Table 4. A narrative description of each site subwatershed with respect to hydrology and agricultural production follows below. Indented sites indicate an upstream Management Plan Monitoring location and are listed below the downstream normal monitoring site name (Table 4).

Table 4. SJCDWQC irrigation season 2008 sampling locations.

Site Name Upstream Management Plan Site Name	Station Code	Latitude	Longitude
Duck Creek @ Highway 4	531XDCAHF	37.9491	-121.1810
Duck Creek @ Drais Rd	531XDCADR	37.9348	-121.0841
French Camp Slough @ Airport Way	531SJC504	37.8817	-121.2493
Grant Line Canal @ Clifton Court Rd	544XGLCCR	37.8414	-121.5288
Grant Line Canal near Calpack Rd	544XGLCAA	37.8205	-121.4999
Kellogg Creek along Hoffman Lane	544XKCAHL	37.8819	-121.6522
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	37.8896	-121.1461
Littlejohns Creek @ 26 Mile Rd	531LCATMR	37.8932	-120.8776
Littlejohns Creek @ Escalon Bellota Rd	531XLCAER	37.9255	-120.9991
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	37.8376	-121.1438
Lone Tree Creek @ Brennan Rd	535XLTABR	37.8255	-121.0159
Lone Tree Creek @ Valley Home Rd	535LTCVHR	37.8202	-120.9022
Mokelumne River @ Bruella Rd	531XMRABR	38.1601	-121.2051
Mormon Slough @ Jack Tone Rd	544MSAJTR	37.9647	-121.1488
Roberts Island Drain @ Holt Rd	544RIDAHT	37.9556	-121.4223
Roberts Island Drain along House Rd	544RIDAHR	37.9702	-121.4074
Sand Creek @ Hwy 4 Bypass	544SCAHFB	37.9475	-121.7430
South Webb Tract Drain	544XXSWTD	38.0632	-121.6033
Terminous Tract Drain @ Hwy 12	544XTTHWT	38.1166	-121.4936
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	37.8536	-121.1457
Unnamed Drain to Lone Tree Creek @ Wagner Rd	531UDLTWR	37.8709	-121.0911

Site Subwatershed Descriptions

The Coalition sampled a total of 16 site subwatersheds as part of normal monitoring during the 2008 irrigation season. On July 14, 2008 the Coalition requested the Executive Officer of the Regional Board to exchange the monitoring location March Creek @ Concord Ave with South Webb Tract Drain. The exchange was approved on August 13, 2008 and South Webb Tract Drain was sampled in September and Marsh Creek sampled from April to August. Therefore 15 site subwatersheds were sampled each event. Four of the subwatersheds contained one or more upstream management plan sites. Descriptions of the site subwatersheds for all sample sites and all upstream management plan sites are provided below alphabetically. Management

Plan Monitoring sites are indented after the associated downstream normal monitoring location.

Duck Creek @ Highway 4 (10,746 irrigated acres) – This site is located just to the east of the city of Stockton. Duck Creek drains a section of southern San Joaquin County between Stockton and the Lone Tree Creek site subwatershed. During the summer flow is typically low in the creek. The creek channel was dredged over several months early in the 2007 irrigation season. The predominant land uses for irrigated agriculture are field crops and irrigated pasture. There are also a relatively large amount of deciduous nuts in the site subwatershed and truck farm/nursery and berry crops are also grown.

Duck Creek @ Drais Rd (5,393 irrigated acres) – This site is upstream of Duck Creek @ Hwy 4, east of the city of Stockton. The predominant irrigated agriculture is field crops and irrigated pasture. There is also a relatively large amount of deciduous nuts in the site subwatershed and truck farm/nursery and berry crops are also grown. Some vineyards are also present in the area.

French Camp Slough @ Airport Way (68,459 irrigated acres) – The main water bodies draining this site subwatershed are Littlejohns Creek and Lone Tree Creek, which merge to form French Camp Slough. This site was selected as a downstream companion site to the Littlejohns Creek @ Jack Tone Road and Lone Tree Creek @ Jack Tone Road sites. These water bodies drain agricultural land to the east of Manteca and Stockton and eventually flow through urban areas prior to their discharge to the San Joaquin River. This site represents all of the major types of agriculture present in the Coalition region including field crops, orchards, grains and hay, vineyards as well as irrigated pasture.

Grant Line Canal near Calpack Road (1,676 irrigated acres) – This site is located on the southwest section of Union Island. The site is adjacent to Grant Line Canal at a pumping station and drains fields immediately north and east. The crops grown are primarily alfalfa, field crops, tomatoes and grain.

Grant Line @ Clifton Court Road (756 irrigated acres) – This site is located on the southwest section of Union Island. The site is west of the Grant Line Canal near Calpack Road site immediately south of Clifton Court and drains fields east and south. The crops are primarily alfalfa, field crops, tomatoes and grain.

Kellogg Creek along Hoffman Lane (2,116 irrigated acres) – This site is upstream from Kellogg Creek @ Hwy 4 which was sampled in 2004 and 2005. Kellogg Creek @ Hwy 4 is no longer sampled because of large urban inputs. Deciduous nuts are the predominant crop grown in the site subwatershed along with nursery, berry, and some field crops.

Littlejohns Creek @ Jack Tone Road (12,356 irrigated acres) – This site is upstream from the French Camp Slough @ Airport Way site. The crops grown in the site subwatershed represent

all of the major types of agriculture present in the Coalition region including field crops, orchards, grains, and vineyards as well as irrigated pasture.

Littlejohns Creek @ 26 Mile Road (1,448 irrigated acres) – This site is upstream of both Littlejohns Creek @ Jack Tone Road and Littlejohns Creek @ Escalon Bellota Road. There is no reported irrigated agriculture above this site, only pasture and grazing land and a small amount of dry-farmed vineyards.

Littlejohns Creek @ Escalon Bellota Road (6,779 irrigated acres) – This site is upstream of Littlejohns Creek @ Jack Tone Road and includes approximately the upper 1/3 of the irrigated agriculture in the subwatershed. The crops grown in this portion of the site subwatershed represent all of the major types of agriculture present in the Coalition region including field crops, orchards, grains, and vineyards as well as irrigated pasture.

Lone Tree Creek @ Jack Tone Road (22,359 irrigated acres) – This site is upstream from the French Camp Slough @ Airport Way site. This site drains a large portion of the southern SJCDWQC region and confluences downstream with Littlejohns Creek and eventually French Camp Slough, flowing through urban areas before emptying into the Delta. The main agricultural land use upstream consists of deciduous nuts, field crops, irrigated pastures and dairies.

Lone Tree Creek @ Brennan Road (14,393 irrigated acres) – This site is upstream of Lone Tree Creek @ Jack Tone Road and includes approximately the upper 1/3 of the irrigated agriculture in the Lone Tree Creek subwatershed and 1/7 of the irrigated agriculture in the French Camp Slough subwatershed. The site includes runoff from irrigated pasture, grains and rice, and field crops.

Lone Tree Creek @ Valley Home Road (5,285 irrigated acres) – This site is upstream of both Lone Tree Creek @ Jack Tone Road and Lone Tree Creek @ Brennan Road and is above most irrigated agriculture in the subwatershed. The site collects runoff from rice and pasture.

Marsh Creek @ Concord Avenue (230 irrigated acres) – Located on the southern edge of Brentwood, this site drains primarily deciduous nuts crops immediately upstream. Marsh Creek is fed by Marsh Creek Reservoir and also by Marsh Creek upstream of the reservoir. Land use upstream of the reservoir has a small amount of deciduous nut and fruit (approx. 45 acres) and approximately 220 acres of grains and hay, but it is largely represented by urban use (approximately 1,000 acres). Monitoring at this site ceased after August 2008 due to the elevated input from urban areas, and the coalition commenced monitoring at South Webb Tract Drain in September.

Mokelumne River @ Bruella Road (11,261 irrigated acres) – Upstream agriculture is primarily vineyards although some orchards are immediately adjacent to the site. Water released from Comanche Reservoir controls the amount of flow at this site as the vineyards are primarily

irrigated by drip and the orchards are irrigated by microspray. This site integrates the signal from a relatively large upstream area.

Mormon Slough @ Jack Tone Road (21,219 irrigated acres) – This site is located to the north of and running parallel to the Duck Creek site subwatershed. Mormon Slough drains an area east of Stockton consisting of mostly agriculture and eventually flowing through Stockton and into the Delta. Vineyards and deciduous nuts make up over half of the irrigated agriculture in the site subwatershed with field crops, grains, truck farm/nursery/berry, and irrigated pasture contributing large acreages.

Roberts Island Drain @ Holt Road (1,171 irrigated acres) – This site subwatershed is a portion of Roberts Island that is drained by the pump along McDonald Road west of the sample site. It is located south of Roberts Island Drain along House Road. The primary agriculture upstream of the sample site is asparagus, field crops, grains, hay (alfalfa), and pasture.

Roberts Island Drain along House Road (1,229 irrigated acres) – This site subwatershed is located on the northeastern edge of Roberts Island. From the sample site, the water in the drain flows north. The primary agriculture in the site subwatershed is asparagus, followed by field crops and pasture.

Sand Creek @ Highway 4 Bypass (185 irrigated acres) – Located northwest of Brentwood where Highway 4 Bypass crosses Sand Creek, this site subwatershed drains approximately 23 fields of deciduous nuts, fruits, grains and hay. The Roddy Ranch Golf Club is located upstream of the sampling site off Empire Mile Road in Horse Valley, which is adjacent to one of the tributaries of Sand Creek.

South Webb Tract Drain (3,314 irrigated acres) – Webb Tract is a central Delta island located just north of Franks Tract near Discovery Bay. There are two pumps on the island, however the south pump moves a large portion of the water and the north pump runs only occasionally. This site subwatershed includes row crops, usually corn.

Terminous Tract Drain @ Highway 12 (9,889 irrigated acres) – This site drains all of the acreage north of State Highway 12 and most of the acreage south of the Highway on Terminous Tract. This sampling site is located near the confluence of White Slough/Potato Slough and the Mokelumne River. The primary agricultural crops are field crops, turf, grains, and hay.

Unnamed Drain to Lone Tree Creek @ Jack Tone Road (23,051 irrigated acres) – This site subwatershed is located to the north of the Lone Tree Creek site subwatershed and south of Littlejohns Creek. The drain forms in the eastern portion of San Joaquin County and flows west eventually confluencing with Lone Tree Creek just west of Jack Tone Road. Unlike most of the SJCDWQC area, rice is a major crop in the site subwatershed. Agriculture in the site subwatershed also consists of deciduous orchards, field crops, and grains.

Unnamed Drain to Lone Tree Creek @ Wagner Road (20,967 irrigated acres) – This site is upstream of Unnamed Drain to Lone Tree Creek @ Jack Tone Road and includes the upper 2/3 of the irrigated agriculture in the subwatershed. The drained area collected at the site includes rice, deciduous orchards, field crops, and grains.

Monitoring and Analysis

Normal Monitoring

Table 5 specifies the constituent groups monitored at each site subwatershed during normal monitoring. The Coalition monitoring program formerly consisted of a mix of Phase I and Phase II monitoring elements at various sites, but during the 2008 irrigation season all sites were sampled for all constituent groups regardless of their sampling history, with three exceptions.

On November 19, 2007 the Coalition submitted a proposal to the Regional Board to drop constituents at sites that had been monitored for two or more full years which did not have a single exceedance of a water quality trigger limit. On December 14, 2007 the Coalition was notified by the Executive Officer that the Coalition would no longer need to monitor at the listed locations for the following constituents:

- Marsh Creek @ Concord Ave: organophosphates, pyrethroids, *Ceriodaphnia dubia* toxicity, and *Selenastrum capricornutum* toxicity,
- Mokelumne River @ Bruella Rd: pyrethroids, *Pimephales promelas* toxicity,
- Terminous Tract @ Hwy 12: pyrethroids and *Hyalella azteca* toxicity.

Additionally, because two years of sampling resulted in no exceedances of *E. coli* at the Mokelumne River @ Bruella Road site, the constituent was dropped from the suite of analytes monitored at that site after the storm season of 2006. However, since that time the CVRWQCB has requested that this constituent be added back into the Coalition monitoring schedule. As a result, *E. coli* monitoring at the Mokelumne River site was reinstituted with the onset of the 2008 irrigation season.

On August 13, 2008 the Coalition received approval to drop Marsh Creek from its monitoring program due to the increased amount of urbanization within this subwatershed. The Coalition replaced the Marsh Creek @ Concord Avenue sampling location with a Delta island location, South Webb Tract Drain, which was first sampled in September 2008.

Refer to the sample details provided under Monitoring Results for a list of samples collected and constituents analyzed during each monitoring event of the irrigation season.

Table 5. SJCDWQC irrigation 2008 sampling constituents.

Constituents listed below include field parameters (pH, DO, SC and temperature), metals, nutrients, physical parameters (color, turbidity, total dissolved solids), total organic carbon (TOC), *E. coli*, pesticides (organophosphates, pyrethroids, carbamates, herbicides, organochlorines, and glyphosate/paraquat), water column toxicity (water flea, algae and fathead minnow) and sediment toxicity.

Site Name	Field Parameters	Metals	Nutrients	TOC	Physical Parameters	*E. coli*	Organophosphates	Pyrethroids	Carbamates	Herbicides	Organochlorines	Glyphosate and Paraquat	Water flee toxicity	Algae toxicity	Fathead minnow toxicity	Sediment Toxicity
Duck Creek @ Hwy 4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
French Camp Slough @ Airport Way	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Grant Line Canal near Calpack Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Grant Line Canal @ Clifton Court Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kellogg Creek along Hoffman Ln	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Littlejohns Creek @ Jack Tone Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lone Tree Creek @ Jack Tone Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Marsh Creek @ Concord Ave[1]	x	x	x	x	x	x			x	x	x	x			x	x
Mokelumne River @ Bruella Rd	x	x	x	x	x	x	x		x	x	x	x	x	x		x
Mormon Slough @ Jack Tone Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Roberts Island Drain @ Holt Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Roberts Island Drain along House Rd	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sand Creek @ Hwy 4 Bypass	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South Webb Tract Drain[2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Terminous Tract Drain @ Hwy 12	x	x	x	x	x	x	x		x	x	x	x	x	x	x	
Unnamed Drain to Lone Tree Cr @ Jack Tone Rd	x			x	x	x	x	x	x	x	x	x	x	x	x	x

[1]Monitored April-August, then replaced by South Webb Tract Drain.

[2] Monitored September only; replaced Marsh Creek @ Concord Ave.

Management Plan Monitoring

Management Plans are intended to identify agriculture sources, document implemented management practices, and provide performance goals in response to water quality impairments within the Coalition. Sites at which two or more exceedances were detected in two years of monitoring were prescribed an enhanced monitoring program in their site subwatershed Management Plan, submitted on September 30, 2008. Management Plan samples were collected in the same calendar month as the exceedances that triggered the Management Plan and are analyzed only for the constituent(s) that triggered the Management Plan. Management Plans specify Tier 1 or Tier 2 monitoring, depending on the frequency and intensity of exceedances detected in the water body. If exceedances continue to occur additional actions are taken, including an attempt to locate the source with upstream sampling. Upstream samples are collected during the same event as normal monitoring yielding results from two or more locations along the length of a water body during a single sampling event.

Additional sampling took place 12 times at four sites and upstream sampling took place 22 times at six sites. Upstream Management Plan sites are indented in the above tables and site descriptions. The complete Management Plan sampling schedule for the 2008 irrigation season indicating the site and target constituent is in Table 6 below.

Table 6. 2008 Management Plan sampling schedule. U = upstream sampling; A = additional sampling.

Sample Site	Month	Type	Chlorpyrifos	Dieldrin	Metals	Copper	Ceriodaphnia dubia	Selenastrum capricornutum
			1 L amber glass (1)	1 L amber glass (1)	500 mL plastic w/ HNO_3 (1)	500 mL plastic w/ HNO_3 (1)	1 gal amber glass (1)	1 gal amber glass (1)
			Organophosphate EPA 8141A	Organochlorine EPA 8141A	Metals EPA 200.8	Metals EPA 200.8	Toxicity EPA 821-R-02-012	Toxicity EPA 821-R-02-013
Kellogg Creek along Hoffman Way	April	A					x	
Duck Creek @ Drais Rd	May	U	x					
Littlejohns Creek @ 26 Mile Rd	May	U			x			
Littlejohns Creek @ Escalon Bellota	May	U			x			
Lonetree Creek @ Valley Home Rd	May	U			x			
Mokelumne River @ Bruella Rd	May	A						x
Mormon Slough @ Jacktone Rd	May	A	x					
Sand Creek @ Hwy 4 Bypass	May	A	x	x			x	
Littlejohns Creek @ 26 Mile Rd	June	U			x			
Littlejohns Creek @ Escalon Bellota	June	U			x			
Lonetree Creek @ Valley Home Rd	June	U			x			
Mokelumne River @ Bruella Rd	June	A				x	x	
Sand Creek @ Hwy 4 Bypass	June	A	x	x			x	
Duck Creek @ Drais Rd	July	U	x					
Kellogg Creek along Hoffman Way	July	A				x		
Littlejohns Creek @ 26 Mile Rd	July	U			x			
Littlejohns Creek @ Escalon Bellota	July	U	x					x
Lonetree Creek @ Brennan Rd	July	U	x		x			
Lonetree Creek @ Valley Home Rd	July	U			x			
Mokelumne River @ Bruella Rd	July	A				x		x
Sand Creek @ Hwy 4 Bypass	July	A					x	
Unnamed Drain @ Wagner Rd	July	U	x					
Littlejohns Creek @ 26 Mile Rd	August	U			x			
Littlejohns Creek @ Escalon Bellota	August	U	x					x
Lonetree Creek @ Brennan Rd	August	U	x		x			
Lonetree Creek @ Valley Home Rd	August	U			x			
Mokelumne River @ Bruella Rd	August	A				x		x
Duck Creek @ Drais Rd	September	U	x					
Littlejohns Creek @ 26 Mile Rd	September	U			x			
Lonetree Creek @ Brennan Rd	September	U			x			
Lonetree Creek @ Valley Home Rd	September	U			x			
Mokelumne River @ Bruella Rd	September	A					x	
Mormon Slough @ Jacktone Rd	September	A	x					
Unnamed Drain @ Wagner Rd	September	U	x					

Location Maps of Sample Sites and Land Use

All site subwatersheds in Table 6 drain agricultural land in the Coalition region. Table 7 includes the land use acreage for each major crop or land use type designated as irrigated/non-irrigated (I/NI) for normal monitoring locations. Land use for each site subwatershed is provided and is listed by alphabetical order. Land use maps are provided as Figures 6 - 8 for normal monitoring locations and include parcel specific land use data as well as the hydrology that drains those parcels. Not included are roadside ditches that may drain fields to the nearest surface water body. Ditches are constructed to move water draining from roads adjacent to the fields and are not generally constructed to move water draining from agricultural fields. Land use information was obtained from data provided by California Department of Water Resources (http://www.landwateruse.water.ca.gov/annualdata/landuse/2001/landuselevels.cfm).
Land use maps for upstream sampling locations can be found in the SJCDWQC Management Plan. A narrative description of each site subwatershed monitored during the 2008 irrigation season is provided in the previous section, Sampling Sites Descriptions.

Table 7. Land use acreage of site subwatersheds.

The land uses are designated as irrigated/non-irrigated (I/NI). Sites are listed alphabetically.

Land Use	I/NI	Duck Creek @ Hwy 4	French Camp Slough @ Airport Way	Grant Line Canal near Calpack Rd	Grant Line Canal @ Clifton Ct	Kellogg Creek along Hoffman Ln	Littlejohns Creek @ Jack Tone Rd.	Lone Tree Creek @ Jack Tone Rd.	Marsh Creek @ Concord	Mokelumne River @ Bruella Rd	Mormon Slough @ Jack Tone Rd	Roberts Is Drain @ Holt Rd	Roberts Is Drain along House Rd	Sand Creek @ Hwy 4 Bypass	South Webb Tract Drain	Terminous Tract @ Hwy 12	Unnamed Drain to Lone Creek @ Jack Tone Rd
Citrus	I		11.4			4.0		11.4		5.1	6.2	5.6					
Deciduous Nut And Fruit	I	1,618.6	10,301.9			846.7	2,391.7	4,641.4	122.6	2,590.2	9,333.6			108.9			919.9
Deciduous Nut And Fruit	NI								21.4	4.3							
Field Crop	I	1,927.7	7,368.8	873.4	443.1	218.4	1,246.7	1,832.5	20.8	518.4	1,308.5	378.7	542.7		1,992.7	5,100.9	3,136.5
Grain And Hay	I	3,452.5	14,977.8	49.1	313.1		3,314.8	4,843.2	69.7	98.3	2,047.3	312.2	42.8	76.5	1,303.9	2,056.8	5,089.7
Grain And Hay	NI		332.9				326.8	22.7	135.8		14.9						
Idle	I	64.6	565.3			122.6	109.0	202.2	16.9	480.4	425.1				17.4	37.1	246.3
Idle	NI		42.4						56.5								42.4
Barren Wasteland	NI									11.4							
Riparian Vegetation	NI		16.3					6.5	39.4	258.6	35.9				124.7	50.7	9.8
Wild Vegetation	NI	91.3	1,430.1				226.4	144.6	60.2	1,695.2	694.9		26.6		24.9	310.5	264.0
Water Surface	NI	11.6	81.2				16.9	4.2	48.2	443.0	155.6				91.4		20.5
Pasture	I	1,080.7	15,233.9	721.8		52.5	1,392.3	6,352.3		892.1	1,461.9	354.7	643.7			1,067.3	5,625.7
Pasture	NI										20.9						
Rice	I		5,973.5					3,000.7									2,933.3
Feedlot, Dairy, Farmstead	NI	112.5	2,233.4	14.8		30.3	210.5	932.3	29.8	147.5	232.8	16.7	12.9			19.4	972.5
Truck, Nursery, Berry	I	1,551.3	5,811.2	32.1		872.3	1,267.4	297.3		324.7	2952.2	119.9				1,275.6	1,415.2
Urban	NI	101.1	1,576.1			10.1	292.2	429.4	944.3	520.7	498.1					143.7	182.3
Golfcourse, Cemetery, Landscape	NI	18.0	165.4				8.7	29.4									
Vineyard	I	1,050.2	8,215.7				2,633.7	1,177.6		6,351.5	3,683.7					350.6	3,641.5
Vineyard	NI																
Total Acres		**11,111.4**	**74,337.2**	**1,691.1**	**756.2**	**2,156.9**	**13,437.1**	**23,927.7**	**1,565.6**	**14,321.5**	**22,872.0**	**1187.8**	**1,268.7**	**185.4**	**3,555.1**	**10,413.0**	**24,500.5**
Irrigated Acres		**10,745.6**	**68,459.4**	**1,676.3**	**756.2**	**2,116.4**	**12,355.6**	**22,358.6**	**229.9**	**8,670.5**	**21,218.6**	**1,171.0**	**1,229.2**	**185.4**	**3,314.0**	**9,888.5**	**23,051.2**

Figure 6. Coalition map showing land use in all site subwatersheds identified for sampling in 2008 irrigation season.

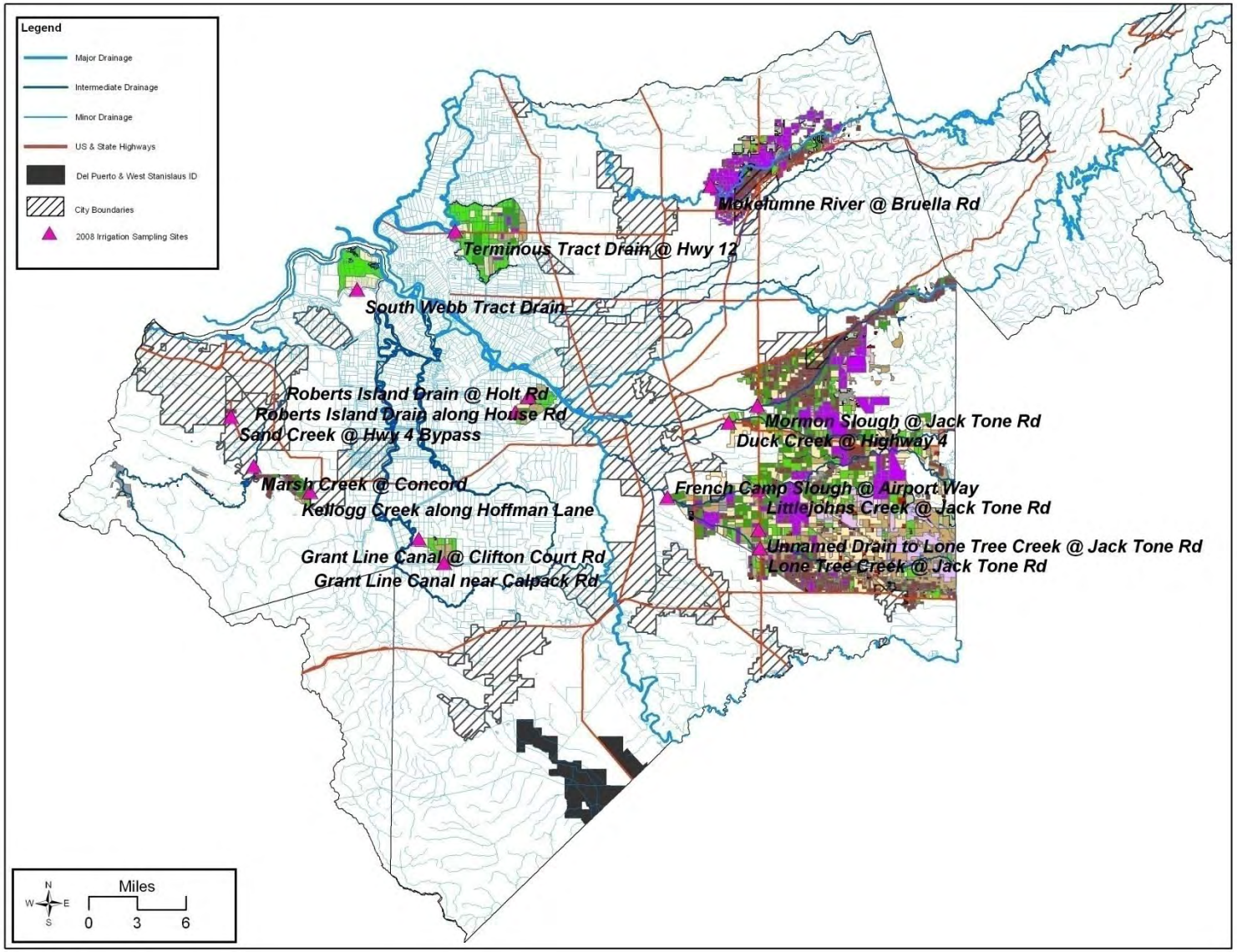


Figure 7. Land use for monitoring sites in Contra Costa County.

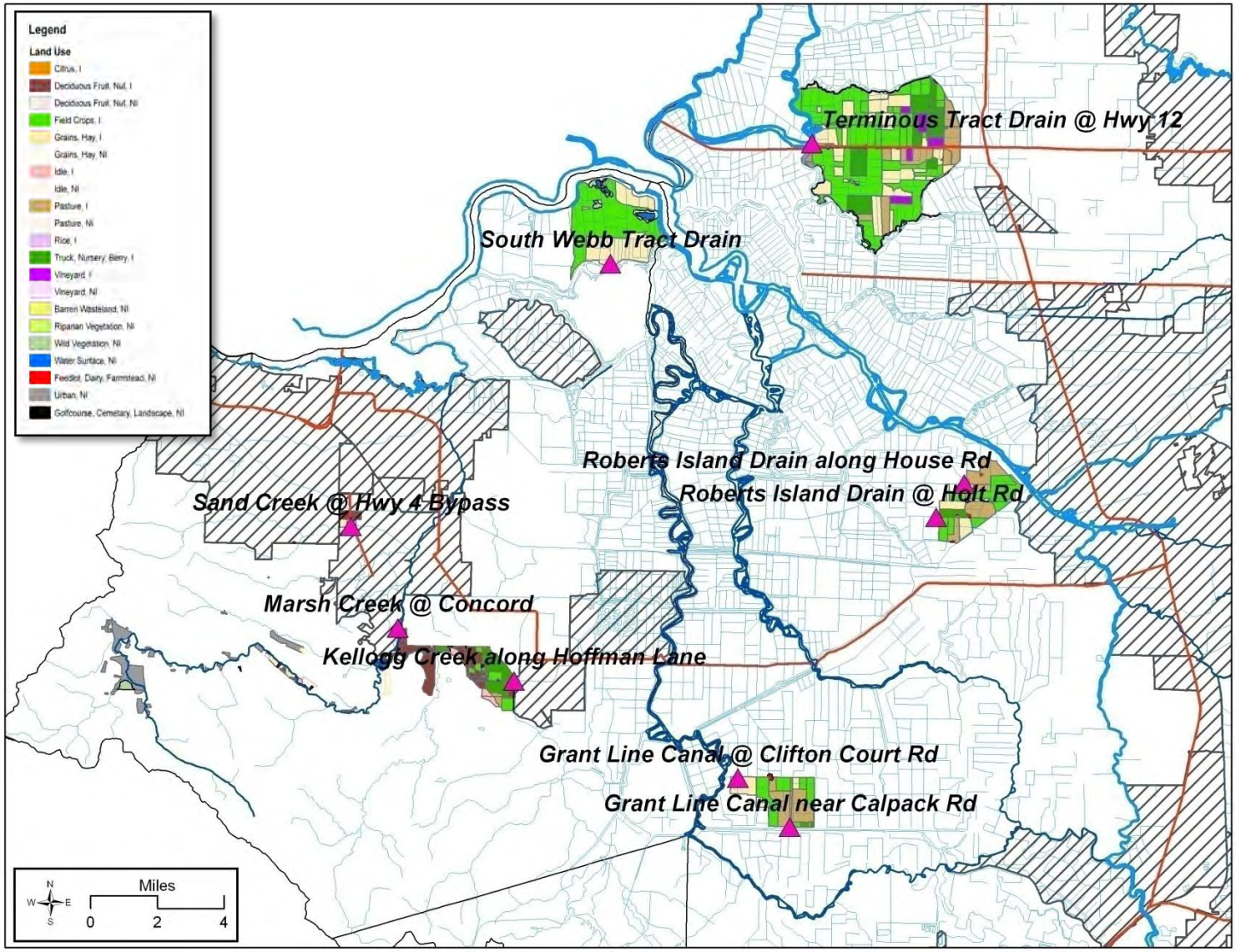
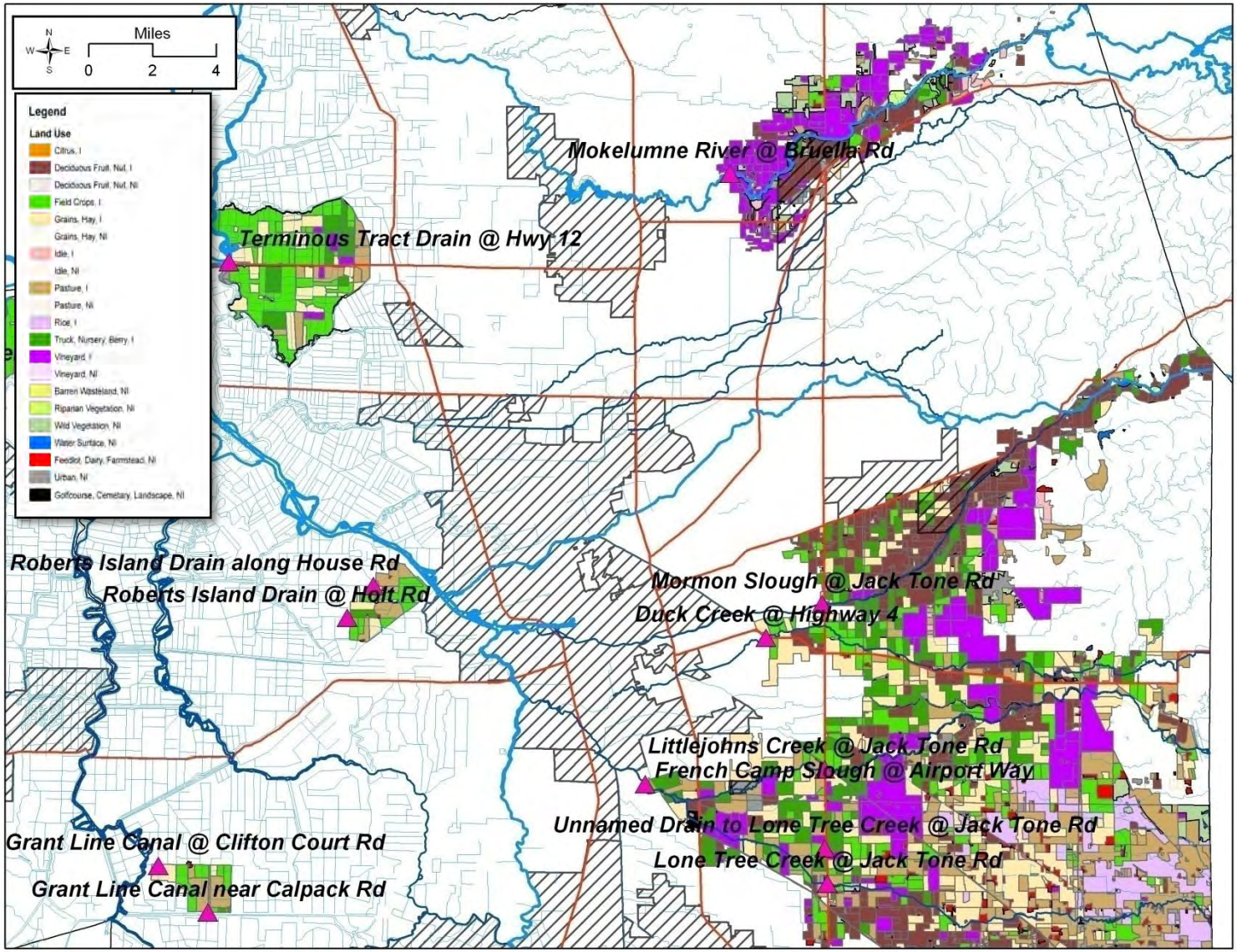


Figure 8. Land use for monitoring sites in San Joaquin County.



Monitoring Results

Sample Details

Monitoring results from the 2008 irrigation season are included in Appendix I. The results include field parameters, organics, inorganics including metals and *E. coli*, toxicity and loads calculated for any detected analyte with corresponding site flow. Loads have been calculated for all detections (Appendix I, Table I-6) according to the following formula:

Instantaneous Load (µg/sec) = Discharge (cfs) X 28.317L x Concentration (milligram/L x 1,000 or µg/L).

The load values calculated and presented for pesticides or other constitutents in this report represent instantaneous loads only. These values should not be used to extrapolate loading over any period of time (e.g. weekly, monthly, seasonal or annual). The primary purpose for reporting instantaneous loads is to provide the Regional Water Board with a context for the concentrations of various constituents at the time that samples were collected.

Monitoring results include results from samples taken for normal monitoring, Management Plan Monitoring, and sediment toxicity monitoring including resampling due to toxicity. Each sampling location, sampling date, sampling time and type of monitoring is listed in Table 8. A detailed schedule of Management Plan Monitoring can be found in the SJCDWQC Management Plan submitted on September 30, 2008.

Table 8. Sample details for the 2008 irrigation season sorted by station name, sample date and monitoring event.

NM = Normal Monitoring (water column). RS = Resampling due to toxicity. MPM = Management Plan Monitoring. Sediment = Sediment sampling including resampling due to toxicity. Sediment is not sampled at Terminous Tract @ Hwy 12.

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Duck Creek @ Drais Rd	531XDCADR	MPM	Irrigation2	5/13/2008	12:10	None	MPM for chlorpyrifos.
Duck Creek @ Drais Rd	531XDCADR	MPM	Irrigation4	7/15/2008	10:40	None	MPM for chlorpyrifos.
Duck Creek @ Drais Rd	531XDCADR	MPM	Irrigation6	9/16/2008	11:40	None	MPM for chlorpyrifos.
Duck Creek @ Hwy 4	531XDCAHF	NM	Irrigation1	4/15/2008	10:40	None	
Duck Creek @ Hwy 4	531XDCAHF	RS	Irrigation1	4/23/2008	12:30	None	RS due to *S. capricornutum* and *C. dubia* toxicity on 04/15/08.
Duck Creek @ Hwy 4	531XDCAHF	NM	Irrigation2	5/13/2008	10:00	None	
Duck Creek @ Hwy 4	531XDCAHF	RS	Irrigation2	5/21/2008	11:50	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Duck Creek @ Hwy 4	531XDCAHF	NM	Irrigation3	6/10/2008	10:40	None	
Duck Creek @ Hwy 4	531XDCAHF	NM	Irrigation4	7/15/2008	9:50	None	
Duck Creek @ Hwy 4	531XDCAHF	RS	Irrigation4	7/22/2008	7:40	None	RS due to *C. dubia* toxicity on 7/15/08
Duck Creek @ Hwy 4	531XDCAHF	NM	Irrigation5	8/12/2008	12:00	None	
Duck Creek @ Hwy 4	531XDCAHF	SED	Irrigation5	8/13/2008	11:00	None	
Duck Creek @ Hwy 4	531XDCAHF	NM	Irrigation6	9/16/2008	10:30	None	
French Camp Slough @ Airport Way	531SJC504	NM	Irrigation1	4/15/2008	14:50	None	
French Camp Slough @ Airport Way	531SJC504	RS	Irrigation1	4/23/2008	11:20	None	RS due to *S. capricornutum* toxicity on 04/15/08.
French Camp Slough @ Airport Way	531SJC504	NM	Irrigation2	5/13/2008	17:20	None	
French Camp Slough @ Airport Way	531SJC504	NM	Irrigation3	6/10/2008	16:20	None	
French Camp Slough @ Airport Way	531SJC504	NM	Irrigation4	7/15/2008	16:20	None	
French Camp Slough @ Airport Way	531SJC504	NM	Irrigation5	8/12/2008	18:00	None	
French Camp Slough @ Airport Way	531SJC504	SED	Irrigation5	8/13/2008	13:20	None	
French Camp Slough @ Airport Way	531SJC504	NM	Irrigation6	9/16/2008	19:20	None	
Grant Line Canal @ Clifton Court Rd	544XGLCAA	NM	Irrigation1	4/15/2008	12:10	None	
Grant Line Canal @ Clifton Court Rd	544XGLCAA	NM	Irrigation2	5/13/2008	13:00	None	
Grant Line Canal @ Clifton Court Rd	544XGLCAA	RS	Irrigation2	5/21/2008	9:00	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Grant Line Canal @ Clifton Court Rd	544XGLCAA	NM	Irrigation3	6/10/2008	11:40	None	
Grant Line Canal @ Clifton Court Rd	544XGLCAA	NM	Irrigation4	7/15/2008	12:40	None	
Grant Line Canal @ Clifton Court Rd	544XGLCAA	NM	Irrigation5	8/12/2008	12:10	None	
Grant Line Canal @ Clifton Court Rd	544XGLCAA	SED	Irrigation5	8/13/2008	13:10	None	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Grant Line Canal @ Clifton Court Rd	544XGLCAA	NM	Irrigation6	9/16/2008	19:20	None	
Grant Line Canal near Calpack Rd	544XGLCCR	NM	Irrigation1	4/15/2008	13:10	None	
Grant Line Canal near Calpack Rd	544XGLCCR	RS	Irrigation1	4/23/2008	9:40	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Grant Line Canal near Calpack Rd	544XGLCCR	NM	Irrigation2	5/13/2008	13:50	None	
Grant Line Canal near Calpack Rd	544XGLCCR	RS	Irrigation2	5/21/2008	9:20	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Grant Line Canal near Calpack Rd	544XGLCCR	NM	Irrigation3	6/10/2008	12:40	None	
Grant Line Canal near Calpack Rd	544XGLCCR	NM	Irrigation4	7/15/2008	13:30	None	
Grant Line Canal near Calpack Rd	544XGLCCR	NM	Irrigation5	8/12/2008	13:10	None	
Grant Line Canal near Calpack Rd	544XGLCCR	SED	Irrigation5	8/13/2008	12:30	None	
Grant Line Canal near Calpack Rd	544XGLCCR	NM	Irrigation6	9/16/2008	18:30	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	NM	Irrigation1	4/15/2008	10:30	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	RS	Irrigation1	4/23/2008	9:00	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Kellogg Creek along Hoffman Ln	544XKCAHL	MPM	Irrigation1	4/30/2008	14:50	None	MPM for toxicity to *C. dubia*.
Kellogg Creek along Hoffman Ln	544XKCAHL	NM	Irrigation2	5/13/2008	11:10	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	RS	Irrigation2	5/21/2008	8:20	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Kellogg Creek along Hoffman Ln	544XKCAHL	NM	Irrigation3	6/10/2008	10:10	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	MPM	Irrigation4	7/8/2008	9:50	None	MPM for copper.
Kellogg Creek along Hoffman Ln	544XKCAHL	NM	Irrigation4	7/15/2008	11:20	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	NM	Irrigation5	8/12/2008	10:20	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	SED	Irrigation5	8/13/2008	11:40	None	
Kellogg Creek along Hoffman Ln	544XKCAHL	NM	Irrigation6	9/16/2008	16:50	None	
Littlejohns Creek @ 26 Mile Rd	531LCATMR	MPM	Irrigation2	5/13/2008	13:00	None	MPM for all metals.
Littlejohns Creek @ 26 Mile Rd	531LCATMR	MPM	Irrigation3	6/10/2008	12:20	None	MPM for all metals.
Littlejohns Creek @ 26 Mile Rd	531LCATMR	MPM	Irrigation4	7/15/2008	11:40	None	MPM for all metals.
Littlejohns Creek @ 26 Mile Rd	531LCATMR	MPM	Irrigation5	8/12/2008	13:50	None	MPM for all metals.
Littlejohns Creek @ 26 Mile Rd	531LCATMR	MPM	Irrigation6	9/16/2008	12:10	None	MPM for all metals.
Littlejohns Creek @ Escalon Bellota Road	531XLCAER	MPM	Irrigation2	5/13/2008	12:20	None	MPM for all metals.
Littlejohns Creek @ Escalon Bellota Road	531XLCAER	MPM	Irrigation3	6/10/2008	11:50	None	MPM for all metals.
Littlejohns Creek @ Escalon Bellota Road	531XLCAER	MPM	Irrigation4	7/15/2008	11:00	None	MPM for chlorpyrifos and toxicity to *S. capricornutum*.
Littlejohns Creek @ Escalon Bellota Road	531XLCAER	MPM	Irrigation5	8/12/2008	13:20	None	MPM for chlorpyrifos and toxicity to *S. capricornutum*.
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	NM	Irrigation1	4/15/2008	11:50	None	
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	RS	Irrigation1	4/23/2008	12:10	None	RS due to *S. capricornutum* toxicity on 04/15/08.

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	NM	Irrigation2	5/13/2008	14:40	None	
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	NM	Irrigation3	6/10/2008	14:00	None	Too deep to measure discharge.
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	NM	Irrigation4	7/15/2008	14:00	None	Too deep to measure discharge.
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	NM	Irrigation5	8/12/2008	16:20	None	
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	SED	Irrigation5	8/13/2008	11:30	None	
Littlejohns Creek @ Jack Tone Rd	531XLCAJR	NM	Irrigation6	9/16/2008	15:10	None	
Lone Tree Creek @ Brennan Rd	535XLTABR	MPM	Irrigation4	7/15/2008	12:40	None	MPM for chlorpyrifos and all metals.
Lone Tree Creek @ Brennan Rd	535XLTABR	MPM	Irrigation5	8/12/2008	15:00	None	MPM for chlorpyrifos and all metals.
Lone Tree Creek @ Brennan Rd	535XLTABR	MPM	Irrigation6	9/16/2008	13:40	None	MPM for all metals.
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	NM	Irrigation1	4/15/2008	13:30	None	
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	RS	Irrigation1	4/23/2008	11:50	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	NM	Irrigation2	5/13/2008	16:20	None	
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	RS	Irrigation2	5/21/2008	11:10	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	NM	Irrigation3	6/10/2008	15:20	None	
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	NM	Irrigation4	7/15/2008	15:20	None	
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	NM	Irrigation5	8/12/2008	17:30	None	
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	SED	Irrigation5	8/13/2008	12:40	None	
Lone Tree Creek @ Jack Tone Rd	531XLTCJR	NM	Irrigation6	9/16/2008	18:20	None	
Lone Tree Creek @ Valley Home Rd	535LTCVHR	MPM	Irrigation2	5/13/2008	13:20	None	MPM for all metals.
Lone Tree Creek @ Valley Home Rd	535LTCVHR	MPM	Irrigation3	6/10/2008	12:50	None	MPM for all metals.
Lone Tree Creek @ Valley Home Rd	535LTCVHR	MPM	Irrigation4	7/15/2008	12:10	None	MPM for all metals.
Lone Tree Creek @ Valley Home Rd	535LTCVHR	MPM	Irrigation5	8/12/2008	14:30	None	MPM for all metals.
Lone Tree Creek @ Valley Home Rd	535LTCVHR	MPM	Irrigation6	9/16/2008	12:50	None	MPM for all metals.
Marsh Creek @ Concord Ave	544XMCACA	NM	Irrigation1	4/15/2008	9:20	None	
Marsh Creek @ Concord Ave	544XMCACA	NM	Irrigation2	5/13/2008	10:00	None	
Marsh Creek @ Concord Ave	544XMCACA	NM	Irrigation3	6/10/2008	9:00	None	
Marsh Creek @ Concord Ave	544XMCACA	NM	Irrigation4	7/15/2008	10:20	None	
Marsh Creek @ Concord Ave	544XMCACA	NM	Irrigation5	8/12/2008	10:00	Site dry.	
Marsh Creek @ Concord Ave	544XMCACA	SED	Irrigation5	8/13/2008	11:03	Site dry.	
Mokelumne River @ Bruella Rd	531XMRABR	NM	Irrigation1	4/15/2008	8:40	None	
Mokelumne River @ Bruella Rd	531XMRABR	RS	Irrigation1	4/23/2008	13:40	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Mokelumne River @ Bruella Rd	531XMRABR	MPM	Irrigation2	5/7/2008	21:20	None	MPM for toxicity to *S. capricornutum*.
Mokelumne River @ Bruella Rd	531XMRABR	NM	Irrigation2	5/13/2008	7:50	None	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Mokelumne River @ Bruella Rd	531XMRABR	RS	Irrigation2	5/21/2008	12:50	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Mokelumne River @ Bruella Rd	531XMRABR	MPM	Irrigation3	6/3/2008	17:00	None	MPM for copper and toxicity to *C. dubia*.
Mokelumne River @ Bruella Rd	531XMRABR	NM	Irrigation3	6/10/2008	9:00	None	Too deep to measure discharge.
Mokelumne River @ Bruella Rd	531XMRABR	MPM	Irrigation4	7/8/2008	9:00	None	MPM for copper and toxicity to *S. capricornutum*.
Mokelumne River @ Bruella Rd	531XMRABR	NM	Irrigation4	7/15/2008	8:00	None	Too deep to measure discharge.
Mokelumne River @ Bruella Rd	531XMRABR	MPM	Irrigation5	8/5/2008	8:00	None	MPM for copper and toxicity to *S. capricornutum*.
Mokelumne River @ Bruella Rd	531XMRABR	NM	Irrigation5	8/12/2008	8:00	None	
Mokelumne River @ Bruella Rd	531XMRABR	SED	Irrigation5	8/13/2008	9:20	None	
Mokelumne River @ Bruella Rd	531XMRABR	MPM	Irrigation6	9/9/2008	7:50	None	MPM for toxicity to *C. dubia*.
Mokelumne River @ Bruella Rd	531XMRABR	NM	Irrigation6	9/16/2008	8:10	None	
Mormon Slough @ Jack Tone Rd	544MSAJTR	NM	Irrigation1	4/15/2008	9:50	None	
Mormon Slough @ Jack Tone Rd	544MSAJTR	RS	Irrigation1	4/23/2008	12:50	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Mormon Slough @ Jack Tone Rd	544MSAJTR	MPM	Irrigation2	5/7/2008	9:50	None	MPM for chlorpyrifos.
Mormon Slough @ Jack Tone Rd	544MSAJTR	NM	Irrigation2	5/13/2008	9:10	None	
Mormon Slough @ Jack Tone Rd	544MSAJTR	RS	Irrigation2	5/21/2008	12:10	None	RS due to *S. capricornutum* and *C. dubia* toxicity on 05/13/08.
Mormon Slough @ Jack Tone Rd	544MSAJTR	NM	Irrigation3	6/10/2008	10:00	None	Too deep to measure discharge.
Mormon Slough @ Jack Tone Rd	544MSAJTR	NM	Irrigation4	7/15/2008	9:10	None	
Mormon Slough @ Jack Tone Rd	544MSAJTR	NM	Irrigation5	8/12/2008	9:50	None	
Mormon Slough @ Jack Tone Rd	544MSAJTR	SED	Irrigation5	8/13/2008	10:20	None	
Mormon Slough @ Jack Tone Rd	544MSAJTR	MPM	Irrigation6	9/9/2008	8:50	None	MPM for chlorpyrifos.
Mormon Slough @ Jack Tone Rd	544MSAJTR	NM	Irrigation6	9/16/2008	9:40	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	NM	Irrigation1	4/15/2008	14:10	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	RS	Irrigation1	4/23/2008	10:30	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Roberts Island Drain @ Holt Rd	544RIDAHT	NM	Irrigation2	5/13/2008	14:50	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	RS	Irrigation2	5/21/2008	10:00	None	RS due to *S. capricornutum* toxicity toxicity on 05/13/08.
Roberts Island Drain @ Holt Rd	544RIDAHT	NM	Irrigation3	6/10/2008	16:10	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	NM	Irrigation4	7/15/2008	14:50	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	NM	Irrigation5	8/12/2008	14:20	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	SED	Irrigation5	8/13/2008	9:40	None	
Roberts Island Drain @ Holt Rd	544RIDAHT	NM	Irrigation6	9/16/2008	10:30	None	
Roberts Island Drain along House Rd	544RIDAHR	NM	Irrigation1	4/15/2008	15:20	None	
Roberts Island Drain along House Rd	544RIDAHR	RS	Irrigation1	4/23/2008	10:50	None	RS due to *S. capricornutum* toxicity on 04/15/08.

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Roberts Island Drain along House Rd	544RIDAHR	NM	Irrigation2	5/13/2008	15:40	None	
Roberts Island Drain along House Rd	544RIDAHR	RS	Irrigation2	5/21/2008	10:20	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Roberts Island Drain along House Rd	544RIDAHR	NM	Irrigation3	6/10/2008	14:10	None	
Roberts Island Drain along House Rd	544RIDAHR	NM	Irrigation4	7/15/2008	17:00	None	
Roberts Island Drain along House Rd	544RIDAHR	NM	Irrigation5	8/12/2008	15:20	None	
Roberts Island Drain along House Rd	544RIDAHR	SED	Irrigation5	8/13/2008	9:10	None	
Roberts Island Drain along House Rd	544RIDAHR	NM	Irrigation6	9/16/2008	9:20	None	
Roberts Island Drain along House Rd	544RIDAHR	SED	Irrigation5	9/18/2008	11:50	None	RS due to *H. azteca* toxicity on 8/13/08
Roberts Island Drain along House Rd	544RIDAHR	RS	Irrigation6	9/23/2008	7:40	None	RS due to *S. capricornutum* toxicity on 09/16/08.
Sand Creek @ Hwy 4 Bypass	544SCAHFB	NM	Irrigation1	4/15/2008	7:50	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	RS	Irrigation1	4/23/2008	8:20	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Sand Creek @ Hwy 4 Bypass	544SCAHFB	MPM	Irrigation2	5/7/2008	8:10	None	MPM for dieldrin, chlorpyrifos, and toxicity to *C. dubia*.
Sand Creek @ Hwy 4 Bypass	544SCAHFB	NM	Irrigation2	5/13/2008	9:00	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	MPM	Irrigation3	6/3/2008	8:10	None	MPM for dieldrin, chlorpyrifos, and toxicity to *C. dubia*.
Sand Creek @ Hwy 4 Bypass	544SCAHFB	NM	Irrigation3	6/10/2008	7:50	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	MPM	Irrigation4	7/8/2008	9:10	None	MPM for toxicity to *C. dubia*.
Sand Creek @ Hwy 4 Bypass	544SCAHFB	NM	Irrigation4	7/15/2008	9:20	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	NM	Irrigation5	8/12/2008	9:00	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	SED	Irrigation5	8/13/2008	10:50	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	RS	Irrigation5	8/19/2008	7:50	None	RS due to *S. capricornutum* toxicity on 8/12/08.
Sand Creek @ Hwy 4 Bypass	544SCAHFB	NM	Irrigation6	9/16/2008	15:40	None	
Sand Creek @ Hwy 4 Bypass	544SCAHFB	SED	Irrigation5	9/18/2008	10:40	None	RS due to *H. azteca* toxicity on 8/13/08
South Webb Tract Drain	544XXSWTD	NM	Irrigation6	9/16/2008	13:50	None	
Terminous Tract Drain @ Hwy 12	544XTTHWT	NM	Irrigation1	4/15/2008	7:30	None	
Terminous Tract Drain @ Hwy 12	544XTTHWT	RS	Irrigation1	4/23/2008	14:30	None	RS due to *S. capricornutum* toxicity on 04/15/08.
Terminous Tract Drain @ Hwy 12	544XTTHWT	NM	Irrigation2	5/13/2008	7:40	None	
Terminous Tract Drain @ Hwy 12	544XTTHWT	RS	Irrigation2	5/21/2008	13:40	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Terminous Tract Drain @ Hwy 12	544XTTHWT	NM	Irrigation3	6/10/2008	7:40	None	
Terminous Tract Drain @ Hwy 12	544XTTHWT	NM	Irrigation4	7/15/2008	8:00	None	
Terminous Tract Drain @ Hwy 12	544XTTHWT	NM	Irrigation5	8/12/2008	8:00	None	
Terminous Tract Drain @ Hwy 12	544XTTHWT	NM	Irrigation6	9/16/2008	8:00	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	NM	Irrigation1	4/15/2008	12:40	None	

Station Name	Station Code	Monitoring Event	Season	Sample Date	Sample Time	Failure Reason	Sample Comments
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	NM	Irrigation2	5/13/2008	15:20	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	RS	Irrigation2	5/21/2008	11:30	None	RS due to *S. capricornutum* toxicity on 05/13/08.
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	NM	Irrigation3	6/10/2008	14:40	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	NM	Irrigation4	7/15/2008	14:40	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	NM	Irrigation5	8/12/2008	17:00	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	SED	Irrigation5	8/13/2008	12:00	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	NM	Irrigation6	9/16/2008	16:20	None	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	SED	Irrigation5	9/18/2008	14:00	None	RS due to *H. azteca* toxicity on 8/13/08
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	531UDLTAJ	RS	Irrigation6	9/23/2008	19:10	None	RS due to *C. dubia* toxicity on 09/16/08.
Unnamed Drain to Lone Tree Creek @ Wagner Rd	531UDLTWR	MPM	Irrigation4	7/15/2008	13:20	None	MPM for chlorpyrifos.
Unnamed Drain to Lone Tree Creek @ Wagner Rd	531UDLTWR	MPM	Irrigation6	9/16/2008	14:20	None	MPM for chlorpyrifos.

Sampling and Analytical Methods Used

Sample collection criteria and field instruments are provided in Table 9 and Table 10. Analytical methods and reporting limits are provided in Table 11. All field sampling methods were performed as outlined in the SOPs provided in the Quality Assurance Project Plan (QAPP). All analytical methods were performed as described in the QAPP.

Table 9. Sampling procedures, containers, sample volumes, preservation and storage techniques and holding times.

Parameter	Sample Container	Sample Volume[1]	Immediate Processing and Storage	Holding Time[2]
Physical Parameters[3]				
Color	Glass or polyethylene	500 mL	Store at 4°C	48 hours
Turbidity	Glass or polyethylene	150 mL	Store at 4°C	48 hours
Total Dissolved Solids	Polyethylene	500 mL	Store at 4°C	7 days
Drinking Water				
E. coli (pathogens)	Polyethylene (sterile)	100 mL	Store at 4°C	24 hours[4]
Total Organic Carbon	Amber Glass VOA, PTFE-lined cap	125 mL	Preserve w/HCL; Store at 4°C	28 days
Toxicity				
Aquatic bioassays	Amber glass	5 gallons	Store at 4°C	36 hours
Sediment bioassays	Glass	1 liter (x2)	Store at 4°C	14 days
Pesticides				
Carbamates	Amber Glass	1 liter		
Organochlorines	Amber Glass	1 liter		
Organophosphates	Amber Glass	1 liter		
Pyrethroids	Amber Glass	1 liter		
Herbicides (general)	Amber Glass	1 liter	Store at 4°C; Extract	
Herbicides (paraquat)	Polyethylene	1 liter	within 7 days	40 days
Herbicides (glyphosate)	Amber Glass VOA	40 ml (x2)	Store at 4°C, freeze within 2 weeks	6 months
Nutrients				
TKN, Ammonia, and Total Phosphorus	Polyethylene	500 mL	Preserve to ≤ pH 2 with H_2SO_4; Store at 4°C	28 days
Nitrate as NO3, Nitrite as N, and Soluble Ortho-Phosphate	Polyethylene	1000 mL	Store at 4°C	48 hours
Metals/Trace Elements				
Trace elements[5]	Polyethylene	500 mL	Filter as necessary; Preserve to ≤ pH 2 with HNO_3	40 days

1. Additional volumes may be required for QC analyses; NA = Not Applicable
2. Holding time after initial preservation or extraction.
3. Volume of water necessary to analyze the physical parameters is typically combined in multiple 1L polyethylene bottles, which provides sufficient volume for re-analyses and lab spike duplicates. This is only possible when the same laboratory provides the analyses for all of the physical parameters.
4. Samples for bacteria analyses should be set up as soon as possible.
5. To include arsenic, boron, cadmium, copper, lead, nickel, selenium, and zinc.

Table 10. Field parameters and instruments used to collect measurements.

Parameter	Instrument
Dissolved Oxygen	YSI Model 556 MPS
Temperature	YSI Model 556 MPS
pH	YSI Model 556 MPS
Electrical Conductivity	YSI Model 556 MPS
Discharge	Marsh-McBirney Flow Mate 2000

Table 11. Analytical methods, target reporting limits (RL) and units.

Analyte	Method	RL	Units
Physical Parameters			
Color	EPA 100.2	3.0	color units
Turbidity	EPA 180.1	0.05	NTU
Dissolved Solids, Total	EPA 160.1	10	mg/L
Drinking Water Parameters			
Escherischia coli (*E. coli*)	SM 9223	1.0	MPN/100 mL
Total Organic Carbon	EPA 415.1	0.5	mg/L
Nutrients			
Total Kjeldahl Nitrogen	EPA 351.3	0.1	mg/L
Nitrate as N	EPA 300.0	0.05	mg/L
Nitrite as N	EPA 354.1	0.03	mg/L
Ammonia	EPA 350.2	0.10	mg/L
Hardness	EPA 130.2	5	mg/L
Total Phosphorus	EPA 365.2	0.01	mg/L
Soluble Orthophosphate	EPA 365.2	0.01	mg/L
Metals			
Arsenic	EPA 200.8	0.5	µg/L
Boron	EPA 200.8	10	µg/L
Cadmium	EPA 200.8	0.1	µg/L
Copper	EPA 200.8	0.5	µg/L
Lead	EPA 200.8	0.25	µg/L
Nickel	EPA 200.8	0.25	µg/L
Selenium	EPA 200.8	1	µg/L
Zinc	EPA 200.8	1	µg/L
Carbamate Pesticides			
Aldicarb	EPA 8321	0.4	µg/L
Carbaryl	EPA 8321	0.07	µg/L
Carbofuran	EPA 8321	0.07	µg/L
Methiocarb	EPA 8321	0.4	µg/L
Methomyl	EPA 8321	0.07	µg/L
Oxnamyl	EPA 8321	0.4	µg/L
Organochlorine Pesticides			
DDD	EPA 8081A	0.01	µg/L
DDE	EPA 8081A	0.01	µg/L
DDt	EPA 8081A	0.01	µg/L
Dicofol	EPA 8081A	0.1	µg/L
Dieldrin	EPA 8081A	0.01	µg/L
Endrin	EPA 8081A	0.01	µg/L
Methoxychlor	EPA 8081A	0.01	µg/L

Analyte	Method	RL	Units
Organophosphorus Pesticides			
Azinphos-methyl	EPA 8141A	0.1	µg/L
Chlorpyrifos	EPA 8141A	0.02	µg/L
Diazinon	EPA 8141A	0.02	µg/L
Dimethoate	EPA 8141A	0.1	µg/L
Disulfoton	EPA 8141A	0.1	µg/L
Malathion	EPA 8141A	0.1	µg/L
Methamidophos	EPA 8141A	0.2	µg/L
Methidathion	EPA 8141A	0.1	µg/L
Parathion-methyl	EPA 8141A	0.1	µg/L
Phorate	EPA 8141A	0.1	µg/L
Phosmet	EPA 8141A	0.2	µg/L
Pyrethroid Pesticides			
Biphenthrin	EPA 8081A	0.02	µg/L
Cyfluthrin	EPA 8081A	0.03	µg/L
Cypermethrin	EPA 8081A	0.05	µg/L
Esfenvalerate	EPA 8081A	0.02	µg/L
Lambda-Cyhalothrin	EPA 8081A	0.02	µg/L
Permethrin	EPA 8081A	0.02	µg/L
Herbicides			
Atrazine	EPA 619	0.5	µg/L
Cyanazine	EPA 619	0.5	µg/L
Diuron	EPA 8321	0.4	µg/L
Glyphosate	EPA 547	5	µg/L
Linuron	EPA 8321	0.4	µg/L
Molinate	EPA 8141A	0.5	µg/L
Paraquat dichloride	EPA 549.1	0.4	µg/L
Simazine	EPA 619	0.5	µg/L
Thiobencarb	EPA 8141A	0.5	µg/L

Copy of Chain of Custody Forms

Original Chain of Custodies (COCs) were scanned and are included as printed pdfs in Appendix II. COCs were faxed by the laboratories to Michael L Johnson, LLC (MLJ-LLC) after the receipt of samples by the laboratory. As such, they are complete and accurate records of sample handling and processing and reflect the timing of sample collection and delivery to the laboratories. Sample collection and delivery were performed according to the Quality Assurance Project Plan (QAPP) submitted to the Regional Board. If there were any discrepancies between the COC and sample delivery, the issues were resolved and documented either directly on the COC or on an anomaly form filled out by the laboratory. Documentation of COC anomalies is included in Table II-1 of Appendix II.

Lab and Field QC Results

Laboratory and field quality control (QC) results are included in Appendix III. Field duplicate and field blank results are included for organics, inorganics (including metals, physical parameters, nutrients and *E. coli*) and toxicity (only field duplicates). Laboratory QC results include matrix spikes (MS) performed on both Coalition and samples from other projects, laboratory control spikes (LCS), laboratory blanks and laboratory duplicates. All control criteria are listed with the result and samples not meeting control criteria are flagged.

Precision and Accuracy

Normal surface water monitoring occurred six times during the irrigation season of 2008 for 15 sites with the following exception due to lack of water:

- Marsh Creek @ Concord Ave (8/12/08)

Resampling to test for water column toxicity persistence occurred at the following sites:

- Duck Creek @ Hwy 4 (4/23/2008, 5/21/2008, 7/22/2008)
- French Camp Slough @ Airport Way (4/23/2008)
- Grant Line Canal @ Clifton Court Rd (5/21/2008)
- Grant Line Canal near Calpack Rd (4/23/2008, 5/21/2008)
- Kellogg Creek along Hoffman Ln (4/23/2008, 5/21/2008)
- Littlejohns Creek @ Jack Tone Rd (4/23/2008)
- Lone Tree Creek @ Jack Tone Rd (4/23/2008, 5/21/2008)
- Mokelumne River @ Bruella Rd (4/23/2008, 5/21/2008)
- Mormon Slough @ Jack Tone Rd (4/23/2008, 5/21/2008)
- Roberts Island Drain @ Holt Rd (4/23/2008, 5/21/2008)
- Roberts Island Drain along House Rd (4/23/2008, 5/21/2008, 9/23/2008)
- Sand Creek @ Hwy 4 Bypass (4/23/2008, 8/19/2008)
- Terminous Tract Drain @ Hwy 12 (4/23/2008, 5/21/2008)
- Unnamed Drain to Lone Tree Creek @ Jack Tone Rd (5/21/2008, 9/23/2008)

Sediment sampling occurred once during the irrigation season during the month of August. Sediment from the following site was not collected due to the site being dry:

- Marsh Creek @ Concord Ave (08/13/08)

Resampling to test for sediment toxicity persistence occurred at the following sites:

- Roberts Island Drain along House Rd (09/18/08)
- Sand Creek @ Hwy 4 Bypass (09/18/08)
- Unnamed Drain to Lone Tree Creek @ Jack Tone Rd (09/18/08)

During the irrigation season, six Management Plan Monitoring sites were sampled in addition to the 15 normal monitoring sites. Management Plan Monitoring was either upstream of the normal monitoring site or an additional sample collected during a different week of the month (see SJCDWQC Management Plan for details). Management Plan sampling occurred in all months between April and September.

Chemistry

The constituents sampled during the 2008 irrigation season are listed by site in Table 5. For normal and Management Plan Monitoring, not including laboratory or field quality control (QC) samples, 89-91 carbamate, organochlorine, and herbicide, 97-110 organophosphate, 73

pyrethroid, 89 *E. coli* and physical parameter, 89-108 nutrient, and 104-108 metal samples were collected and analyzed for the irrigation events in 2008. There was 100% completeness for environmental samples collected for chemistry analyses.

For each irrigation event, a field duplicate and field blank were collected for each constituent to meet the field QC requirement of 5%. Field blanks and duplicates comprised 11-14% of organic samples, 12% of *E. coli* samples and physical parameter samples, 10-12% of nutrient samples, and 10% of metal samples.

For some constituents the concentration of a constituent in the environmental sample may exceed the amount that the detector can detect and therefore requires a dilution. The result reported is the amount found in the diluted sample multiplied by the dilution factor to represent the amount of the analyte present in the original sample. The dilution factor is recorded and the reporting limit (RL) is generally increased by multiplying the RL for that analyte by the dilution factor. Therefore, for each dilution that occurs, there is a corresponding increase in the limit of quantification.

For pesticides such as paraquat, co-elution, also referred to as matrix interference, may cause the RL to be raised and the sample is flagged. In such cases the dilution factor (DF) is recorded for each sample.

All results are reported in the Monitoring Results section of this report (Appendix I). Each result is flagged if it does not meet data quality objectives (acceptability criteria) using SWAMP codes and can also be found in the SWAMP comparable database managed by the Coalition. The Coalition works with the University of California, Davis Data Center to ensure that all data remain SWAMP comparable and that all data are suitable to be uploaded to the California Environmental Data Exchange Network (CEDEN). A copy of the database has been submitted to the Regional Board with the hardcopy of this report. A review of the number of samples analyzed and the percentage per analyte that meets acceptability criteria are listed in the tables following this section. A brief overview is listed below to assess overall precision and accuracy per analyte (all pesticides are grouped and discussed together).

- Color: Eighty-three percent of field blanks met acceptability criteria (< RL and < 1/5 environmental sample). The single detection in the field blank sample that exceeded the acceptance criteria was 5 color units (environmental sample = 23 color units). Half of the field duplicate samples collected did not meet the acceptance criteria, RPD less than 25%. Laboratory control spikes (LCS), lab blanks, and laboratory duplicates were run with each batch and all met laboratory QC criteria. Matrix spikes and matrix spike duplicates cannot be performed for color.

- Hardness: One hundred percent of field blanks met acceptability criteria. Half of the field duplicate samples collected had RPDs over 25%. One hundred percent of lab blanks and laboratory control spikes met the acceptance criteria. Eighty-seven percent of matrix spikes met the acceptability criteria. The 13% of matrix spikes that did not

meet the acceptability criteria were from two batches where both the matrix spike and the matrix spike duplicate were below the control limits due to possible matrix interference. One hundred percent of matrix spike duplicates met the acceptability criteria for precision, RPD < 25%.

- Dissolved Solids (TDS): One hundred percent of field blanks and field duplicates met acceptance criteria. Lab blanks were run with every batch and were less than the RL for 100% of samples. One hundred percent of laboratory control spikes and lab duplicates met acceptance criteria. Matrix spikes and matrix spike duplicates cannot be performed for TDS.

- Turbidity: One hundred percent of field blanks were less than the RL. One hundred percent of field duplicates had RPDs less than 25%. Laboratory control spikes were run with every batch and 100% met acceptance criteria. Lab blanks and laboratory duplicates were analyzed with each batch and 100% met acceptance criteria. Matrix spikes and matrix spike duplicates cannot be performed for turbidity.

- Nitrate as N: One hundred percent of field blanks met acceptance criteria. Eighty-three percent of field duplicates had RPD values <25%. One hundred percent of laboratory control spikes and lab blanks met acceptance criteria. Matrix spikes met acceptance criteria for 87.5% of samples (14 of 16). The one matrix spike/matrix spike duplicate pair recovered above control limits was due to possible matrix interference in the QC sample. No matrix spikes were recovered below the control limit (90-110%). One hundred percent of matrix spike duplicates met the acceptability criteria for precision, RPD < 25%.

- Ammonia as N: One hundred percent of field blanks met acceptance criteria. Eighty-three percent of field duplicates met acceptance criteria. One hundred percent of laboratory blanks were less than the RL. Laboratory control spikes were analyzed with each batch and 100% met acceptance criteria. Matrix spikes and matrix spike duplicates were all within acceptability criteria, meeting requirements of accuracy and precision.

- Nitrogen, Total Kjeldahl (TKN): Sixty-seven percent of field blanks were < RL or < 1/5 of the environmental sample. Field duplicates met the acceptance criteria, RPD < 25%, in 67% of the samples analyzed. One hundred percent of laboratory blanks and laboratory control spikes met acceptance criteria. Eighty-six percent of matrix spikes met acceptance criteria. The four matrix spikes/matrix spike duplicates samples that were below the control limits were due to possible matrix interference, and in each case the LCS was within the acceptability criteria. One hundred percent of matrix spike duplicates had RPDs < 25%.

- Nitrite as N: One hundred percent of field blanks and field duplicates met acceptability criteria. One hundred percent of laboratory blanks were less than the RL. Laboratory

control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches.

- Orthophosphate as P: Field blanks met acceptability criteria for 100% of samples analyzed. Eighty-three percent of field duplicates had RPDs < 25% (5 of 6). Laboratory blanks and lab control spikes were run with every batch and 100% met acceptability criteria. Seventy-nine percent of matrix spikes met acceptability criteria (11 of 14). Possible matrix interferences in the QC samples of two batches resulted in MS/MSD recoveries to be below control limits. One batch contained a matrix spike recovery above control limits (the associated MSD was within control requirements of 90-110% recoveries). In all batches the LCS was within control limits. One hundred percent of matrix spike duplicates had RPDs less than 25%.

- Phosphate as P: One hundred percent of field blanks met acceptability criteria. One hundred percent of field duplicates had RPDs less than 25%. Laboratory blanks were run with each batch and all were less than the RL. One hundred percent of laboratory control spikes met acceptability criteria. Ninety-six percent of matrix spikes and 100% of matrix spike duplicates were within acceptability criteria meeting requirements of accuracy and precision.

- Total Organic Carbon (TOC): Eighty-three percent of field blanks met acceptability criteria, < RL or < 1/5 the environmental sample (5 of 6). Field duplicates had RPDs less than 25% for all of the samples analyzed. One hundred percent of laboratory blanks were less than the RL. One hundred percent of laboratory control spikes, matrix spikes, and matrix spike duplicates met acceptability criteria.

- Total Metals: On July 22nd the field crews began using Caltest de-ionized water, in low-density polyethylene (LDPE) containers, exclusively for field blanks. The field blanks were filled previously from de-ionized water collected from UC Davis and stored in a high–density polyethylene (HDPE) carboy. One hundred percent of field blanks met field precision criteria except for a single zinc field blank sample. The single zinc field blank sample exceeded the reporting limit and was greater than one fifth of the environmental sample (environmental sample = 2 µg/L, field blank = 2 µg/L). Contamination in the field may be due to contamination of the field blank water, the field blank storage container, the field blank bottle, or contamination from the sampler. The field blank bottle came directly from the laboratory and is certified pre-clean. The bottle was not opened until right before filling it with DI water. Clean gloves were used when filling the bottle with DI water from the LDPE container and neither the lid nor the opening of the bottle was touched. The cap was immediately returned to the bottle and screwed on tightly after filling. All sampling SOPs (which include the above steps to prevent contamination) were followed. Other sources of contamination may have occurred during transport from the field to the laboratory (all bottles were closed tightly and only touched when being put in the cooler by the sampler and taken from the

cooler by the laboratory with gloved hands) and/or during the laboratory extraction process.

Due to past detections in field blanks, travel blanks were sent from the lab and traveled with the sampling crew from beginning to end. All but two travel blanks for zinc met acceptability criteria of being less than the RL however travel blanks collected in April, June and July all had detectable amounts of zinc. The April and July field blanks also had detectable amounts of zinc in them (below the RL). In response to the zinc detections in the blank water, Caltest collected a series of blank samples in and around their lab, and found sporadic low level zinc detections as high as 1.3 µg/L. After placing various controls around their lab the zinc concentration in the blank was 0.3 µg/L, less than the reporting limit of 1 µg/L, which leads Caltest to believe that their controls are helping. Caltest plans to continue this monitoring on an ongoing basis. Travel blanks collected in September and August did not have any detections of zinc in them. Laboratory blanks were run with each metals batch and 100% met acceptability criteria.

All field duplicates, except for selenium and zinc, met the acceptability criteria (RPDs < 25%). The selenium RPDs outside the acceptance limits were 33%, 56.6% and 51.4%, and the zinc RPD was 36.4%. Of the selenium field duplicate and environmental samples associated with the RPDs above, 25 all had concentrations below the selenium RL (1 µg/L). The zinc concentrations (environmental result = 13 µg/L, field duplicate result = 9 µg/L) were both above the reporting limit value of 1 µg/L. The field sheets describe that the sample site had low to moderate flow with cloudy or murky/turbid water. It is possible that metals present in the sediment could have been mobilized in the water column while the samples were being taken. These field parameters could account for the large RPD between the zinc environmental and field duplicate samples. Laboratory control spikes were within acceptable recovery limits for 100% of metals run. Matrix spike recoveries were within control limits for 93.5% of all metals samples analyzed. All metal matrix spikes had recoveries within acceptable criteria for more than 90% of the samples except for boron. Sixty-seven percent of boron matrix spikes were within control limits (PR 85-115). Eleven of 36 boron matrix spikes were outside of the control limits with three recovering below control limits (all non project matrix spikes) and eight of them were above control limits. For each batch with a matrix spike that recovered outside of recovery criteria, the samples were spiked with an amount less than half of what was detected in the environmental sample. Poor recoveries are most likely due to the amount of boron in the sample being detected at a level over twice the amount that the sample was spiked with. In all cases, laboratory control spikes extracted and run in the same batch were within acceptable recovery limits. None of the MS/MSDs were re-analyzed since LCS recovered within acceptability criteria. All matrix spike duplicates met acceptability criteria for precision (RPD < 25%).

- *E. coli*: Sterility checks of laboratory blanks, negative control and positive control samples were run for each batch. One hundred percent of laboratory blanks met acceptability criteria. One hundred percent of field blanks collected had *E. coli* numbers

less than the reporting limit of 1. R_{log}s were performed on *E. coli* lab duplicates by Caltest Laboratories. The mean R_{log} for the laboratory was calculated to be 0.40. This value multiplied by 3.27 resulted in a precision criterion of 1.30. All laboratory duplicates had R_{log}s below the criteria acceptance level. Due to the nature of the analysis method and *E. coli* distribution within the water column, it is not possible to use RPDs to assess precision however field duplicate RPDs have been recorded to monitor the variation in duplicates over time analyzed by the lab.

- Pesticides: One hundred percent of pesticide field blanks met acceptability criteria. One hundred percent of field duplicates except for chlorpyrifos met acceptability criteria RPDs < 25% (RPD = 31%). The associated chlorpyrifos environmental and field duplicate concentrations were below the reporting limit and considered estimates. The low levels detected in the environmental and field duplicate samples may be the cause of the high RPD. A water body that is not well mixed across the width of the channel can result in unequal concentrations of a pesticide, as can a channel with high flow and turbid waters due to increased sediment mobilization. The sample water at the site associated with the chlorpyrifos RPD >25% (as well as color, hardness, and ammonia RPDs above the acceptability criteria) was brown and cloudy with a turbidity result of 24 NTU, and was flowing at 57.81 cfs. The moderate flow and turbidity are possible causes for the increased relative percent difference between the environmental and field duplicate samples collected. All field SOPs were followed by the field crew including collecting the environmental and field duplicate samples at the same time.

  For the irrigation season, pesticides were analyzed in eight different groups: pyrethroids (EPA 8081A), organochlorines (EPA 8081A), organophoshates (EPA 8141A), carbamates (EPA 8321A), methamidophos (EPA 8141A), paraquat (EPA 549.2), glyphosate (EPA 547M) and triazines (EPA 619). Lab blanks were run with each batch and 100% met acceptability criteria. Matrix spikes and laboratory control spikes were performed for each batch to assess accuracy as well as possible matrix interference. Either a matrix spike duplicate and/or a laboratory control spike duplicate were performed per batch to assess precision. Ninety-four percent of matrix spike samples run were within acceptability criteria. The individual pesticides with less than 90% of samples within acceptable recoveries for matrix spikes include methiocarb (83%), methomyl (83%), paraquat (8%), cyhalothrin (83%), methidathion (67%) and phosmet (50%). A single batch matrix spike and matrix spike duplicate were above control limits for methiocarb (as well as for methomyl and cyhalothrin), but their associated laboratory control spike was within the acceptability criteria and all environmental samples were non-detect. Two methidathion and phosmet batches had matrix spike and matrix spike duplicates above control limits, but the laboratory control spikes were within the criteria range and all environmental samples were non-detect. Two paraquat batches' MS/MSD were below the control limits (PR 43-102), but the LCS was within the acceptable range, all samples were non-detect and the MS/MSD samples were not re-analyzed. The paraquat analysis is difficult to perform due to matrix interferences; paraquat tends to bind to suspended solids in the sample and therefore recoveries of matrix spike samples

are consistently low. Of the four paraquat batches with high matrix spike recoveries, two had laboratory control spike results within range and two had LCS recoveries above the acceptability criteria. In the instances where both the matrix spike and the lab control spike were both out of range the samples were re-analyzed with similar results. All of the batches had non-detect environmental samples. Laboratory precision assessed by the RPD of laboratory duplicates, met acceptability criteria in 99% of matrix spike duplicates. Laboratory control spikes were within acceptability criteria for 99% of samples analyzed, and 100% of laboratory control spike duplicates had RPDs less than 25%.

Surrogates were run for each analysis except for glyphosate and paraquat. Surrogate recoveries were within specific acceptance criteria for 98% of all samples analyzed. All batches with laboratory QCs outside of acceptability criteria have been flagged in addition to the specific sample acceptability criteria. When a surrogate is recovered outside of the acceptability criteria, the associated environmental sample is flagged as well. Batches are approved by evaluating all measures of precision and accuracy such that although a single QC sample may be outside of acceptability criteria, the entire batch may be accepted due to other QCs within that batch meeting acceptability criteria.

Eight batches this season were run without matrix spike and matrix spike duplicate samples, causing the batches to be flagged as having "incomplete QC"; four batches involved Management Plan Monitoring and the other four were due to a single sample extracted separately from the designated MS/MSD sample. Four Management Plan Monitoring batches, one each month from May through August, were missing MS/MSD due to a miscommunication with the laboratory. It was not noted on the COC that a matrix spike was to be run, and therefore the lab did not run the spike analyses. The issue was resolved mid-August and the matrix spike analysis is now noted on the COC for all management plan samples. During each of those months, normal monitoring samples were collected within 2 weeks of the Management Plan Monitoring and matrix spikes were collected and run in those batches. In July, the samples from Lone Tree Creek @ Jack Tone Road were extracted and analyzed separately from other samples collected on the same date and consequently were run without a matrix spike or matrix spike duplicate (four batches); however a matrix spike and matrix spike duplicate were collected on the same day and extracted/run with the other samples. All batches missing a matrix spike were extracted and run with an LCS and LCSD meeting accuracy and precision requirements. Though the batches were run with a lab control spike and lab control spike duplicate, the matrix spike was still missing; therefore these four batches were also flagged as having incomplete QC.

Hold times for all chemistry analysis were met, except for two individual *E. coli* samples, and one turbidity lab duplicate. The *E. coli* samples were analyzed past hold time due to a laboratory error which resulted in the courier not arriving to pick up the samples. Once it was recognized that the courier was not coming, the field crew drove the samples to the laboratory

resulting in two samples being analyzed outside of hold time; however, all samples were analyzed within 25 hours of collection. The turbidity sample, not noted in Table 21 since it is a laboratory duplicate, was analyzed past the 48 hour hold time due to laboratory error.

Toxicity

For aquatic toxicity tests, the acceptability of test results is determined primarily by performance-based criteria for test organisms, culture and test conditions, and the results of control bioassays. Control bioassays include monthly reference toxicant testing and negative and solvent controls (for TIEs). Test acceptability requirements are documented in the method documents for each bioassay method and are included in the QAPP. In addition to the QA requirements for the toxicity testing methods, a minimum of 5% of the samples collected are required to be collected as field duplicates. Field duplicates were collected every sampling event such that the overall rate of field duplicates would be at least 5% of all samples including resamples due to toxicity during normal monitoring. The overall percentage of field duplicates are as follows: *Ceriodaphnia* 6%, *Pimephales* 7%, *Selenastrum* 5% and *Hyalella* 6%.

- Water Column Toxicity: Field duplicates were collected during each normal monitoring event and were tested for *Ceriodaphnia*, *Selenastrum* and *Pimephales*. All three species had field duplicates within the acceptability criteria (RPDs < 25%) except for *Selenastrum*, which had 66.6% of RPDs less than 25% (4 of 6). Both pairs of field duplicates and their associated environmental samples showed significant toxicity relative to their controls. All tests met holding time criteria (< 36 hours), water quality requirements and control requirements (as listed in the EPA method guidelines).

- Sediment Toxicity: Sediment was collected on August 13, 2008 and resampled on September 18, 2008. One field duplicate was collected and its RPD was less than 25%. One hundred percent of the sediment samples had laboratory controls within acceptability criteria. All sediment samples met holding time criteria.

Table 12. SJCDWQC summary of field blank quality control sample evaluations.

Samples collected during the irrigation season of 2008, sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Carbaryl	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Carbofuran	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Methiocarb	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Methomyl	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Oxamyl	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Diuron	<RL or < (env sample/5)	6	6	100.00
EPA 8321A CARB	Linuron	<RL or < (env sample/5)	6	6	100.00
EPA 619	Atrazine	<RL or < (env sample/5)	6	6	100.00
EPA 619	Cyanazine	<RL or < (env sample/5)	6	6	100.00
EPA 619	Simazine	<RL or < (env sample/5)	6	6	100.00
EPA 547M	Glyphosate	<RL or < (env sample/5)	6	6	100.00
EPA 549.2M	Paraquat dichloride	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	DDD(p,p')	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	DDE(p,p')	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	DDT(p,p')	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Dicofol	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Dieldrin	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Endrin	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Methoxychlor	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Bifenthrin	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Cyfluthrin, total	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Cypermethrin, total	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Cyhalothrin, lambda, total	<RL or < (env sample/5)	6	6	100.00
EPA 8081A	Permethrin, total	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Azinphos methyl	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Chlorpyrifos	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Diazinon	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Dimethoate	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Disulfoton	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Malathion	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Methidathion	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Parathion, Methyl	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Phorate	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Phosmet	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Molinate	<RL or < (env sample/5)	6	6	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Thiobencarb	<RL or < (env sample/5)	6	6	100.00
EPA 8141A OP	Methamidophos	<RL or < (env sample/5)	6	6	100.00
EPA 110.2	Color	<RL or < (env sample/5)	6	5	83.33
EPA 130.2	Hardness as CaCO3	<RL or < (env sample/5)	6	6	100.00
EPA 160.1	Total Dissolved Solids	<RL or < (env sample/5)	6	6	100.00
EPA 180.1	Turbidity	<RL or < (env sample/5)	6	6	100.00
EPA 300.0	Nitrate as N	<RL or < (env sample/5)	6	6	100.00
EPA 350.2	Ammonia as N	<RL or < (env sample/5)	6	6	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	<RL or < (env sample/5)	6	4	66.67
EPA 354.1	Nitrite as N	<RL or < (env sample/5)	6	6	100.00
EPA 365.2	OrthoPhosphate as P	<RL or < (env sample/5)	6	6	100.00
EPA 365.2	Phosphate as P	<RL or < (env sample/5)	6	6	100.00
EPA 415.1	Total Organic Carbon	<RL or < (env sample/5)	6	5	83.33
SM 9223	E. coli	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Arsenic	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Boron	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Cadmium	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Copper	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Lead	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Nickel	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Selenium	<RL or < (env sample/5)	6	6	100.00
EPA 200.8	Zinc	<RL or < (env sample/5)	6	5	83.33
		TOTAL	**354**	**349**	**98.59**

Table 13. SJCDWQC summary of field duplicate quality control sample evaluations.

Samples collected during the irrigation season of 2008, sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Carbaryl	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Carbofuran	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Methiocarb	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Methomyl	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Oxamyl	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Diuron	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Linuron	RPD ≤ 25	6	6	100.00
EPA 619	Atrazine	RPD ≤ 25	6	6	100.00
EPA 619	Cyanazine	RPD ≤ 25	6	6	100.00
EPA 619	Simazine	RPD ≤ 25	6	6	100.00
EPA 547M	Glyphosate	RPD ≤ 25	6	6	100.00
EPA 549.2M	Paraquat dichloride	RPD ≤ 25	6	6	100.00
EPA 8081A	DDD(p,p')	RPD ≤ 25	6	6	100.00
EPA 8081A	DDE(p,p')	RPD ≤ 25	6	6	100.00
EPA 8081A	DDT(p,p')	RPD ≤ 25	6	6	100.00
EPA 8081A	Dicofol	RPD ≤ 25	6	6	100.00
EPA 8081A	Dieldrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Endrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Methoxychlor	RPD ≤ 25	6	6	100.00
EPA 8081A	Bifenthrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Cyfluthrin, total	RPD ≤ 25	6	6	100.00
EPA 8081A	Cypermethrin, total	RPD ≤ 25	6	6	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	RPD ≤ 25	6	6	100.00
EPA 8081A	Cyhalothrin, lambda, total	RPD ≤ 25	6	6	100.00
EPA 8081A	Permethrin, total	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Azinphos methyl	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	6	5	83.33
EPA 8141A OP	Diazinon	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Dimethoate	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Disulfoton	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Malathion	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Methidathion	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Phorate	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Phosmet	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Molinate	RPD ≤ 25	6	6	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Thiobencarb	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Methamidophos	RPD ≤ 25	6	6	100.00
EPA 110.2	Color	RPD ≤ 25	6	3	50.00
EPA 130.2	Hardness as CaCO3	RPD ≤ 25	6	3	50.00
EPA 160.1	Total Dissolved Solids	RPD ≤ 25	6	6	100.00
EPA 180.1	Turbidity	RPD ≤ 25	6	6	100.00
EPA 300.0	Nitrate as N	RPD ≤ 25	6	5	83.33
EPA 350.2	Ammonia as N	RPD ≤ 25	6	5	83.33
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25	6	4	66.67
EPA 354.1	Nitrite as N	RPD ≤ 25	6	6	100.00
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25	6	5	83.33
EPA 365.2	Phosphate as P	RPD ≤ 25	6	6	100.00
EPA 415.1	Total Organic Carbon	RPD ≤ 25	6	6	100.00
SM 9223	E. coli	RPD ≤ 25			NA
EPA 200.8	Arsenic	RPD ≤ 25	6	6	100.00
EPA 200.8	Boron	RPD ≤ 25	6	6	100.00
EPA 200.8	Cadmium	RPD ≤ 25	6	6	100.00
EPA 200.8	Copper	RPD ≤ 25	6	6	100.00
EPA 200.8	Lead	RPD ≤ 25	6	6	100.00
EPA 200.8	Nickel	RPD ≤ 25	6	6	100.00
EPA 200.8	Selenium	RPD ≤ 25	6	3	50.00
EPA 200.8	Zinc	RPD ≤ 25	6	5	83.33
		TOTAL	**354**	**338**	**95.48**

Table 14. SJCDWQC summary of method blank quality control sample evaluations.

Samples analyzed in batches with samples collected during the irrigation season of 2008, sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	<RL	7	7	100.00
EPA 8321A CARB	Carbaryl	<RL	7	7	100.00
EPA 8321A CARB	Carbofuran	<RL	7	7	100.00
EPA 8321A CARB	Methiocarb	<RL	7	7	100.00
EPA 8321A CARB	Methomyl	<RL	7	7	100.00
EPA 8321A CARB	Oxamyl	<RL	7	7	100.00
EPA 8321A CARB	Diuron	<RL	7	7	100.00
EPA 8321A CARB	Linuron	<RL	7	7	100.00
EPA 619	Atrazine	<RL	7	7	100.00
EPA 619	Cyanazine	<RL	7	7	100.00
EPA 619	Simazine	<RL	7	7	100.00
EPA 547M	Glyphosate	<RL	6	6	100.00
EPA 549.2M	Paraquat dichloride	<RL	6	6	100.00
EPA 8081A	DDD(p,p')	<RL	7	7	100.00
EPA 8081A	DDE(p,p')	<RL	7	7	100.00
EPA 8081A	DDT(p,p')	<RL	7	7	100.00
EPA 8081A	Dicofol	<RL	7	7	100.00
EPA 8081A	Dieldrin	<RL	9	9	100.00
EPA 8081A	Endrin	<RL	7	7	100.00
EPA 8081A	Methoxychlor	<RL	7	7	100.00
EPA 8081A	Bifenthrin	<RL	7	7	100.00
EPA 8081A	Cyfluthrin, total	<RL	7	7	100.00
EPA 8081A	Cypermethrin, total	<RL	7	7	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	<RL	7	7	100.00
EPA 8081A	Cyhalothrin, lambda, total	<RL	7	7	100.00
EPA 8081A	Permethrin, total	<RL	7	7	100.00
EPA 8141A OP	Azinphos methyl	<RL	7	7	100.00
EPA 8141A OP	Chlorpyrifos	<RL	12	12	100.00
EPA 8141A OP	Diazinon	<RL	7	7	100.00
EPA 8141A OP	Dimethoate	<RL	7	7	100.00
EPA 8141A OP	Disulfoton	<RL	7	7	100.00
EPA 8141A OP	Malathion	<RL	7	7	100.00
EPA 8141A OP	Methidathion	<RL	7	7	100.00
EPA 8141A OP	Parathion, Methyl	<RL	7	7	100.00
EPA 8141A OP	Phorate	<RL	7	7	100.00
EPA 8141A OP	Phosmet	<RL	7	7	100.00
EPA 8141A OP	Molinate	<RL	7	7	100.00
EPA 8141A OP	Thiobencarb	<RL	7	7	100.00
EPA 8141A OP	Methamidophos	<RL	6	6	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 110.2	Color	<RL	6	6	100.00
EPA 130.2	Hardness as CaCO3	<RL	15	15	100.00
EPA 160.1	Total Dissolved Solids	<RL	11	11	100.00
EPA 180.1	Turbidity	<RL	9	9	100.00
EPA 300.0	Nitrate as N	<RL	8	8	100.00
EPA 350.2	Ammonia as N	<RL	11	11	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	<RL	14	14	100.00
EPA 354.1	Nitrite as N	<RL	8	8	100.00
EPA 365.2	OrthoPhosphate as P	<RL	7	7	100.00
EPA 365.2	Phosphate as P	<RL	12	12	100.00
EPA 415.1	Total Organic Carbon	<RL	10	10	100.00
SM 9223	E. coli	<RL	6	6	100.00
EPA 200.8	Arsenic	<RL	18	18	100.00
EPA 200.8	Boron	<RL	18	18	100.00
EPA 200.8	Cadmium	<RL	18	18	100.00
EPA 200.8	Copper	<RL	21	21	100.00
EPA 200.8	Lead	<RL	18	18	100.00
EPA 200.8	Nickel	<RL	18	18	100.00
EPA 200.8	Selenium	<RL	18	18	100.00
EPA 200.8	Zinc	<RL	19	19	100.00
		TOTAL	**542**	**542**	**100.00**

Table 15. SJCDWQC summary of lab control spike quality control sample evaluations.

Laboratory control spikes and laboratory control spike duplicates analyzed in batches with samples collected during the irrigation season of 2008, sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	PR 31-133	8	8	100.00
EPA 8321A CARB	Carbaryl	PR 44-133	8	8	100.00
EPA 8321A CARB	Carbofuran	PR 36-165	8	8	100.00
EPA 8321A CARB	Methiocarb	PR 35-142	8	8	100.00
EPA 8321A CARB	Methomyl	PR23-152	8	8	100.00
EPA 8321A CARB	Oxamyl	PR 10-117	8	8	100.00
EPA 8321A CARB	Diuron	PR 52-136	8	8	100.00
EPA 8321A CARB	Linuron	PR 49-144	8	8	100.00
EPA 619	Atrazine	PR 39-156	9	9	100.00
EPA 619	Cyanazine	PR 22-172	9	9	100.00
EPA 619	Simazine	PR 21-179	9	9	100.00
EPA 547M	Glyphosate	PR 72-131	12	12	100.00
EPA 549.2M	Paraquat dichloride	PR 43-102	6	4	66.67
EPA 8081A	DDD(p,p')	PR 38-135	9	9	100.00
EPA 8081A	DDE(p,p')	PR 21-134	9	9	100.00
EPA 8081A	DDT(p,p')	PR 18-145	9	9	100.00
EPA 8081A	Dicofol	PR 40-135	9	9	100.00
EPA 8081A	Dieldrin	PR 48-121	13	13	100.00
EPA 8081A	Endrin	PR 24-143	9	9	100.00
EPA 8081A	Methoxychlor	PR 30-163	9	9	100.00
EPA 8081A	Bifenthrin	PR 52-117	9	9	100.00
EPA 8081A	Cyfluthrin	PR 53-125	9	9	100.00
EPA 8081A	Cypermethrin	PR 55-107	9	9	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	PR 52-117	9	9	100.00
EPA 8081A	Cyhalothrin, lambda, total	PR 62-104	9	8	88.89
EPA 8081A	Permethrin, total	PR 24-166	9	9	100.00
EPA 8141A OP	Azinphos methyl	PR 36-189	9	9	100.00
EPA 8141A OP	Chlorpyrifos	PR 61-125	17	17	100.00
EPA 8141A OP	Diazinon	PR 57-130	9	9	100.00
EPA 8141A OP	Dimethoate	PR 68-202	9	9	100.00
EPA 8141A OP	Disulfoton	PR 47-117	9	9	100.00
EPA 8141A OP	Malathion	PR 47-125	9	9	100.00
EPA 8141A OP	Methidathion	PR 50-150	9	9	100.00
EPA 8141A OP	Parathion, Methyl	PR 55-164	9	9	100.00
EPA 8141A OP	Phorate	PR 44-117	9	9	100.00
EPA 8141A OP	Phosmet	PR 50-150	9	8	88.89
EPA 8141A OP	Molinate	PR 50-150	9	9	100.00
EPA 8141A OP	Thiobencarb	PR 50-150	9	9	100.00
EPA 8141A OP	Methamidophos	PR 40-135	9	9	100.00
EPA 110.2	Color	PR 80-120	6	6	100.00
EPA 130.2	Hardness as CaCO3	PR 80-120	15	15	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 160.1	Total Dissolved Solids	PR 80-120	11	11	100.00
EPA 180.1	Turbidity	PR 90-110	9	9	100.00
EPA 300.0	Nitrate as N	PR 90-110	8	8	100.00
EPA 350.2	Ammonia as N	PR 90-110	11	11	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	PR 90-110	14	14	100.00
EPA 354.1	Nitrite as N	PR 80-120	8	8	100.00
EPA 365.2	OrthoPhosphate as P	PR 90-110	7	7	100.00
EPA 365.2	Phosphate as P	PR 90-110	12	12	100.00
EPA 415.1	Total Organic Carbon	PR 80-120	10	10	100.00
SM 9223	E. coli	PR 80-120			NA
EPA 200.8	Arsenic	PR 85-115	18	18	100.00
EPA 200.8	Boron	PR 85-115	18	18	100.00
EPA 200.8	Cadmium	PR 85-115	18	18	100.00
EPA 200.8	Copper	PR 85-115	21	21	100.00
EPA 200.8	Lead	PR 85-115	18	18	100.00
EPA 200.8	Nickel	PR 85-115	18	18	100.00
EPA 200.8	Selenium	PR 85-115	18	18	100.00
EPA 200.8	Zinc	PR 85-115	19	19	100.00
		TOTAL	**614**	**610**	**99.35**

Table 16. SJCDWQC summary of lab control spike duplicate quality control sample evaluations.

Laboratory control spikes and laboratory control spike duplicates analyzed in batches with samples collected during the irrigation season of 2008, sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Carbaryl	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Carbofuran	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Methiocarb	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Methomyl	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Oxamyl	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Diuron	RPD ≤ 25	1	1	100.00
EPA 8321A CARB	Linuron	RPD ≤ 25	1	1	100.00
EPA 619	Atrazine	RPD ≤ 25	2	2	100.00
EPA 619	Cyanazine	RPD ≤ 25	2	2	100.00
EPA 619	Simazine	RPD ≤ 25	2	2	100.00
EPA 547M	Glyphosate	RPD ≤ 25	6	6	100.00
EPA 549.2M	Paraquat dichloride	RPD ≤ 25			NA
EPA 8081A	DDD(p,p')	RPD ≤ 25	2	2	100.00
EPA 8081A	DDE(p,p')	RPD ≤ 25	2	2	100.00
EPA 8081A	DDT(p,p')	RPD ≤ 25	2	2	100.00
EPA 8081A	Dicofol	RPD ≤ 25	2	2	100.00
EPA 8081A	Dieldrin	RPD ≤ 25	4	4	100.00
EPA 8081A	Endrin	RPD ≤ 25	2	2	100.00
EPA 8081A	Methoxychlor	RPD ≤ 25	2	2	100.00
EPA 8081A	Bifenthrin	RPD ≤ 25	2	2	100.00
EPA 8081A	Cyfluthrin	RPD ≤ 25	2	2	100.00
EPA 8081A	Cypermethrin	RPD ≤ 25	2	2	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	RPD ≤ 25	2	2	100.00
EPA 8081A	Cyhalothrin, lambda, total	RPD ≤ 25	2	2	100.00
EPA 8081A	Permethrin, total	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Azinphos methyl	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	5	5	100.00
EPA 8141A OP	Diazinon	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Dimethoate	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Disulfoton	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Malathion	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Methidathion	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Phorate	RPD ≤ 25	2	2	100.00

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Phosmet	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Molinate	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Thiobencarb	RPD ≤ 25	2	2	100.00
EPA 8141A OP	Methamidophos	RPD ≤ 25	3	3	100.00
EPA 110.2	Color	RPD ≤ 25			NA
EPA 130.2	Hardness as CaCO3	RPD ≤ 25			NA
EPA 160.1	Total Dissolved Solids	RPD ≤ 25			NA
EPA 180.1	Turbidity	RPD ≤ 25			NA
EPA 300.0	Nitrate as N	RPD ≤ 25			NA
EPA 350.2	Ammonia as N	RPD ≤ 25			NA
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25			NA
EPA 354.1	Nitrite as N	RPD ≤ 25			NA
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25			NA
EPA 365.2	Phosphate as P	RPD ≤ 25			NA
EPA 415.1	Total Organic Carbon	RPD ≤ 25			NA
SM 9223	E. coli	RPD ≤ 25			NA
EPA 200.8	Arsenic	RPD ≤ 25			NA
EPA 200.8	Boron	RPD ≤ 25			NA
EPA 200.8	Cadmium	RPD ≤ 25			NA
EPA 200.8	Copper	RPD ≤ 25			NA
EPA 200.8	Lead	RPD ≤ 25			NA
EPA 200.8	Nickel	RPD ≤ 25			NA
EPA 200.8	Selenium	RPD ≤ 25			NA
EPA 200.8	Zinc	RPD ≤ 25			NA
		TOTAL	**78**	**78**	**100.00**

Table 17. SJCDWQC summary of matrix spike quality control sample evaluations.

Matrix spikes and matrix spike duplicates collected during the irrigation season of 2008. Included in the following table are NONAG matrix spikes included for batch quality assurance purposes. Evaluations are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	PR 31-133	12	11	91.67
EPA 8321A CARB	Carbaryl	PR 44-133	12	12	100.00
EPA 8321A CARB	Carbofuran	PR 36-165	12	12	100.00
EPA 8321A CARB	Methiocarb	PR 35-142	12	10	83.33
EPA 8321A CARB	Methomyl	PR23-152	12	10	83.33
EPA 8321A CARB	Oxamyl	PR 10-117	12	12	100.00
EPA 8321A CARB	Diuron	PR 52-136	12	12	100.00
EPA 8321A CARB	Linuron	PR 49-144	12	12	100.00
EPA 619	Atrazine	PR 39-156	12	12	100.00
EPA 619	Cyanazine	PR 22-172	12	12	100.00
EPA 619	Simazine	PR 21-179	12	12	100.00
EPA 547M	Glyphosate	PR 72-131	12	12	100.00
EPA 549.2M	Paraquat dichloride	PR 43-102	12	1	8.33
EPA 8081A	DDD(p,p')	PR 38-135	12	12	100.00
EPA 8081A	DDE(p,p')	PR 21-134	12	12	100.00
EPA 8081A	DDT(p,p')	PR 18-145	12	12	100.00
EPA 8081A	Dicofol	PR 40-135	12	12	100.00
EPA 8081A	Dieldrin	PR 48-121	12	12	100.00
EPA 8081A	Endrin	PR 24-143	12	12	100.00
EPA 8081A	Methoxychlor	PR 30-163	12	12	100.00
EPA 8081A	Bifenthrin	PR 52-117	12	12	100.00
EPA 8081A	Cyfluthrin	PR 53-125	12	12	100.00
EPA 8081A	Cypermethrin	PR 55-107	12	11	91.67
EPA 8081A	Esfenvalerate/Fenvalerate, total	PR 52-117	12	12	100.00
EPA 8081A	Cyhalothrin, lambda, total	PR 62-104	12	10	83.33
EPA 8081A	Permethrin, total	PR 24-166	12	12	100.00
EPA 8141A OP	Azinphos methyl	PR 36-189	12	12	100.00
EPA 8141A OP	Chlorpyrifos	PR 61-125	16	15	93.75
EPA 8141A OP	Diazinon	PR 57-130	12	12	100.00
EPA 8141A OP	Dimethoate	PR 68-202	12	12	100.00
EPA 8141A OP	Disulfoton	PR 47-117	12	12	100.00
EPA 8141A OP	Malathion	PR 47-125	12	12	100.00
EPA 8141A OP	Methidathion	PR 50-150	12	8	66.67
EPA 8141A OP	Parathion, Methyl	PR 55-164	12	12	100.00
EPA 8141A OP	Phorate	PR 44-117	12	12	100.00
EPA 8141A OP	Phosmet	PR 50-150	12	6	50.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Molinate	PR 50-150	12	12	100.00
EPA 8141A OP	Thiobencarb	PR 50-150	12	12	100.00
EPA 8141A OP	Methamidophos	PR 40-135	12	12	100.00
EPA 110.2	Color	PR 80-120			NA
EPA 130.2	Hardness as CaCO3	PR 80-120	30	26	86.67
EPA 160.1	Total Dissolved Solids	PR 80-120			NA
EPA 180.1	Turbidity	PR 90-110			NA
EPA 300.0	Nitrate as N	PR 90-110	16	14	87.50
EPA 350.2	Ammonia as N	PR 90-110	22	22	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	PR 90-110	28	24	85.71
EPA 354.1	Nitrite as N	PR 80-120	16	16	100.00
EPA 365.2	OrthoPhosphate as P	PR 90-110	14	11	78.57
EPA 365.2	Phosphate as P	PR 90-110	24	23	95.83
EPA 415.1	Total Organic Carbon	PR 80-120	22	22	100.00
SM 9223	E. coli	PR 80-120			NA
EPA 200.8	Arsenic	PR 85-115	36	35	97.22
EPA 200.8	Boron	PR 85-115	36	24	66.67
EPA 200.8	Cadmium	PR 85-115	36	36	100.00
EPA 200.8	Copper	PR 85-115	42	41	97.62
EPA 200.8	Lead	PR 85-115	36	36	100.00
EPA 200.8	Nickel	PR 85-115	36	34	94.44
EPA 200.8	Selenium	PR 85-115	36	34	94.44
EPA 200.8	Zinc	PR 85-115	38	37	97.37
		TOTAL	**940**	**877**	**93.30**

Table 18. SJCDWQC summary of matrix spike duplicate quality control sample evaluations.

Matrix spikes and matrix spike duplicates were collected during the irrigation season of 2008. Included in the following table are NONAG matrix spikes included for batch quality assurance purposes. Evaluations are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25	6	5	83.33
EPA 8321A CARB	Carbaryl	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Carbofuran	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Methiocarb	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Methomyl	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Oxamyl	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Diuron	RPD ≤ 25	6	6	100.00
EPA 8321A CARB	Linuron	RPD ≤ 25	6	6	100.00
EPA 619	Atrazine	RPD ≤ 25	6	6	100.00
EPA 619	Cyanazine	RPD ≤ 25	6	6	100.00
EPA 619	Simazine	RPD ≤ 25	6	6	100.00
EPA 547M	Glyphosate	RPD ≤ 25	6	6	100.00
EPA 549.2M	Paraquat dichloride	RPD ≤ 25	6	6	100.00
EPA 8081A	DDD(p,p')	RPD ≤ 25	6	6	100.00
EPA 8081A	DDE(p,p')	RPD ≤ 25	6	6	100.00
EPA 8081A	DDT(p,p')	RPD ≤ 25	6	6	100.00
EPA 8081A	Dicofol	RPD ≤ 25	6	6	100.00
EPA 8081A	Dieldrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Endrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Methoxychlor	RPD ≤ 25	6	6	100.00
EPA 8081A	Bifenthrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Cyfluthrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Cypermethrin	RPD ≤ 25	6	6	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	RPD ≤ 25	6	6	100.00
EPA 8081A	Cyhalothrin, lambda, total	RPD ≤ 25	6	6	100.00
EPA 8081A	Permethrin, total	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Azinphos methyl	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25	8	7	87.50
EPA 8141A OP	Diazinon	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Dimethoate	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Disulfoton	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Malathion	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Methidathion	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Phorate	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Phosmet	RPD ≤ 25	6	6	100.00

Method	Analyte	Data Quality Objective	Number of Pairs	Pairs Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Molinate	RPD ≤ 25	6	6	100.00
EPA 8141A OP	Thiobencarb	RPD ≤ 25	6	5	83.33
EPA 8141A OP	Methamidophos	RPD ≤ 25	6	6	100.00
EPA 110.2	Color	RPD ≤ 25			NA
EPA 130.2	Hardness as CaCO3	RPD ≤ 25	15	15	100.00
EPA 160.1	Total Dissolved Solids	RPD ≤ 25			NA
EPA 180.1	Turbidity	RPD ≤ 25			NA
EPA 300.0	Nitrate as N	RPD ≤ 25	8	8	100.00
EPA 350.2	Ammonia as N	RPD ≤ 25	11	11	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25	14	14	100.00
EPA 354.1	Nitrite as N	RPD ≤ 25	8	8	100.00
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25	7	7	100.00
EPA 365.2	Phosphate as P	RPD ≤ 25	12	12	100.00
EPA 415.1	Total Organic Carbon	RPD ≤ 25	11	11	100.00
SM 9223	E. coli	RPD ≤ 25			NA
EPA 200.8	Arsenic	RPD ≤ 25	18	18	100.00
EPA 200.8	Boron	RPD ≤ 25	18	18	100.00
EPA 200.8	Cadmium	RPD ≤ 25	18	18	100.00
EPA 200.8	Copper	RPD ≤ 25	21	21	100.00
EPA 200.8	Lead	RPD ≤ 25	18	18	100.00
EPA 200.8	Nickel	RPD ≤ 25	18	18	100.00
EPA 200.8	Selenium	RPD ≤ 25	18	18	100.00
EPA 200.8	Zinc	RPD ≤ 25	19	19	100.00
		TOTAL	**470**	**467**	**99.36**

Table 19. SJCDWQC summary of lab duplicate quality control sample evaluations.

Samples were analyzed in batches with samples collected during the irrigation season of 2008 and also include NONAG samples included for batch quality assurance purposes; sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	RPD ≤ 25			NA
EPA 8321A CARB	Carbaryl	RPD ≤ 25			NA
EPA 8321A CARB	Carbofuran	RPD ≤ 25			NA
EPA 8321A CARB	Methiocarb	RPD ≤ 25			NA
EPA 8321A CARB	Methomyl	RPD ≤ 25			NA
EPA 8321A CARB	Oxamyl	RPD ≤ 25			NA
EPA 8321A CARB	Diuron	RPD ≤ 25			NA
EPA 8321A CARB	Linuron	RPD ≤ 25			NA
EPA 619	Atrazine	RPD ≤ 25			NA
EPA 619	Cyanazine	RPD ≤ 25			NA
EPA 619	Simazine	RPD ≤ 25			NA
EPA 547M	Glyphosate	RPD ≤ 25			NA
EPA 549.2M	Paraquat dichloride	RPD ≤ 25			NA
EPA 8081A	DDD(p,p')	RPD ≤ 25			NA
EPA 8081A	DDE(p,p')	RPD ≤ 25			NA
EPA 8081A	DDT(p,p')	RPD ≤ 25			NA
EPA 8081A	Dicofol	RPD ≤ 25			NA
EPA 8081A	Dieldrin	RPD ≤ 25			NA
EPA 8081A	Endrin	RPD ≤ 25			NA
EPA 8081A	Methoxychlor	RPD ≤ 25			NA
EPA 8081A	Bifenthrin	RPD ≤ 25			NA
EPA 8081A	Cyfluthrin, total	RPD ≤ 25			NA
EPA 8081A	Cypermethrin, total	RPD ≤ 25			NA
EPA 8081A	Esfenvalerate/Fenvalerate, total	RPD ≤ 25			NA
EPA 8081A	Cyhalothrin, lambda, total	RPD ≤ 25			NA
EPA 8081A	Permethrin, total	RPD ≤ 25			NA
EPA 8141A OP	Azinphos methyl	RPD ≤ 25			NA
EPA 8141A OP	Chlorpyrifos	RPD ≤ 25			NA
EPA 8141A OP	Diazinon	RPD ≤ 25			NA
EPA 8141A OP	Dimethoate	RPD ≤ 25			NA
EPA 8141A OP	Disulfoton	RPD ≤ 25			NA
EPA 8141A OP	Malathion	RPD ≤ 25			NA
EPA 8141A OP	Methidathion	RPD ≤ 25			NA
EPA 8141A OP	Parathion, Methyl	RPD ≤ 25			NA
EPA 8141A OP	Phorate	RPD ≤ 25			NA
EPA 8141A OP	Phosmet	RPD ≤ 25			NA

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Molinate	RPD ≤ 25			NA
EPA 8141A OP	Thiobencarb	RPD ≤ 25			NA
EPA 8141A OP	Methamidophos	RPD ≤ 25			NA
EPA 110.2	Color	RPD ≤ 25	6	6	100.00
EPA 130.2	Hardness as CaCO3	RPD ≤ 25			NA
EPA 160.1	Total Dissolved Solids	RPD ≤ 25	11	11	100.00
EPA 180.1	Turbidity	RPD ≤ 25	9	9	100.00
EPA 300.0	Nitrate as N	RPD ≤ 25			NA
EPA 350.2	Ammonia as N	RPD ≤ 25			NA
EPA 351.3	Nitrogen, Total Kjeldahl	RPD ≤ 25			NA
EPA 354.1	Nitrite as N	RPD ≤ 25			NA
EPA 365.2	OrthoPhosphate as P	RPD ≤ 25			NA
EPA 365.2	Phosphate as P	RPD ≤ 25			NA
EPA 415.1	Total Organic Carbon	RPD ≤ 25			NA
SM 9223	E. coli	Rlog ≤ 1.30	6	6	100.00
EPA 200.8	Arsenic	RPD ≤ 25			NA
EPA 200.8	Boron	RPD ≤ 25			NA
EPA 200.8	Cadmium	RPD ≤ 25			NA
EPA 200.8	Copper	RPD ≤ 25			NA
EPA 200.8	Lead	RPD ≤ 25			NA
EPA 200.8	Nickel	RPD ≤ 25			NA
EPA 200.8	Selenium	RPD ≤ 25			NA
EPA 200.8	Zinc	RPD ≤ 25			NA
		TOTAL	**32**	**32**	**100.00**

Table 20. SJCDWQC summary of surrogate recovery quality control sample evaluations.

Surrogates were run with water samples collected and LABQAs analyzed during the irrigation season of 2008 for all organics except paraquat and glyphosate. Included are NONAG samples. Evaluations are sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Isoxaben(Surrogate)	RPD ≤ 25; PR 36-140	63	63	100.00
EPA 8321A CARB	Tributylphosphate(Surrogate)	RPD ≤ 25; PR 36-140	128	128	100.00
EPA 8321A CARB	Triphenyl phosphate(Surrogate)	RPD ≤ 25; PR 56-129			NA
EPA 619	Tributylphosphate(Surrogate)	RPD ≤ 25; PR 62-145	129	128	99.22
EPA 619	Triphenyl phosphate(Surrogate)	RPD ≤ 25; PR 54-144	129	129	100.00
EPA 8081A	Decachlorobiphenyl(Surrogate)	RPD ≤ 25; PR 16-146	137	137	100.00
EPA 8081A	Tetrachloro-m-xylene(Surrogate)	RPD ≤ 25; PR 15-98	137	137	100.00
EPA 8141A OP	Tributylphosphate(Surrogate)	RPD ≤ 25; PR 60-150	287	281	97.91
EPA 8141A OP	Triphenyl phosphate(Surrogate)	RPD ≤ 25; PR 56-129	287	273	95.12
		TOTAL	**1297**	**1276**	**98.38**

Table 21. SJCDWQC summary of holding time evaluations for environmental, field blank, field duplicate and matrix spike samples collected during the irrigation season of 2008; sorted by method and analyte.

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8321A CARB	Aldicarb	7 days	107	107	100.00
EPA 8321A CARB	Carbaryl	7 days	107	107	100.00
EPA 8321A CARB	Carbofuran	7 days	107	107	100.00
EPA 8321A CARB	Methiocarb	7 days	107	107	100.00
EPA 8321A CARB	Methomyl	7 days	107	107	100.00
EPA 8321A CARB	Oxamyl	7 days	107	107	100.00
EPA 8321A CARB	Diuron	7 days	107	107	100.00
EPA 8321A CARB	Linuron	7 days	107	107	100.00
EPA 619	Atrazine	7 days	107	107	100.00
EPA 619	Cyanazine	7 days	107	107	100.00
EPA 619	Simazine	7 days	107	107	100.00
EPA 547M	Glyphosate	14 days	107	107	100.00
EPA 549.2M	Paraquat dichloride	7 days	107	107	100.00
EPA 8081A	DDD(p,p')	7 days	107	107	100.00
EPA 8081A	DDE(p,p')	7 days	107	107	100.00
EPA 8081A	DDT(p,p')	7 days	107	107	100.00
EPA 8081A	Dicofol	7 days	107	107	100.00
EPA 8081A	Dieldrin	7 days	109	109	100.00
EPA 8081A	Endrin	7 days	107	107	100.00
EPA 8081A	Methoxychlor	7 days	107	107	100.00
EPA 8081A	Bifenthrin	7 days	91	91	100.00
EPA 8081A	Cyfluthrin	7 days	91	91	100.00
EPA 8081A	Cypermethrin	7 days	91	91	100.00
EPA 8081A	Esfenvalerate/Fenvalerate, total	7 days	91	91	100.00
EPA 8081A	Cyhalothrin, lambda, total	7 days	91	91	100.00
EPA 8081A	Permethrin, total	7 days	91	91	100.00
EPA 8141A OP	Azinphos methyl	7 days	103	103	100.00
EPA 8141A OP	Chlorpyrifos	7 days	117	117	100.00
EPA 8141A OP	Diazinon	7 days	103	103	100.00
EPA 8141A OP	Dimethoate	7 days	103	103	100.00
EPA 8141A OP	Disulfoton	7 days	103	103	100.00
EPA 8141A OP	Malathion	7 days	103	103	100.00
EPA 8141A OP	Methidathion	7 days	103	103	100.00
EPA 8141A OP	Parathion, Methyl	7 days	103	103	100.00
EPA 8141A OP	Phorate	7 days	103	103	100.00
EPA 8141A OP	Phosmet	7 days	103	103	100.00
EPA 8141A OP	Molinate	7 days	107	107	100.00

Method	Analyte	Data Quality Objective	Number of Samples	Samples Within Control Limits	Percent Samples Acceptable
EPA 8141A OP	Thiobencarb	7 days	107	107	100.00
EPA 8141A OP	Methamidophos	7 days	106	106	100.00
EPA 110.2	Color	48 hours	101	101	100.00
EPA 130.2	Hardness as CaCO3	6 months	129	129	100.00
EPA 160.1	Total Dissolved Solids	48 hours	101	101	100.00
EPA 180.1	Turbidity	48 hours	101	101	100.00
EPA 300.0	Nitrate as N	48 hours	109	109	100.00
EPA 350.2	Ammonia as N	Field acidify, 28 days	107	107	100.00
EPA 351.3	Nitrogen, Total Kjeldahl	Field acidify, 28 days	107	107	100.00
EPA 354.1	Nitrite as N	48 hours	108	108	100.00
EPA 365.2	OrthoPhosphate as P	48 hours	107	107	100.00
EPA 365.2	Phosphate as P	Field acidify, 28 days	111	111	100.00
EPA 415.1	Total Organic Carbon	28 days	109	109	100.00
SM 9223	E. coli	24 hours	101	99	98.02
EPA 200.8	Arsenic	Field acidify, 40 days	128	128	100.00
EPA 200.8	Boron	Field acidify, 40 days	128	128	100.00
EPA 200.8	Cadmium	Field acidify, 40 days	128	128	100.00
EPA 200.8	Copper	Field acidify, 40 days	133	133	100.00
EPA 200.8	Lead	Field acidify, 40 days	128	128	100.00
EPA 200.8	Nickel	Field acidify, 40 days	128	128	100.00
EPA 200.8	Selenium	Field acidify, 40 days	128	128	100.00
EPA 200.8	Zinc	Field acidify, 40 days	128	128	100.00
		TOTAL	**6372**	**6370**	**99.97**

Table 22. SJCDWQC summary of toxicity retest evaluations due to failed toxicity criteria for samples collected during the irrigation season of 2008; sorted by method and species.

Method	Toxicity Species	Total Samples	Total Samples Retested	Percent Samples Within Acceptable Criteria
EPA 821/R-02-012	*Ceriodaphnia dubia*	102	0	100.00
EPA 821/R-02-012	*Pimephales promelas*	89	0	100.00
EPA 821/R-02-013	*Selenastrum capricornutum*	120	0	100.00
EPA 600/R-99-064	*Hyalella azteca*	16	0	100.00

Table 23. SJCDWQC summary of toxicity field duplicate sample evaluations collected during the irrigation season of 2008; sorted by method and species.

Method	Toxicity Species	Total Field Duplicate Samples	Data Quality Objective (DQO)	Total Field Duplicate Samples Within DQO	Percent Samples Within Acceptable Criteria
EPA 821/R-02-012	*Ceriodaphnia dubia*	6	RPD ≤ 25	6	100.00
EPA 821/R-02-012	*Pimephales promelas*	6	RPD ≤ 25	6	100.00
EPA 821/R-02-013	*Selenastrum capricornutum*	6	RPD ≤ 25	4	66.67
EPA 600/R-99-064	*Hyalella azteca*	1	RPD ≤ 25	1	100.00

Pesticide Use Information

All exceedances for the 2008 irrigation sampling are provided in Table 27 to Table 30 in the following section, Data Interpretation. Pesticide use reports (PURs) for April through September 2008 were requested from all the counties within the Coalition region. These PUR data can be found in Appendix IV. It should be noted that this information is direct from the Ag Commissioners and is considered preliminary. The data are reported exactly as it is received and may include errors and/or omissions.

For each sampling period in which chemicals, metals or toxicity were detected, all reported pesticide use data for one to six months prior to sampling (depending on exceedance, Table 24) were collected for the specific site subwatersheds based on Township-Range-Section (TRS). All pesticide products that contained the detected chemicals and metals are listed by their active ingredients and application method and are provided in maps in Appendix IV. Pesticide use is reported as amount of product used. Some products may have more than one active ingredient and in this case the product appears more than once with the name of the chemical ingredient. Data are not available for individual fields or parcels except where they coincide with complete sections. If necessary, PURs can be tentatively assigned to individual parcels by matching the size of the parcel and crop from the land use data with the number of acres and the commodity to which the product was applied and also using land ownership information and matching to user information on the PUR tables. Where exceedances in consecutive monitoring periods require pesticide use reports, only the additional pesticide use from the date of the previous exceedance are provided for the later exceedance. If there were no applications within the specified PUR collection period (Table 24), PUR data for an additional month back was reviewed. If no applications were made during this additional month, the last application was noted.

Cyanazine, dieldrin, endrin, DDT and DDE exceedances are not queried since there are no registered products that contain these chemicals. Nitrate/nitrite exceedances are not listed since the use of these products are not reported.

Table 24. Pesticide use data collected for reported exceedences.

Exceedance Type	Pesticides Use Data Collected
Pesticides in water column	1 month, except pyrethroids 6 months
Metals (copper) in water column	3 months
Sediment Toxicity – *Hyalella azteca*	3 months with 6 months for pyrethroids
Water column toxicity – *Selenastrum capricornutum, Pimephales promelas* and *Ceriodaphnia dubia*	1 months with 6 months for pyrethroids

Data Interpretation

Discrepancies occurred between exceedances reported in this document and those submitted as exceedance reports to the CVRWQCB during the 2008 irrigation monitoring season (Table 25). These discrepancies include detections that were either not reported in official exceedance reports or that were reported incorrectly for the various reasons described below.

Marsh Creek exceedances are not reported in Table 27-30 since this subwatershed was omitted from the SJCDWQC monitoring program in September 2008. Since the SJCDWQC is not managing this subwatershed, the exceedances are not being reported in the *Data Interpretation* and *Interpretation of Results* sections. However, all results from this subwatershed are included in Appendix I, have been included in the precision and accuracy analysis, and have been reported in Exceedance Reports. The Marsh Creek exceedances that occurred between April and August 2008 include specific conductivity (2), DDE (4), DDT (3), *E. coli* (4), boron (1), copper (2), lead (1), nickel (1), and zinc (1).

Exceedances of cadmium, lead, and nickel have been reported in Exceedance Reports that are not included in the following tables due to increased WQTLs (revised WQTL list received on September 16, 2008). Therefore 21 cadmium exceedances (WQTL raised from 0.04 to 5 µg/L), eight lead exceedances (WQTL raised from 2 to 15 µg/L), and 13 nickel exceedances (WQTL raised from 12 to 100 µg/L) were reported to the Regional Board but are no longer considered exceedances of the current WQTLs.

In addition, discrepancies occurred between the initial percentages reported for *Selenastrum capricornutum* toxicity and those included in this report. *Selenastrum* toxicity test results are reported from the laboratory in both absorbance units and cells/mL (calculated based on absorbance). Initially a percent cell growth relative to the control was calculated based on the reported absorbance; however the percent relative to the control values entered into the Coalition database were calculated based on cell counts. Because of the nature of the calculations, the percentages reported in the initial exceedance reports may vary slightly from the final exceedances listed in Table 30.

In an Exceedance Report submitted on September 4, 2008 an exceedance of the DDE WQTL was reported for samples collected from Terminous Tract Drain @ Hwy 12 on July 15, 2008; the exceedance was actually for DDT (Table 25).

An exceedance of the chlorpyrifos WQTL did not get reported in the Exceedance Report submitted on September 4, 2008 for Duck Creek @ Hwy 4 sampled on July 15, 2008 (Table 25).

An exceedance of the malathion WQTL was reported in an Exceedance Report submitted on October 2, 2008 for samples collected from Grant Line Canal @ Clifton Ct on August 12, 2008. This exceedance should have been reported for Grant Line Canal near Calpack (Table 25).

All samples that were toxic were resampled within 48 hours of receiving laboratory results. All samples that experienced toxicity greater than 50% of the control underwent toxicity identification evaluations (TIEs). Complete TIE results are included in Appendix VI and summarized in Table 30.

Water quality trigger limits (WQTLs) used to determine exceedances are provided in Table 26. A summary of exceedances that occurred during monitoring over the 2008 irrigation season is presented in Tables 27-30.

Table 25. Exceedance discrepancies that occurred during the 2008 irrigation season.

Station Name	Sample Date	Analyte	Unit	Exceedance Report Error	Current Report
Terminous Tract Drain @ Hwy 12	07/15/08	DDT	µg/L	Reported as DDE	0.008
Duck Creek @ Hwy 4	07/15/08	Chlorpyrifos	µg/L	Not Reported	0.066
Grant Line Canal near Calpack	08/12/08	Malathion	µg/L	Reported for Grant Line Canal @ Calpack	0.069

Table 26. Water Quality Triggers Limits (WQTLs) for constituents and parameters measured during Coalition monitoring (updated on September 16, 2008).

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Field and Physical Parameters					
pH	6.5 - 8.5 units	Numeric		Sacramento/San Joaquin Rivers Basin Plan (page III.6.00)	1
Electrical Conductivity (maximum)	700 umhos/cm	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
Dissolved Oxygen (minimum)	7 mg/L	Numeric	Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Rivers Basin Plan. Water Quality Control Plan for the Tulare Lake Basin.	1
	5 mg/L		Warm Freshwater Habitat	Basin Plan Objective, page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan	
Turbidity	variable	Numeric	Municipal and Domestic Supply	Basin Plan Objective - increase varies based on natural turbidity	1
Total Dissolved Solids	450 mg/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
Total Suspended Solids	NA				
Temperature	variable	Numeric		Basin Plan Objective (see objectives for COLD, WARM, and Enclosed Bays and Estuaries)	1
E coli	235 MPN/100 ml	Narrative	Water Contact Recreation	EPA ambient water quality criteria, single-sample maximum	3
Fecal coliform	200 MPN/100 ml 400 MPN/100 ml	Numeric	Water Contact Recreation	Sacramento/San Joaquin Rivers Basin Plan (page III.3.00) Geometric mean of not less than five samples for any 30- day period, nor shall more than 10% of the total number of samples taken during a 30 -day period.	1
TOC	NA				
Pesticides - Carbamates					
Aldicarb	3 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health)	1
Carbaryl	2.53 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average	3
Carbofuran	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
Methiocarb	0.5 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates	3
Methomyl	0.52 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life)	3

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Oxamyl	50 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Dept of Health Services. Primary MCL	3
Pesticides - Organochlorines					
DDD(p,p')	0.00083 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
DDE(p,p')	0.00059 ug/L				
DDT(p,p')	0.00059 ug/L				
Dicofol	NA				
Dieldrin	0.00014 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.056	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) / Continuous Concentration 4-day average (total)	1
Endrin	0.036 ug/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-Day Average	1
	0.76 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
Methoxychlor	0.03 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum	3
	30 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Pesticides - Organophosphates					
Azinphos methyl	0.01 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - instantaneous maximum	3
Chlorpyrifos	0.015 ug/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Rivers Basin Plan: page III-6.01; San Joaquin River & Delta, Sacramento & Feather Rivers; more stringent 4-day average.	1
Diazinon	0.1 ug/L	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan: San Joaquin River & Delta numeric standard. Sacramento & Feather Rivers numeric standard	1
Dichlorvos	0.085 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. Cal/EPA Cancer Potency Factor as a drinking water level	3
Dimethoate	1.0 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Notification Level – DHS (MUN, human health). California Notification Levels. (Department of Health Services)	3

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Demeton-s	NA				
Disulfoton	0.05 ug/L	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum	3
Malathion	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
Methamidophos	0.35 ug/L	Narrative	Municipal and Domestic Supply	Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3
Methidathion	0.7	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose (MUN, human health)	3
Parathion, Methyl	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition	2
Phorate	0.7 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3
Phosmet	140 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level.	3
Group A Pesticides					
Aldrin	0.00013 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	3 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Instantaneous maximum	
Chlordane	0.00057 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0043 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Heptachlor	0.00021ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0038 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Heptachlor Epoxide	0.0001 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0038 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Total Hexachlorocyclohexane (including lindane)	0.0039 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.95 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Maximum Concentration (1-hour Average)	
Endosulfan	110 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.056 ug/L		Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR (USEPA) - Continuous Concentration 4-day average (total)	
Toxaphene	0.00073 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption)	1
	0.0002 ug/L		Cold Freshwater Habitat, Spawning	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Continuous Concentration 4-day average (total)	
Pesticides - Herbicides					
Atrazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Cyanazine	1.0 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Health Advisory (human health)	3
Diuron	2 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. USEPA Health Advisory. Likely to be carcinogenic to humans (U.S. Environmental Protection Agency, 2005 Guidelines for Carcinogen Risk Assessment).	3
Glyphosate	700 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Linuron	1.4 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level	3

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
Molinate	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition	2
Paraquat dichloride	3.2 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level	3
Simazine	4.0 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Thiobencarb	ND	Numeric		Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition	2
Trifluralin	5 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Cancer Risk Level. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water	3
Metals (c)					
Arsenic	10 ug/L	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health)	1
Boron	700 ug/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3
Cadmium	for aquatic life; variable (see cadmium worksheet).	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness	1
	5 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Copper	for aquatic life; variable (see copper worksheet).	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness/	1
	1,300 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Lead	for aquatic life; variable (see lead worksheet).	Numeric	Freshwater Habitat	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
	15 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Molybdenum	15 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan - San Joaquin River, Mouth of the Merced River to Vernalis	1
	50 ug/L			Sacramento/San Joaquin Basin Plan - Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River	
	10 ug/L	Narrative	Agricultural Supply	Water Quality for Agriculture (Ayers & Westcot)	3

Constituent	Water Quality Trigger Limit (WQTL)	Standard Type	Beneficial Use (BU) with most protective limit	Reference for the Trigger Limit	Category (see footnotes)
	35 ug/L		Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level.	
Nickel	For aquatic life variable (see Nickel worksheet).	Numeric	Freshwater Habitat	CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness	1
	100 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
Selenium	50 ug/L	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health)	1
	5 ug/L (4-day average)	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR Freshwater Aquatic Life Protection - Continuous Concentration - 4-Day Average	
Zinc	For aquatic life variable (see Zinc worksheet).	Numeric	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness/	1
Nutrients					
Nitrate as NO3 Nitrate as N	45,000 ug/L as NO3 10,000 ug/L as N	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Nitrite as Nitrogen	1,000 ug/L as N	Numeric	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL	1
Ammonia	For aquatic life variable (see ammonia worksheet).	Narrative	Freshwater Habitat	Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Freshwater Aquatic Life Criteria, Continuous Concentration	3
	1.5 mg/L (regardless of pH and Temperature values)	Narrative	Municipal and Domestic Supply	Sacramento/San Joaquin Basin Plan Toxicity Objective: Taste and Odor Threshold (Ammore and Hautala)	3

Category 1: Constituents that have numeric water quality objectives in the Sac-SJR Basin Plan or other WQO listed by reference such as MCLs (Page III-3.0)* , CTRs (Page III-10.1)*, and chlorinated hydrocarbon pesticides (Page III-6.0, third bullet)*. Other numeric objectives may only apply to specific water bodies sections, or during specified time periods (see Basin Plan for more details).
Category 2: Pesticides with discharge prohibitions. Prohibitions apply to any discharges not subject to board-approved management practices (Page IV-25.0)*.
Category 3: Constituent does not have numeric WQO, and does not have a primary MCL. WQ Trigger Limit exceedance is based on implementation of narrative objective. All detections should be tracked. None are default exceedances.
Category 4: Coalitions may propose alternative triggers for specific water bodies. The coalition must provide the documentation that supports their proposed alternative trigger.
(*) Water Quality Control Plan for the Sacramento and San Joaquin River Basins. Revised on October 2007. Narrative WQTLs are based on Water Quality Goals Database. Updated by Jon Marshack on 16 July 2008
NA = Not Available. Until completion of evaluation studies and MRP Plan submittals with site specific information on beneficial uses.
ND = Non Detect.

Table 27. Exceedances of field parameters; sorted by station name and sample date.

Station Name	Sample Type Code	Sample Date	Sample Time	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm
Duck Creek @ Drais Rd	MPM	5/13/2008	12:10	6	6.05	
Duck Creek @ Drais Rd	MPM	7/15/2008	10:40	2.66		
Duck Creek @ Drais Rd	MPM	9/16/2008	11:40	3.99		
Duck Creek @ Hwy 4	E	5/13/2008	10:00	6.95	6.31	
Duck Creek @ Hwy 4	E	6/10/2008	10:40	6.89		
Duck Creek @ Hwy 4	E	7/15/2008	9:50	5.87		
Duck Creek @ Hwy 4	E	7/22/2008	7:40	4.92		
Duck Creek @ Hwy 4	E	8/12/2008	12:00	6		
Duck Creek @ Hwy 4	E	8/13/2008	11:00	5.34		
Duck Creek @ Hwy 4	E	9/16/2008	10:30	5.92		
French Camp Slough @ Airport Way	E	5/13/2008	17:20	5.83	5.95	
French Camp Slough @ Airport Way	E	8/13/2008	13:20	6.27		
French Camp Slough @ Airport Way	E	9/16/2008	19:20	6.51		
Grant Line Canal @ Clifton Court Rd	E	4/15/2008	12:10	4.82		763
Grant Line Canal @ Clifton Court Rd	E	5/13/2008	13:00			821
Grant Line Canal @ Clifton Court Rd	E	5/21/2008	9:00	1.15		
Grant Line Canal @ Clifton Court Rd	E	6/10/2008	11:40	4.24		892
Grant Line Canal @ Clifton Court Rd	E	7/15/2008	12:40			879
Grant Line Canal @ Clifton Court Rd	E	9/16/2008	19:20		8.61	1099
Grant Line Canal near Calpack Rd	E	4/15/2008	13:10	5.84		1205
Grant Line Canal near Calpack Rd	E	4/23/2008	9:40	3.59		1112
Grant Line Canal near Calpack Rd	E	5/13/2008	13:50			1733
Grant Line Canal near Calpack Rd	E	5/21/2008	9:20	4.95		1067
Grant Line Canal near Calpack Rd	E	6/10/2008	12:40	3.33		1066
Grant Line Canal near Calpack Rd	E	7/15/2008	13:30	3.8		927
Grant Line Canal near Calpack Rd	E	8/12/2008	13:10	0.45		945
Grant Line Canal near Calpack Rd	E	8/13/2008	12:30	2.79		899
Grant Line Canal near Calpack Rd	E	9/16/2008	18:30	0.47		1049
Kellogg Creek along Hoffman Ln	MPM	7/8/2008	9:50	6.54		
Kellogg Creek along Hoffman Ln	E	7/15/2008	11:20	6.59		
Kellogg Creek along Hoffman Ln	E	8/13/2008	11:40	6.89		
Littlejohns Creek @ 26 Mile Rd	MPM	5/13/2008	13:00	4.54	6.32	
Littlejohns Creek @ 26 Mile Rd	MPM	7/15/2008	11:40	5.5		
Littlejohns Creek @ 26 Mile Rd	MPM	8/12/2008	13:50	6.45		
Littlejohns Creek @ 26 Mile Rd	MPM	9/16/2008	12:10	3.65		
Littlejohns Creek @ Jack Tone Rd	E	5/13/2008	14:40	6.7		
Littlejohns Creek @ Jack Tone Rd	E	8/13/2008	11:30	6.19		
Littlejohns Creek @ Jack Tone Rd	E	9/16/2008	15:10	6.34		
Lone Tree Creek @ Brennan Rd	MPM	8/12/2008	15:00	6.66		
Lone Tree Creek @ Jack Tone Rd	E	4/15/2008	13:30	5.85		

Station Name	Sample Type Code	Sample Date	Sample Time	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm
Lone Tree Creek @ Jack Tone Rd	E	5/13/2008	16:20	4.65	6.1	
Lone Tree Creek @ Valley Home Rd	MPM	5/13/2008	13:20	5.29	5.91	
Lone Tree Creek @ Valley Home Rd	MPM	6/10/2008	12:50	6.62		
Lone Tree Creek @ Valley Home Rd	MPM	7/15/2008	12:10	6.07		
Lone Tree Creek @ Valley Home Rd	MPM	8/12/2008	14:30	4.2		
Lone Tree Creek @ Valley Home Rd	MPM	9/16/2008	12:50	5.93		
Mormon Slough @ Jack Tone Rd	E	4/15/2008	9:50	6.34		
Mormon Slough @ Jack Tone Rd	MPM	5/7/2008	9:50	6.7		
Mormon Slough @ Jack Tone Rd	E	5/13/2008	9:10	4.5		
Mormon Slough @ Jack Tone Rd	E	7/15/2008	9:10		8.61	
Mormon Slough @ Jack Tone Rd	E	8/12/2008	9:50	4.82		
Mormon Slough @ Jack Tone Rd	E	8/13/2008	10:20		8.59	
Mormon Slough @ Jack Tone Rd	MPM	9/9/2008	8:50	6.92	8.57	
Mormon Slough @ Jack Tone Rd	E	9/16/2008	9:40		8.58	
Roberts Island Drain @ Holt Rd	E	4/15/2008	14:10			1122
Roberts Island Drain @ Holt Rd	E	4/23/2008	10:30	5.41		914
Roberts Island Drain @ Holt Rd	E	5/13/2008	14:50	5.21		1285
Roberts Island Drain @ Holt Rd	E	5/21/2008	10:00	5.74		878
Roberts Island Drain @ Holt Rd	E	6/10/2008	16:10			937
Roberts Island Drain @ Holt Rd	E	7/15/2008	14:50	6.47		
Roberts Island Drain @ Holt Rd	E	8/12/2008	14:20	6.98		
Roberts Island Drain @ Holt Rd	E	8/13/2008	9:40	6.28		
Roberts Island Drain @ Holt Rd	E	9/16/2008	10:30	6		814
Roberts Island Drain along House Rd	E	4/15/2008	15:20	6.82		1225
Roberts Island Drain along House Rd	E	4/23/2008	10:50	3.82		1207
Roberts Island Drain along House Rd	E	5/13/2008	15:40			1540
Roberts Island Drain along House Rd	E	5/21/2008	10:20	5.77		964
Roberts Island Drain along House Rd	E	6/10/2008	14:10	4.38		871
Roberts Island Drain along House Rd	E	7/15/2008	17:00	5.55		
Roberts Island Drain along House Rd	E	8/12/2008	15:20			925
Roberts Island Drain along House Rd	E	8/13/2008	9:10	4.85		774
Roberts Island Drain along House Rd	E	9/16/2008	9:20	5		
Roberts Island Drain along House Rd	E	9/18/2008	11:50	4.65		767
Roberts Island Drain along House Rd	E	9/23/2008	7:40	2.85		961
Sand Creek @ Hwy 4 Bypass	E	4/15/2008	7:50	5.97		2029
Sand Creek @ Hwy 4 Bypass	E	4/23/2008	8:20	5.97		1913
Sand Creek @ Hwy 4 Bypass	MPM	5/7/2008	8:10	5.21		1707
Sand Creek @ Hwy 4 Bypass	E	5/13/2008	9:00	5.77		1859
Sand Creek @ Hwy 4 Bypass	MPM	6/3/2008	8:10	5.26		1898
Sand Creek @ Hwy 4 Bypass	E	6/10/2008	7:50	2.92		1845
Sand Creek @ Hwy 4 Bypass	MPM	7/8/2008	9:10	3.52		1758
Sand Creek @ Hwy 4 Bypass	E	7/15/2008	9:20	4.77		1059

Station Name	Sample Type Code	Sample Date	Sample Time	Oxygen, Dissolved, mg/L	pH, none	Specific Conductivity, µS/cm
Sand Creek @ Hwy 4 Bypass	E	8/12/2008	9:00	5.36		1885
Sand Creek @ Hwy 4 Bypass	E	8/13/2008	10:50	6.1		1818
Sand Creek @ Hwy 4 Bypass	E	8/19/2008	7:50	4.91		1897
Sand Creek @ Hwy 4 Bypass	E	9/16/2008	15:40			1709
Sand Creek @ Hwy 4 Bypass	E	9/18/2008	10:40	6.73		1854
South Webb Tract Drain	E	9/16/2008	13:50	1.32		
Terminous Tract Drain @ Hwy 12	E	4/15/2008	7:30			727
Terminous Tract Drain @ Hwy 12	E	4/23/2008	14:30			737
Terminous Tract Drain @ Hwy 12	E	5/13/2008	7:40	6.96		1003
Terminous Tract Drain @ Hwy 12	E	5/21/2008	13:40			1010
Terminous Tract Drain @ Hwy 12	E	6/10/2008	7:40	5.08		751
Terminous Tract Drain @ Hwy 12	E	7/15/2008	8:00	4.45		
Terminous Tract Drain @ Hwy 12	E	8/12/2008	8:00	2.56		
Terminous Tract Drain @ Hwy 12	E	9/16/2008	8:00	4.71		858
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	5/13/2008	15:20	5.61	6.17	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	9/16/2008	16:20	6.7		
Unnamed Drain to Lone Tree Creek @ Wagner Rd	MPM	9/16/2008	14:20	6.6		
Environmental Exceedances				**64**	**8**	**45**
Management Plan Monitoring Exceedances				**20**	**4**	**3**
Total				**84**	**12**	**48**

E = Environmental sample; MPM = Management Plan Monitoring

Table 28. Pesticides exceedances in the water column; sorted by station name and sample date.

Station Name	Sample Type Code	Sample Date	Sample Time	Carbofuran, µg/L	Chlorpyrifos, µg/L	DDD(p,p'), µg/L	DDE(p,p'), µg/L	DDT(p,p'), µg/L	Dieldrin, µg/L	Dimethoate, µg/L	Disulfoton, µg/L	Malathion, µg/L	Parathion, methyl, µg/L	Thiobencarb, µg/L
Duck Creek @ Drais Rd	MPM	05/13/08	12:10		0.42									
Duck Creek @ Hwy 4	E	04/15/08	10:40		0.057									
Duck Creek @ Hwy 4	E	06/10/08	10:40		0.11							0.22		
Duck Creek @ Hwy 4	E	07/15/08	9:50		0.066									
Duck Creek @ Hwy 4	E	08/12/08	12:00		0.017									
Duck Creek @ Hwy 4	E	09/16/08	10:30		0.027									
French Camp Slough @ Airport Way	E	05/13/08	17:20	0.19	0.4									
French Camp Slough @ Airport Way	E	07/15/08	16:20						0.0083	2.4				
French Camp Slough @ Airport Way	E	08/12/08	18:00		0.022									
French Camp Slough @ Airport Way	E	09/16/08	19:20		0.039									
Grant Line Canal near Calpack Rd	E	08/12/08	13:10									0.069		
Littlejohns Creek @ Jack Tone Rd	E	04/15/08	11:50		0.034									
Littlejohns Creek @ Jack Tone Rd	E	05/13/08	14:40	0.41										
Littlejohns Creek @ Jack Tone Rd	E	06/10/08	14:00		0.077									
Littlejohns Creek @ Jack Tone Rd	E	07/15/08	14:00		0.025									
Mormon Slough @ Jack Tone Rd	E	05/13/08	9:10		0.066									
Mormon Slough @ Jack Tone Rd	E	07/15/08	9:10		0.047									
Mormon Slough @ Jack Tone Rd	E	08/12/08	9:50		0.025								0.15	
Mormon Slough @ Jack Tone Rd	FD	08/12/08	9:50		*0.027								*0.15	
Mormon Slough @ Jack Tone Rd	MPM	09/09/08	8:50		0.034									
Mormon Slough @ Jack Tone Rd	E	09/16/08	9:40		0.036									
Roberts Island Drain @ Holt Rd	E	08/12/08	14:20		0.034									
Roberts Island Drain along House Rd	E	08/12/08	15:20		0.044									
Roberts Island Drain along House Rd	E	09/16/08	9:20		1.7									

Station Name	Sample Type Code	Sample Date	Sample Time	Carbofuran, µg/L	Chlorpyrifos, µg/L	DDD(p,p'), µg/L	DDE(p,p'), µg/L	DDT(p,p'), µg/L	Dieldrin, µg/L	Dimethoate, µg/L	Disulfoton, µg/L	Malathion, µg/L	Parathion, methyl, µg/L	Thiobencarb, µg/L
Sand Creek @ Hwy 4 Bypass	MPM	05/07/08	8:10						0.012					
Sand Creek @ Hwy 4 Bypass	E	05/13/08	9:00								0.11			
Sand Creek @ Hwy 4 Bypass	E	06/10/08	7:50				0.006				0.2			
Sand Creek @ Hwy 4 Bypass	E	08/12/08	9:00			0.0075	0.078	0.011	0.0058		0.18			
Terminous Tract Drain @ Hwy 12	E	07/15/08	8:00					0.008						
Terminous Tract Drain @ Hwy 12	E	08/12/08	8:00		0.021									
Terminous Tract Drain @ Hwy 12	E	09/16/08	8:00		0.02									
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	05/13/08	15:20	0.64	0.41									
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	06/10/08	14:40		0.12									0.12
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	07/15/08	14:40		0.028									
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	09/16/08	16:20		0.12									
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	FD	09/16/08	16:20		*0.12									
Unnamed Drain to Lone Tree Creek @ Wagner Rd	MPM	09/16/08	14:20		0.14									
Environmental Exceedances				**3**	**24**	**1**	**2**	**2**	**2**	**1**	**3**	**2**	**1**	**1**
Management Plan Monitoring Exceedances				**0**	**3**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
Total				**3**	**27**	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**1**	**1**

E = Environmental sample; FD = Field Duplicate; MPM = Management Plan Monitoring

* Not counted in exceedance tallies due to exceedance in associated environmental sample.

Table 29. Inorganics/Physical Parameters exceedances in water column.

The hardness value for metals is included in parenthesis along with the metals result; sorted by station name and sample date.

Station Name	Sample Type Code	Sample Date	Sample Time	Dissolved Solids, mg/L	*E. coli*, MPN/100mL	Arsenic, µg/L	Copper, µg/L (hardness)	Lead, µg/L (hardness)
French Camp Slough @ Airport Way	FD	04/15/08	14:50		290			
French Camp Slough @ Airport Way	E	05/13/08	17:20		280			
French Camp Slough @ Airport Way	E	07/15/08	16:20		240			
Grant Line Canal @ Clifton Court Rd	E	04/15/08	12:10	490	2000			
Grant Line Canal @ Clifton Court Rd	E	05/13/08	13:00	880	260	17		
Grant Line Canal @ Clifton Court Rd	E	06/10/08	11:40	650	440			
Grant Line Canal @ Clifton Court Rd	E	07/15/08	12:40	590		28		
Grant Line Canal @ Clifton Court Rd	E	08/12/08	12:10			12	28 (220)	
Grant Line Canal @ Clifton Court Rd	E	09/16/08	19:20	620		14		
Grant Line Canal near Calpack Rd	E	04/15/08	13:10	800				
Grant Line Canal near Calpack Rd	E	05/13/08	13:50	1100				
Grant Line Canal near Calpack Rd	E	06/10/08	12:40	560	240			
Grant Line Canal near Calpack Rd	E	07/15/08	13:30	530	>2400			
Grant Line Canal near Calpack Rd	E	08/12/08	13:10	570	>2400			
Grant Line Canal near Calpack Rd	E	09/16/08	18:30	680	2400	11		
Kellogg Creek along Hoffman Ln	MPM	07/08/08	9:50				98 (90)	
Littlejohns Creek @ Jack Tone Rd	E	05/13/08	14:40				4.2 (38)	
Littlejohns Creek @ Jack Tone Rd	E	09/16/08	15:10				4.2 (32)	
Lone Tree Creek @ Jack Tone Rd	E	04/15/08	13:30		650			
Lone Tree Creek @ Jack Tone Rd	E	05/13/08	16:20		1300			
Lone Tree Creek @ Jack Tone Rd	E	06/10/08	15:20		690			
Lone Tree Creek @ Jack Tone Rd	E	07/15/08	15:20		460			
Lone Tree Creek @ Jack Tone Rd	E	08/12/08	17:30		310			
Lone Tree Creek @ Valley Home Rd	E	07/15/08	12:10				7 (66)	
Mokelumne River @ Bruella Rd	E	04/15/08	8:40		390			
Roberts Island Drain @ Holt Rd	E	04/15/08	14:10	680				
Roberts Island Drain @ Holt Rd	E	05/13/08	14:50	960	240			
Roberts Island Drain @ Holt Rd	E	06/10/08	16:10	550				
Roberts Island Drain @ Holt Rd	E	07/15/08	14:50	460				
Roberts Island Drain @ Holt Rd	FD	07/15/08	14:50	*470				

Station Name	Sample Type Code	Sample Date	Sample Time	Dissolved Solids, mg/L	*E. coli*, MPN/100mL	Arsenic, µg/L	Copper, µg/L (hardness)	Lead, µg/L (hardness)
Roberts Island Drain @ Holt Rd	E	09/16/08	10:30	500	410			
Roberts Island Drain along House Rd	E	04/15/08	15:20	790				
Roberts Island Drain along House Rd	E	05/13/08	15:40	980		13		
Roberts Island Drain along House Rd	E	06/10/08	14:10	590				
Roberts Island Drain along House Rd	FD	06/10/08	14:10	*520				
Roberts Island Drain along House Rd	E	07/15/08	17:00		>2400			
Roberts Island Drain along House Rd	E	08/12/08	15:20	610				
Sand Creek @ Hwy 4 Bypass	E	04/15/08	7:50	1500	330			
Sand Creek @ Hwy 4 Bypass	E	05/13/08	9:00	1400	290			
Sand Creek @ Hwy 4 Bypass	E	06/10/08	7:50	1100	370			
Sand Creek @ Hwy 4 Bypass	E	07/15/08	9:20	1200	250			
Sand Creek @ Hwy 4 Bypass	E	08/12/08	9:00	2800	460			
Sand Creek @ Hwy 4 Bypass	E	09/16/08	15:40	1200	310			
South Webb Tract Drain	E	09/16/08	13:50			19		
Terminous Tract Drain @ Hwy 12	E	05/13/08	7:40	550				
Terminous Tract Drain @ Hwy 12	E	06/10/08	7:40	470				
Terminous Tract Drain @ Hwy 12	E	09/16/08	8:00	540		11		
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	04/15/08	12:40		250		23 (88)	6.1 (88)
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	05/13/08	15:20		460		7.8 (66)	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	07/15/08	14:40		690		6.9 (56)	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	08/12/08	17:00		260		6.8 (58)	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	09/16/08	16:20				6.5 (40)	1.3 (40)
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	FD	09/16/08	16:20				*6.2 (22)	*1.3 (22)
Environmental Exceedances				**30**	**29**	**8**	**9**	**2**
Management Plan Monitoring Exceedances				**0**	**0**	**0**	**1**	**0**
Total				**30**	**29**	**8**	**10**	**2**

E = Environmental sample; FD = Field Duplicate; MPM = Management Plan Monitoring

* Not counted in exceedance tallies due to exceedance in associated environmental sample.

Table 30. Toxicity exceedances and results of TIE studies; sorted by station name and sample date.

Station Name	Sample Type Code	Sample Date	Sample Time	Species	Toxicity End Point	Mean	Percent Control	Toxicity Significance	Summary Comments
Duck Creek @ Hwy 4	E	4/15/2008	10:40	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	TIE initiated on 4/22/08 and toxicity caused by OP insecticide(s) and cationic chemical(s). Resampled on 04/23/08.
Duck Creek @ Hwy 4	E	4/15/2008	10:40	*Selenastrum capricornutum*	Total Cell Count	374263	42.0	SL	TIE initiated on 5/1/08 and sample lost all toxicity. Resampled on 04/23/08; toxicity was not persistent.
Duck Creek @ Hwy 4	RS	4/23/2008	12:30	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	Resampling event due to *C. dubia* toxicity on 04/15/08; toxicity was persistent.
Duck Creek @ Hwy 4	E	5/13/2008	10:00	*Selenastrum capricornutum*	Total Cell Count	191899	6.15	SL	TIE conducted on 5/24/08 and sample lost all toxicity. Resampled on 5/20/08; toxicity was not persistent.
Duck Creek @ Hwy 4	FD	5/13/2008	10:00	*Selenastrum capricornutum*	Total Cell Count	2184877	70.0	SL	FD RPD 167
Duck Creek @ Hwy 4	E	7/15/2008	9:50	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	A TIE was conducted on 07/18/08 and it was concluded that OP insecticides was the cause of toxicity. Resampled on 07/22/08.
Duck Creek @ Hwy 4	RS	7/22/2008	7:40	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	Resampling event due to *C. dubia* toxicity on 07/15/08; toxicity persistent.
French Camp Slough @ Airport Way	E	4/15/2008	14:50	*Selenastrum capricornutum*	Total Cell Count	198412	22.2	SL	TIE initiated on 5/1/08 and toxicity due to non-polor organic and cationic chemical(s). Resampled on 04/23/08; toxicity was not persistent.
French Camp Slough @ Airport Way	FD	4/15/2008	14:50	*Selenastrum capricornutum*	Total Cell Count	266798	29.9	SL	FD RPD 29; Resampled on 04/23/08; toxicity was not persistent.
Grant Line Canal @ Clifton Court Rd	E	5/13/2008	13:00	*Selenastrum capricornutum*	Total Cell Count	87691	2.81	SL	TIE conducted on 5/24/08 and toxicity caused by cationic chemical(s). Resampled on 5/20/08; toxicity was not persistent.
Grant Line Canal near Calpack Rd	E	4/15/2008	13:10	*Selenastrum capricornutum*	Total Cell Count	103973	11.7	SL	TIE initiated on 5/1/08 and toxicity due to non-polor organic and cationic chemical(s). Resampled on 04/23/08.
Grant Line Canal near Calpack Rd	RS	4/23/2008	9:40	*Selenastrum capricornutum*	Total Cell Count	976715	51.9	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Grant Line Canal near Calpack Rd	E	5/13/2008	13:50	*Selenastrum capricornutum*	Total Cell Count	17852	0.572	SL	TIE conducted on 5/24/08 and a portion of toxicity caused by cationic metals. Resampled on 5/20/08.
Grant Line Canal near Calpack Rd	RS	5/21/2008	9:20	*Selenastrum capricornutum*	Total Cell Count	1859227	49.4	SL	Resampling event due to *S. capricornutum* toxicity on 05/13/08; toxicity was persistent.
Kellogg Creek along Hoffman Lane	E	4/15/2008	10:30	*Selenastrum capricornutum*	Total Cell Count	178873	17.2	SL	TIE initiated on 5/1/08 and toxicity due to non-polor organic and cationic chemical(s). Resampled on 04/23/08.
Kellogg Creek along Hoffman Lane	RS	4/23/2008	9:00	*Selenastrum capricornutum*	Total Cell Count	706426	37.5	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Kellogg Creek along Hoffman Lane	E	5/13/2008	11:10	*Selenastrum capricornutum*	Total Cell Count	185386	5.37	SL	TIE conducted on 5/24/08 and toxicity caused by cationic chemical(s). Resampled on 5/20/08.
Kellogg Creek along Hoffman Lane	RS	5/21/2008	8:20	*Selenastrum capricornutum*	Total Cell Count	2367241	62.9	SL	Resampling event due to *S. capricornutum* toxicity on 05/13/08; toxicity was persistent.

Station Name	Sample Type Code	Sample Date	Sample Time	Species	Toxicity End Point	Mean	Percent Control	Toxicity Significance	Summary Comments
Littlejohns Creek @ Jack Tone Rd	E	4/15/2008	11:50	*Selenastrum capricornutum*	Total Cell Count	61639	5.9	SL	TIE initiated on 5/8/08 and some, but not all, toxicity due to cationic chemical(s). Resampled on 4/23/08.
Littlejohns Creek @ Jack Tone Rd	RS	4/23/2008	12:10	*Selenastrum capricornutum*	Total Cell Count	836686	44.5	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Lone Tree Creek @ Jack Tone Rd	E	4/15/2008	13:30	*Selenastrum capricornutum*	Total Cell Count	862738	82.8	SG	Resampled on 4/23/08.
Lone Tree Creek @ Jack Tone Rd	RS	4/23/2008	11:50	*Selenastrum capricornutum*	Total Cell Count	1360982	72.3	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Lone Tree Creek @ Jack Tone Rd	E	5/13/2008	16:20	*Selenastrum capricornutum*	Total Cell Count	250516	7.26	SL	TIE conducted on 5/25/08 and sample lost all toxicity. Resampled on 5/20/08; toxicity was not persistent.
Mokelumne River @ Bruella Rd	E	4/15/2008	8:40	*Selenastrum capricornutum*	Total Cell Count	455675	43.7	SL	TIE initiated on 5/8/08 and toxicity due to non-polor organic chemical(s). Resampled on 4/23/08.
Mokelumne River @ Bruella Rd	RS	4/23/2008	13:40	*Selenastrum capricornutum*	Total Cell Count	257029	18.5	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Mokelumne River @ Bruella Rd	MPM	5/7/2008	21:20	*Selenastrum capricornutum*	Total Cell Count	364493	10.4	SL	TIE performed on sample taken on 5/13/08 (sample lost all toxicity). Resampled on 5/13/08 (scheduled monitoring sample).
Mokelumne River @ Bruella Rd	E	5/13/2008	7:50	*Selenastrum capricornutum*	Total Cell Count	940894	27.3	SL	TIE conducted on 5/25/08 and sample lost all toxicity. Resampled on 5/20/08; toxicity was persistent.
Mokelumne River @ Bruella Rd	RS	5/21/2008	12:50	*Selenastrum capricornutum*	Total Cell Count	2735225	72.7	SL	Resampling event due to *S. capricornutum* toxicity on 05/13/08; toxicity was persistent.
Mokelumne River @ Bruella Rd	MPM	7/8/2008	9:00	*Selenastrum capricornutum*	Total Cell Count	1211183	82.1	SG	Resampled on 07/15/08 (scheduled monitoring sample); toxicity was not persistent.
Mormon Slough @ Jack Tone Rd	E	4/15/2008	9:50	*Selenastrum capricornutum*	Total Cell Count	188642	18.1	SL	TIE initiated on 5/8/08 and toxicity due to non-polar organic and cationic chemical(s). Resampled on 4/23/08.
Mormon Slough @ Jack Tone Rd	RS	4/23/2008	12:50	*Selenastrum capricornutum*	Total Cell Count	357980	25.8	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Mormon Slough @ Jack Tone Rd	E	5/13/2008	9:10	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	TIE conducted on 5/21/08 and no toxicity was present. Resampled on 5/20/08; toxicity was not persistent.
Mormon Slough @ Jack Tone Rd	E	5/13/2008	9:10	*Selenastrum capricornutum*	Total Cell Count	123512	3.58	SL	TIE conducted on 5/25/08 and toxicity caused by cationic chemical(s). Resampled on 5/20/08; toxicity was not persistent.
Roberts Island Drain @ Holt Rd	E	4/15/2008	14:10	*Selenastrum capricornutum*	Total Cell Count	198412	22.1	SL	TIE initiated on 5/10/08 and toxicity due to non-polar organic and cationic chemical(s). Resampled on 4/23/08; toxicity was not persistent.
Roberts Island Drain @ Holt Rd	E	5/13/2008	14:50	*Selenastrum capricornutum*	Total Cell Count	768299	23.3	SL	TIE conducted on 5/26/08 and toxicity caused by cationic chemical(s). Resampled on 5/20/08.
Roberts Island Drain @ Holt Rd	RS	5/21/2008	10:00	*Selenastrum capricornutum*	Total Cell Count	1631272	42.5	SL	Resampling event due to *S. capricornutum* toxicity on 05/13/08; toxicity was persistent.
Roberts Island Drain along House Rd	E	4/15/2008	15:20	*Selenastrum capricornutum*	Total Cell Count	136538	15.2	SL	TIE initiated on 5/10/08 and toxicity due to cationic chemical(s). Resampled on 4/23/08.
Roberts Island Drain along House Rd	RS	4/23/2008	10:50	*Selenastrum capricornutum*	Total Cell Count	1061384	76.5	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.

Station Name	Sample Type Code	Sample Date	Sample Time	Species	Toxicity End Point	Mean	Percent Control	Toxicity Significance	Summary Comments
Roberts Island Drain along House Rd	E	5/13/2008	15:40	*Selenastrum capricornutum*	Total Cell Count	331928	10.1	SL	TIE conducted on 5/26/08 and toxicity caused by cationic chemical(s) and non-polar organic(s). Resampled on 5/20/08.
Roberts Island Drain along House Rd	RS	5/21/2008	10:20	*Selenastrum capricornutum*	Total Cell Count	1595450	41.6	SL	Resampling event due to *S. capricornutum* toxicity on 05/13/08; toxicity was persistent.
Roberts Island Drain along House Rd	FD	8/13/2008	9:10	*Hyalella azteca*	Survival (%)	78	83.0	SG	FD RPD 17.5; Resampled on 9/18/08.
Roberts Island Drain along House Rd	E	9/16/2008	9:20	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	A TIE was conducted on 9/19/08 and it was concluded that OP insecticides cause of toxicity. Resampled on 9/23/08.
Roberts Island Drain along House Rd	RS	9/18/2008	11:50	*Hyalella azteca*	Survival (%)	79	84.9	SG	Resampling event due to *H. azteca* toxicity on 8/13/08; toxicity was persistent.
Roberts Island Drain along House Rd	RS	9/23/2008	7:50	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	Resampling event due to *C. dubia* toxicity on 09/16/08; toxicity was persistent.
Sand Creek @ Hwy 4 Bypass	E	4/15/2008	7:50	*Selenastrum capricornutum*	Total Cell Count	397058	44.2	SL	TIE initiated on 5/8/08 and toxicity due to non-polar organic chemical(s). Resampled on 4/23/08.
Sand Creek @ Hwy 4 Bypass	RS	4/23/2008	8:20	*Selenastrum capricornutum*	Total Cell Count	755273	54.5	SL	Resampling event due to *S. capricornutum* toxicity on 04/15/08; toxicity was persistent.
Sand Creek @ Hwy 4 Bypass	E	8/12/2008	9:00	*Selenastrum capricornutum*	Total Cell Count	374263	38	SL	TIE conducted on 8/19/08; no toxicity was detected and cause(s) of toxicity could not be determined. Resampled on 8/19/08; toxicity was not persistent.
Sand Creek @ Hwy 4 Bypass	E	8/13/2008	10:50	*Hyalella azteca*	Survival (%)	2	2.13	SL	Resampled on 9/18/08.
Sand Creek @ Hwy 4 Bypass	RS	9/18/2008	10:40	*Hyalella azteca*	Survival (%)	0	0.0	SL	Resampling event due to *H. azteca* toxicity on 8/13/08; toxicity was persistent.
Terminous Tract Drain @ Hwy 12	E	4/15/2008	7:30	*Selenastrum capricornutum*	Total Cell Count	455675	50.7	SL	Resampled on 4/23/08; toxicity was not persistent.
Terminous Tract Drain @ Hwy 12	E	5/13/2008	7:40	*Selenastrum capricornutum*	Total Cell Count	16165	0.490	SL	TIE conducted on 5/26/08 and toxicity due to cationic chemical(s) and non-polor organic(s). Resampled on 5/20/08; toxicity was not persistent.
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	5/13/2008	15:20	*Selenastrum capricornutum*	Total Cell Count	1126514	34.2	SL	TIE conducted on 5/26/08 and sample lost all toxicity. Resampled on 5/20/08; toxicity was not persistent.
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	8/13/2008	12:00	*Hyalella azteca*	Survival (%)	82	87.2	SG	Resampled on 9/18/08; toxicity was not persistent.
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	E	9/16/2008	16:20	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	A TIE was conducted on 9/19/08 and it was concluded that OP insecticides cause of toxicity. Resampled on 9/23/08.
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	FD	9/16/2008	16:20	*Ceriodaphnia dubia*	Survival (%)	0	0	SL	FD RPD 0
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	RS	9/23/2008	19:10	*Ceriodaphnia dubia*	Survival (%)	65	65	SL	Resampling event due to *C. dubia* toxicity on 09/16/08; toxicity was persistent.

E = Environmental sample; RS = Resample; SL = Significant Loss; TIE = Toxicity Identification Evaluation; OP = Organophosphate; DO = Dissolved Oxygen; RPD = Relative Percent Difference; QC = Quality Control

Interpretation of Results

Monitoring of ambient waters is conducted by the Coalition for the purpose of characterizing agricultural discharges in the Coalition area. Over the long term, monitoring data provide insight on the general trends in water quality at each of the sample sites. To understand the source of exceedances, the Coalition can perform any of the following:

1. An analysis of associated toxicity data (for chemistry exceedances) to prioritize the search for biologically relevant chemical exceedances, or the evaluation of chemistry data (for toxicity exceedances) to determine possible sources of toxicity
2. An analysis of relevant Toxicity Identification Evaluation (TIE) results to determine possible causes of toxicity in sample water including constituents for which the Coalition does not test
3. The use of PURs to identify relevant applications that occurred upstream of the sample site prior to the sampling event
4. An analysis of monitoring data to determine the potential mechanism associated with exceedances of physical and field parameters such as DO, pH, and TDS
5. Special studies where appropriate and cost-effective, to determine the sources of constituents such as *E. coli* or the potential causes of exceedances such as low DO
6. Additional sampling as listed in the ESJWQC Management Plan submitted September 30, 2008

These actions were implemented on a case by case basis over the course of the 2008 irrigation monitoring season. All PUR data for exceedances that occurred during the 2008 irrigation season can be found in Appendix IV.

Both normal monitoring (NM) and Management Plan Monitoring (MPM) exceedances of WQTLs from the 2008 irrigation season are discussed in this section. All site subwatersheds are listed alphabetically and include a site subwatershed table of exceedances under the subsection, *Site Subwatershed Analysis*. As described in the *Data Interpretation* section, analysis of Marsh Creek WQTL exceedances is not included in this section since this subwatershed has been removed from the SJCDWQC monitoring program. A summary of the constituents analyzed for NM (Table 5) and MPM (Table 6) is provided in the Monitoring and Analysis section of this document. All monitoring results can be found in Appendix I. A full analysis of MPM results will be included in the SJCDWQC Management Plan update to be submitted on April 1, 2009 for priority site subwatersheds. The Management Plan update will also review any new site/constituent requiring a management plan due to exceedances that have occurred in 2008. A general discussion of exceedances of pH, DO, SC/TDS, nutrients, ammonia, *E. coli*, arsenic and lead are provided at the end of this section.

Site Subwatershed Analyses

Duck Creek @ Hwy 4

Table 31. Duck Creek @ Hwy4 and Duck Creek @ Drais Rd sample sites - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH	*Ceriodaphnia dubia*, survival: % of control	*Selenastrum capricornutum*, growth: % of control	Chlorpyrifos, µg/L	Malathion, µg/L
Duck Creek @ Hwy 4	4/15/2008	NM			0	42	0.057	
Duck Creek @ Hwy 4	4/23/2008	RS			0			
Duck Creek @ Drais Rd	5/13/2008	MPM	6.00	6.05			0.42	
Duck Creek @ Hwy 4	5/13/2008	NM	6.95	6.31		6		
Duck Creek @ Hwy 4	5/13/2008	FD				70		
Duck Creek @ Hwy 4	6/10/2008	NM	6.89				0.11	0.22
Duck Creek @ Drais Rd	7/15/2008	MPM	2.66					
Duck Creek @ Hwy 4	7/15/2008	NM	5.87		0		0.066	
Duck Creek @ Hwy 4	7/22/2008	RS	4.92		0			
Duck Creek @ Hwy 4	8/12/2008	NM	6.00				0.017	
Duck Creek @ Hwy 4	8/13/2008	Sediment	5.34					
Duck Creek @ Drais Rd	9/16/2008	MPM	3.99					
Duck Creek @ Hwy 4	9/16/2008	NM	5.92				0.027	

FD – field duplicate; NM – normal monitoring; MPM – Management Plan monitoring; Sediment – sediment monitoring; RS – resample
*WQTL based on hardness and shown in parenthesis

Water column toxicity to *Ceriodaphnia dubia* occurred in samples collected on April 15 and July 15, 2008 at the Duck Creek @ Hwy 4 site (Table 31). Both samples and their associated resamples resulted in complete mortality of *Ceriodaphnia*. TIEs including dilution series were conducted on the original samples. The Phase I TIE conducted on the April sample indicated organophosphates and cationic metals as possible sources of toxicity. The sample contained 1.2 TUa and the Phase III TIE suggested that chlorpyrifos was responsible for a majority of the toxicity (0.7 TUa) and total metals were responsible a smaller portion (0.4 TUa). The Phase I TIE conducted on the July sample indicated organophosphates as a possible source of toxicity with the sample containing 32 TUa. The Phase III TIE suggests that chlorpyrifos was responsible for a majority of the toxicity (0.8 TUa) however unknown cationic chemicals may also be present. Of the six normal monitoring events at the Duck Creek site, five samples contained concentrations of chlorpyrifos above 0.015 µg/L; however only two samples, April and July, also had corresponding toxicity to *Ceriodaphnia*. PUR data include six applications of products

containing chlorpyrifos in the site subwatershed between May 31 and April 15, 2008, as well as five additional applications prior to the resampling event on April 23. Applications occurred on corn, outdoor plants, and walnuts. In addition, there were 255 applications of other pesticides that may be relevant to the *Ceriodaphnia* toxicity on April 15. Pesticides applied include copper hydroxide, lambda-cyhalothrin, beta-cyfluthrin, (s)-cypermethrin, copper sulfate, (pentahydrate), glyphosate, isopropylamine salt, diazinon, pyraclostrobin, boscalid, iprodione, maneb, oxytetracycline, calcium complex, streptomycin sulfate, fosetyl-al, paraquat dichloride, myclobutanil, mancozeb, chlorothalonil, pyriproxyfen, sulfur, carbaryl, methoxyfenozide, kresoxim-methyl, copper oxide (ous), abamectin, thiophanate-methyl, acephate, dimethomorph, 2,4-d dimethylamine salt, imidacloprid, formetanate hydrochloride, propiconazole, trifloxystrobin, and dimethoate. Prior to the July 15 exceedance, there were 339 applications of pesticides relevant to the *Ceriodaphnia* toxicity. There were nine applications of chlorpyrifos applied on walnuts and alfalfa. In addition, there were applications of acequinocyl, azinphos-methyl, bifenazate, bifenthrin, boscalid, carbaryl, copper hydroxide, copper sulfate (basic), copper sulfate (pentahydrate), cyfluthrin, dimethoate, dimethomorph, emamectin benzoate, esfenvalerate, etoxazole, fenarimol, fenpropathrin, flonicamid, glyphosate, isopropylamine salt, imidacloprid, kaolin, kresoxim-methyl, lambda-cyhalothrin, mancozeb, methomyl, methoxyfenozide, myclobutanil, propargite, pyraclostrobin, quinoxyfen, spirodiclofen, spiromesifen, sulfur, tebuconazole, and thiamethoxam. Prior to 2008, one sample tested toxic to *Ceriodaphnia* on September 19, 2006. This toxicity also corresponded to a chlorpyrifos exceedance (0.15 µg/L). *Ceriodaphnia* toxicity has not yet been addressed in the Site Subwatershed Management Plan for Duck Creek. As a result of the 2008 irrigation exceedances, *Ceriodaphnia* toxicity will be included in the next SJCDWQC Management Plan update.

Toxicity to *Selenastrum* occurred in samples collected during the first and second irrigation monitoring events on April 15 and May 13, 2008 (42% and 6% growth compared to the control, respectively, Table 31). In addition, the field duplicate collected on March 13 also had a significant reduction of growth compared to the control (70%). Resampling occurred one week after sampling, and toxicity was not persistent in either sample. TIEs were conducted on both the April and May samples however toxicity did not persist through the treatments and as a result the cause of toxicity could not be determined. During the April toxicity event, chlorpyrifos was detected in water samples (0.057 µg/L) however this amount would not contribute to the toxicity. There were no other exceedances of pesticides or metals in samples collected on April 15, however there were low-level concentrations of cyanazine (0.48 µg/L), simazine (0.1 µg/L) and most of the tested metals. PUR data indicate 195 applications that may be relevant to the April *Selenastrum* toxicity. Active ingredients include copper hydroxide, copper sulfate (pentahydrate), isopropylamine salt, flumioxazin, pendimethalin, glufosinate-ammonium, rimsulfuron, glyphosate, carfentrazone-ethyl, bromoxynil octanoate, bromoxynil heptanoate, oxyfluorfen, oxytetracycline, calcium complex, sethoxydim, n6-benzyl adenine, paraquat dichloride, amino ethoxy vinyl glycine hydrochloride, diglycolamine salt of 3,6-dichloro-o-anisic acid, copper oxide(ous), s-metolachlor, diuron, simazine, 2,4-d dimethylamine salt, potassium salt, 2,4-d diethanolamine salt, imidacloprid, and metribuzin. There were 109 applications of pesticides relevant to *Selenastrum* toxicity between April 15 and May 13, 2008.

Active ingredients applied during that time include most of those previously listed with the addition of imazamox, ammonium salt, and 4(2,4-db) dimethylamine salt. Prior to 2008, one sample tested toxic to *Selenastrum* on February 28, 2007. As a result of the toxicity exceedances discussed herein, *Selenastrum* toxicity will be included in the SJCDWQC Management Plan update.

There were six exceedances of chlorpyrifos in the Duck Creek site subwatershed during the 2008 irrigation season. Five of these exceedances were detected during normal monitoring events at the Duck Creek @ Hwy 4 site, and one exceedance was detected during Management Plan Monitoring at the upstream site, Duck Creek @ Drais Rd (Table 31). The upstream site was sampled for chlorpyrifos during the May, July and September monitoring events. Duck Creek @ Drais Rd had one exceedance of chlorpyrifos in May while July and September samples had no detections of chlorpyrifos. Chlorpyrifos exceedances have occurred at the normal monitoring site five times previous to the 2008 irrigation season. All of the chlorpyrifos exceedances at this site have occurred during irrigation season monitoring events. PUR data from the Duck Creek @ Hwy 4 site subwatershed indicate that chlorpyrifos applications began in early March and continued through mid-August. One and one half months prior to the April 15, 2008 exceedance, 18 applications occurred across 868 acres of alfalfa, apples, corn, and walnuts. Applications of chlorpyrifos in May, June, July and August were to apples, corn, outdoor nursery plants, walnuts and alfalfa. A final exceedance was recorded September 16, 2008 although there were no additional applications after August 13, 2008. PUR data from Duck Creek @ Drais Rd prior to the May 13 exceedance include five applications of chlorpyrifos applied on walnuts, corn and outdoor nursery plants. Chlorpyrifos is a priority A constituent at the Duck Creek @ Hwy 4 site. Further analysis and actions to address chlorpyrifos exceedances at this site will occur through the Site Subwatershed Management Plan.

One exceedance of malathion occurred in samples collected on June 10, 2008 (Table 31). This was the first detection of malathion to occur at the Duck Creek @ Hwy 4 sample site. Malathion is a prohibited discharge pesticide and any detection of the constituent is considered an exceedance. Malathion is known to be toxic to *Ceriodaphnia dubia,* however there was no toxicity detected in these samples. PUR data for the Duck Creek @ Hwy 4 site indicate no reported use of malathion during 2008. In 2007 there were twelve applications of products containing malathion from mid-March to early September with 261.25 gallons applied on 690 acres of alfalfa, onions, and walnuts. Malathion has not been addressed in the Management Plan for Duck Creek. If additional exceedances are detected at this site, the constituent will be included in the subsequent updated Management Plan.

DO was measured at concentrations below the WQTL at Duck Creek @ Hwy 4 and Duck Creek @ Drais Rd during all the irrigation season events except April (Table 31). DO exceedances are common in the Coalition region, particularly during the warmer summer months and low DO has been measured at Duck Creek @ Hwy 4 during the irrigation season of 2006 and 2007. Only one measurement of DO has occurred during storm season monitoring that was less than 7 mg/L (March 6, 2007). A discussion of parameters that may affect DO in surface waters is

provided below under *Constituent Specific Analyses/Special Studies*. Exceedances from the 2008 irrigation season will further be addressed in the SJCDWQC Management Plan update.

Low pH was measured at the NM and MPM site on May 13, 2008 (6.31 and 6.05, respectively; Table 31). Two exceedances of the pH WQTL have occurred at this site prior to the 2008 irrigation season, one below the lower WQTL (on August 16, 2006) and one above the upper WQTL (on June 12, 2007). A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. The Management Plan for Duck Creek @ Hwy 4 includes pH as a priority E constituent.

French Camp Slough @ Airport Way

Table 32. French Camp Slough @ Airport Way sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL	Carbofuran, µg/L	Chlorpyrifos, µg/L	Dieldrin, µg/L	Dimethoate, µg/L
French Camp Slough @ Airport Way	4/15/2008	NM			22					
French Camp Slough @ Airport Way	4/15/2008	FD			30	290				
French Camp Slough @ Airport Way	5/13/2008	NM	5.83	5.95†		280	0.19	0.4		
French Camp Slough @ Airport Way	6/10/2008	NM								
French Camp Slough @ Airport Way	7/15/2008	NM				240			0.0083	2.4
French Camp Slough @ Airport Way	8/12/2008	NM						0.022		
French Camp Slough @ Airport Way	8/13/2008	Sediment	6.27							
French Camp Slough @ Airport Way	9/16/2008	NM	6.51					0.039		

FD – field duplicate; NM – normal monitoring; Sediment – sediment monitoring;

†post-sampling calibration of the multi-meter used at this site indicated that the pH probe may have been reading low.

Toxicity to *Selenastrum* occurred in samples collected during the first irrigation monitoring event on April 15, 2008 (22% growth as compared to the control, Table 32). Both a grab sample and a field duplicate sample were collected from this site during this event and toxicity was experienced in both of these samples. Resampling occurred one week later, and toxicity was not persistent. A TIE was conducted on the April 15 sample, and results indicated that the source of toxicity was non-polar organic and cationic chemical(s). There were no exceedance level concentrations of any pesticides or metals during this event, however there were low concentrations (below the WQTL) of chlorpyrifos (0.003), diuron (0.84 µg/L), simazine (0.82 µg/L) and all of the tested metals detected in the water samples. The Phase III TIE suggests that diuron and metals account for a portion of the sample toxicity however unknown toxicants are

likely present (diuron = 0.4 TUc). PUR data include 453 applications that may be relevant to the April *Selenastrum* toxicity including copper hydroxide, copper oxide(ous), copper sulfate, copper sulfate (pentahydrate), paraquat dichloride, oryzalin, oxyfluorfen, glyphosate, potassium salt, carfentrazone-ethyl, pendimethalin, copper salts of fatty and rosin acids, isopropylamine salt, glufosinate-ammonium, norflurazon, s-metolachlor, simazine, rimsulfuron, 2,4-d dimethylamine salt, 2,4-d, diethanolamine salt, sethoxydim, oxytetracycline, calcium complex, n6-benzyl adenine, flumioxazin, diglycolamine salt of, 3,6-dichloro-o-anisic acid, amino ethoxy vinyl glycine hydrochloride, diuron, diquat, dibromide, EPTC, methyl bromide, metribuzin, and clethodim. Prior to 2008, one sample tested toxic to *Selenastrum*, on February 16, 2005. As a result of the toxicity in this report, *Selenastrum* toxicity will be included in an updated Management Plan for the French Camp Slough site subwatershed.

Carbofuran was detected at exceedance level concentrations for the first time at the French Camp Slough site in samples collected on May 13, 2008 (Table 32). Carbofuran is a prohibited discharge pesticide and any detection of the constituent in a water sample is considered an exceedance. It is also a restricted use pesticide and is applied minimally in California on crops such as artichokes, grapes and ornamentals. Carbofuran is highly toxic to *Ceriodaphnia dubia*. There was no *Ceriodaphnia* toxicity detected in these samples. PUR data include no applications within one month prior to the exceedance, but six applications did occur on March 12 and 13, 2008 with 87.4 gallons of product containing carbofuran applied on 350 acres of alfalfa. Carbofuran has not yet been addressed in the Management Plan for French Camp Slough, however if additional exceedances occur at this site, then carbofuran will be included in the Site Subwatershed Management Plan.

There were three exceedances of chlorpyrifos at the French Camp Slough site during the 2008 irrigation season in May, August and September (Table 32). Five chlorpyrifos exceedances occurred at this site previous to the 2008 irrigation season. Three of these exceedances occurred during irrigation season monitoring events and two occurred during storm season events. PUR data include chlorpyrifos use during May with eight applications on 410 acres of corn and walnuts. Prior to the August 12, 2008 exceedance, 19 relevant applications occurred on 808.3 acres of alfalfa, almonds, corn and walnuts. Between July 25 and September 16 there were no new applications. Chlorpyrifos is a priority A constituent at the French Camp Slough @ Airport Way site. Further analysis and actions to address chlorpyrifos exceedances at this site will occur through the Site Subwatershed Management Plan.

Dieldrin was detected at concentrations above the WQTL in samples collected on July 15, 2008 (0.0083 µg/L). This was the second exceedance of dieldrin at this site. The first exceedance occurred in samples collected on July 10, 2007. Dieldrin is an organochlorine insecticide that is not currently registered for agricultural use. All products containing dieldrin were banned from use in 1987. There was no associated toxicity in samples collected during this event. Dieldrin has not been addressed in the Site Subwatershed Management Plan for French Camp Slough; however as a result of the second exceedance dieldrin will be included in the SJCDWQC Management Plan update.

Dimethoate was detected in concentrations above the WQTL for the first time at the French Camp Slough @ Airport Way sample site during the July 15, 2008 sampling event (Table 32). PUR data include 34 applications two weeks prior to the exceedance when 216.2 gallons of product was applied on 1,492.6 acres of corn and tomatoes. One month prior to the exceedance, there were 311.9 gallons of dimethoate containing product applied on 2,110.7 acres of corn and tomatoes. Dimethoate has not yet been addressed in a Site Subwatershed Management Plan. If additional exceedances occur, dimethoate will be included in the Management Plan update.

Exceedances of *E. coli* occurred in three of six samples analyzed for this constituent during the irrigation season (Table 32). Possible sources of *E. coli* include irrigated pasture, dairies, leaky sewer lines or septic systems, applied manure, biosolids, liquid dairy waste, and a large array of wildlife. The French Camp Slough drains a large area of irrigated farmland upstream of the sample site, including many dairies and land allocated to pasture. Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the Site Subwatershed Management Plan for French Camp Slough as a priority E constituent.

Low DO concentration was measured at French Camp Slough in May, August and September (Table 32). Exceedances of the DO WQTL are common in the Coalition region, particularly during the warmer summer months. Low DO occurred during the irrigation season of 2005 and 2006 but in 2007 all measurements were above the lower WQTL of 7 mg/L. Only one exceedance has occurred during storm season monitoring (February 11, 2007). A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for French Camp Slough. Exceedances from the 2008 irrigation season will further be addressed in the updated SJCDWQC Management Plan.

pH was measured below the WQTL of 6.5 on May 13, 2008 (5.95, Table 32). Based on the calibration analysis conducted at the end of the sampling day, it was noted that the meter used during this event may have provided inaccurate measurements of pH. Meter calibration is conducted before and after each sampling event as a part of the regular monitoring protocol. Calibration that occurred prior to sampling produced normal measurements. However, post-sampling calibration indicated that the meter was measuring pH below the calibration standard (pH 7 calibration solution read at 5.64). As a result, it is likely that the low pH readings were a result of a malfunctioning probe and not necessarily a reflection of the actual pH at the sample sites. After the May monitoring event, there were no pH exceedances at this site. A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. The Management Plan for French Camp Slough includes pH as a priority E constituent.

Grant Line Canal @ Clifton Court Rd

Table 33. Grant Line Canal @ Clifton Court Rd sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH	SC, umhos/cm	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL	TDS, mg/L	Arsenic, µg/L	Copper*, µg/L
Grant Line Canal @ Clifton Court Rd	4/15/2008	NM	4.82		763		2000	490		
Grant Line Canal @ Clifton Court Rd	5/13/2008	NM			821	3	260	880	17	
Grant Line Canal @ Clifton Court Rd	5/21/2008	RS	1.15							
Grant Line Canal @ Clifton Court Rd	6/10/2008	NM	4.24		892		440	650		
Grant Line Canal @ Clifton Court Rd	7/15/2008	NM			879			590	28	
Grant Line Canal @ Clifton Court Rd	8/12/2008	NM							12	28 (18)
Grant Line Canal @ Clifton Court Rd	9/16/2008	NM		8.61	1099			620	14	

NM – normal monitoring; RS – resample
*WQTL based on hardness and shown in parenthesis

Toxicity to *Selenastrum* occurred in samples collected during the second irrigation monitoring event on May 13, 2008 (3% growth compared to the control, Table 33). Resampling occurred one week later and toxicity was not persistent. A TIE was conducted and results indicated that cationic chemical(s) were responsible for the majority of the toxicity. There were no exceedances of pesticides WQTLs during this event. Low-level concentrations (below the WQTL) in these water samples included cyanazine (0.29 µg/L) and all of the metals for which the Coalition analyzes. PUR data include 15 applications of pesticides relevant to the *Selenastrum* toxicity including copper hydroxide, s-metolachlor, 2,4-d triisopropanolamine salt, 2,4-d dimethylamine salt, diglycolamine salt of 3,6-dichloro-o-anisic acid, rimsulfuron, and nicosulfuron. Prior to 2008, one sample tested toxic to *Selenastrum* at this site on January 23, 2008. *Selenastrum* toxicity will be included in an updated Site Subwatershed Management Plan for the Grant Line Canal @ Clifton Court Rd site subwatershed.

One exceedance of the copper WQTL occurred in samples collected on August 12, 2008 (Table 33). There have been five previous exceedances of the copper WQTL during irrigation events sampled in 2006 and 2007. Copper can be applied by agriculture as copper, copper hydroxide, copper sulfate and copper sulfate pentahydrate. Copper can also become available to water bodies through the weathering of rocks and soils that naturally contain metals. Some automobile components also contain copper and wearing of brakes can add substantial amounts of copper to surface waters that pass through or near urban areas. Since metals do not degrade in the environment, it is possible that copper can stay bound in soils, mobilized and

moved to surface waters as a result of storm water runoff or irrigation return flows. PUR data indicate no copper applications within three months prior to the exceedance. Two applications of copper containing product did occur on March 14, 2008 when 337.5 pounds of product were applied on 225 acres of alfalfa. Copper is addressed as a priority C constituent in the Site Subwatershed Management Plan for Grant Line Canal @ Clifton Court Rd. Exceedances experienced during 2008 will be addressed further in the SJCDWQC Management Plan update.

The WQTL for arsenic was exceeded in four out of six samples that were analyzed for metals during the 2008 irrigation season (Table 33). Samples from this site have been tested for metals since the irrigation season of 2006 and exceedances have occurred during past irrigation seasons. Arsenic is not currently applied by agriculture in the Coalition region. Refer to the explanation provided below, under *Constituent Specific Analyses/Special Studies*, for details on the historical use of arsenic in agriculture. At this point the source of arsenic in the Grant Line Canal is unclear, although it is likely that natural or legacy sources of arsenic are bound within the native soils in the site subwatershed. Arsenic is addressed in the SJCDWQC Management Plan.

Exceedances of *E. coli* occurred in three of six samples during the irrigation season (Table 33). The Grant Line Canal @ Clifton Court Rd site drains a small area of irrigated field crops and grains, upstream. There are no dairies or pastures within the site subwatershed. Possible sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the management plan for the Grant Line Canal @ Clifton Court Rd as a priority E constituent.

Exceedances of total dissolved solids (TDS) and specific conductivity (SC) occurred during most events of the 2008 irrigation season (Table 33). TDS describes all solids (usually mineral salts) that are dissolved in water and are frequently associated with exceedances of SC. Potential sources of TDS and SC are minerals leached from soils by upstream surface water and ground water or drain water from irrigated agriculture. Irrigation water is taken from the Delta which is naturally high in salts, and the Delta island interior channels typically receive a net positive flow of water through hydrostatic pressure resulting from the subsidence of the islands. These sources are described further below under *Constituent Specific Analyses/Special Studies.* Exceedances of SC and TDS have occurred during most storm and irrigation sampling events since 2005, when monitoring began at this site. SC and TDS have been addressed in the Site Subwatershed Management Plan for the Grant Line Canal @ Clifton Court Rd as priority E constituents.

Exceedances of the DO WQTL occurred during three irrigation season monitoring events (Table 33). Exceedances are common in the Coalition region, particularly during the warmer summer months. Exceedances have occurred during most irrigation season events since monitoring began at Grant Line Canal @ Clifton Court Rd, and have also occurred occasionally during storm season events. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for the Grant Line Canal.

There was one exceedance of the pH WQTL on September 16, 2008 (Table 33). The measured pH was above the upper WQTL during this event. Six exceedances of pH have occurred at this site prior to the 2008 irrigation season, all measured below the lower WQTL reaching as low as 5.99. As a result, the high pH in the canal on September 16, 2008 was an anomaly for this site. A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. The Site Subwatershed Management Plan for Grant Line Canal @ Clifton Court Rd addresses pH as a priority E constituent.

Grant Line Canal near Calpack Rd

Table 34. Grant Line Canal near Calpack Rd sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL	TDS, mg/L	Arsenic, µg/L	Malathion, µg/L
Grant Line Canal near Calpack Rd	4/15/2008	NM	5.84	1205	12		800		
Grant Line Canal near Calpack Rd	4/23/2008	RS	3.59	1112	52				
Grant Line Canal near Calpack Rd	5/13/2008	NM		1733	1		1100		
Grant Line Canal near Calpack Rd	5/21/2008	RS	4.95	1067	49				
Grant Line Canal near Calpack Rd	6/10/2008	NM	3.33	1066		240	560		
Grant Line Canal near Calpack Rd	7/15/2008	NM	3.8	927		>2400	530		
Grant Line Canal near Calpack Rd	8/12/2008	NM	0.45	945		>2400	570		0.069
Grant Line Canal near Calpack Rd	8/13/2008	Sediment	2.79	899					
Grant Line Canal near Calpack Rd	9/16/2008	NM	0.47	1049		2400	680	11	

NM – normal monitoring; RS – resample; Sediment – sediment monitoring

Toxicity to *Selenastrum* occurred in samples collected during the first and second irrigation monitoring events on April 15 and May 13, 2008 (12% and 1% growth compared to the control, Table 34). In both cases, resamples collected one week later were toxic to algae (Table 34). Results from the TIE conducted on the April 15th sample indicated that non-polar organic and cationic chemical(s) were responsible for the toxicity. Cyanazine accounted for 0.1 TUc. In addition, the Phase III TIE indicated that unknown toxicants were likely present. The Phase I TIE conducted on the May 13th sample indicated that non-polar organics and unknown toxicants were the probable sources of algae toxicity. The Phase III TIE suggests that diuron and metals account for a portion of the sample toxicity (diuron = 0.4 TUc) however unknown toxicants were likely present. There were no exceedance level concentrations of any pesticides or metals during either of these events. PUR data include six applications of pesticides relevant to *Selenastrum* toxicity in the 30 days preceding the sample collected on April 15 and two

applications of copper hydroxide to alfalfa in the preceding 90 days. The five pesticides applied were copper hydroxide, carfentrazone-ethyl, glyphosate, linuron, and diuron. The toxicity to *Selenastrum* on May 13 was preceded by thirteen applications of seven pesticides, including two applications of copper hydroxide. Other pesticides applied were s-metolachlor, EPTC, glyphosate, 2,4-D triisopropanolamine salt, and diglycolamine salt of 3,6-dichloro-o-anisic acid. Pesticides were applied to alfalfa, asparagus and corn. Prior to the 2008 irrigation season, four samples have tested toxic to *Selenastrum* (two of which resulted in toxicity again in the resample). *Selenastrum* toxicity is a priority D constituent in the Site Subwatershed Management Plan for the Grant Line Canal near Calpack Rd site subwatershed.

One exceedance of malathion occurred on August 12, 2008 (Table 34). This was the first detection of malathion to occur at the Grant Line Canal near Calpack Rd sample site. Malathion is a prohibited discharge pesticide and any detection of the constituent in a water sample is considered an exceedance. Though malathion is known to be toxic to *Ceriodaphnia dubia,* there was no toxicity detected in these samples. PUR data for the Grand Line Canal near Calpack Rd site indicate no malathion reported use one month prior to the exceedance. However, one application on May 10, 2008 of 16 gallons of product applied on 64 acres of alfalfa crop was reported. Malathion has not yet been addressed in the Management Plan for Grant Line Canal, however if additional exceedances are detected at this site, then the constituent will be included in the subsequent Management Plan update.

One exceedance of the arsenic WQTL occurred at this site on September 13, 2008 (Table 34). Samples from this site have been tested for metals since the irrigation season of 2006. Prior to 2008, three exceedances of arsenic occurred, all during irrigation season events. Arsenic is not currently applied by agriculture in the Coalition region. Refer to the explanation provided below, under *Constituent Specific Analyses/Special Studies*, for details on the historical use of arsenic in agriculture. At this point the source of these exceedances in the Grant Line Canal is unclear, although it is likely that natural sources of arsenic are bound within the native soils in the site subwatershed. Arsenic has been addressed as a priority E constituent in the Site Subwatershed Management Plan for Grant Line Canal near Calpack Rd.

Exceedances of the *E. coli* WQTL occurred in four of six samples during the irrigation season (Table 34). The Grant Line Canal near Calpack Rd site drains a small area of irrigated field crops and grains, upstream. There are no dairies or pastures within the site subwatershed. Possible sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the Site Subwatershed Management Plan for the Grant Line Canal near Calpack Rd as a priority E constituent.

Exceedances of the total dissolved solids (TDS) and specific conductivity (SC) WQTLs occurred in all samples analyzed for this constituent during the 2008 irrigation season (Table 34). TDS describes all solids (usually mineral salts) that are dissolved in water and are frequently associated with exceedances of SC, as shown in the results from this site. Potential sources of TDS and SC are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. These sources are described further below under

Constituent Specific Analyses/Special Studies. A shallow ground water table appears to be the cause of elevated salinity in many SJCDWQC water bodies within the Sacramento/San Joaquin Delta, and is likely the cause of elevated TDS and SC in the Grant Line Canal. Exceedances of SC and TDS have occurred during most storm and irrigation sampling events since 2005 when monitoring began at this site. SC and TDS have been addressed in the Site Subwatershed Management Plan for the Grant Line Canal near Calpack Rd as priority E constituents.

Low DO (below 7 mg/L) has been measured during all irrigation monitoring months (Table 34). Exceedances of the DO WQTL are common in the Coalition region, particularly during the warmer summer months. DO has been measured below the WQTL at the Grant Line Canal near Calpack Rd site during all irrigation monitoring events and occasionally during storm season events. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for the Grant Line Canal.

Kellogg Creek along Hoffman Ln

Table 35. Kellogg Creek along Hoffman Ln sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	*Selenastrum capricornutum*, growth: % of control	Copper*, µg/L
Kellogg Creek along Hoffman Ln	4/15/2008	NM		17	
Kellogg Creek along Hoffman Ln	4/23/2008	RS		38	
Kellogg Creek along Hoffman Ln	5/13/2008	NM		5	
Kellogg Creek along Hoffman Ln	5/21/2008	RS		63	
Kellogg Creek along Hoffman Ln	7/8/2008	MPM	6.54		98 (8.5)
Kellogg Creek along Hoffman Ln	7/15/2008	NM	6.59		
Kellogg Creek along Hoffman Ln	8/13/2008	Sediment	6.89		

NM – normal monitoring; MPM – Management Plan monitoring; RS – resample; Sediment – sediment monitoring
*WQTL based on hardness and shown in parenthesis

Toxicity to *Selenastrum* occurred for the first time at the Kellogg Creek @ Hoffman Ln site during the first irrigation event on April 15 and again during the second irrigation event on May 13, 2008 (17% and 5% growth compared to the control, Table 35). TIEs were run on both samples. Results from the April 15 samples indicated that non-polar organic and cationic chemical(s) were responsible for the toxicity, and results from the May 13 samples pointed to cationic chemical(s) as the major source of toxicity. The Phase III TIE conducted on the April sample suggests that diuron and metals (copper and zinc) account for a portion of the sample

toxicity (diuron = 0.2 TUc) however unknown toxicants were likely present. Results from the Phase III TIE conducted on the May sample suggest that metals (copper and zinc) account for a portion of the sample toxicity however unknown toxicants were likely present. Resampling occurred one week after each of the toxicity events, and both the April and May resamples were toxic to algae (Table 35). Neither sample contained exceedance level concentrations of any constituents known to be toxic to *Selenastrum*. PUR data for the subwatershed indicate eight applications of copper containing products totaling 1420 lbs applied on apricots, cherries, grapes, and walnuts. In addition seven other active ingredients including s-metolachlor, glyphosate, pyraflufen-ethyl, oxyfluorfen, and oryzalin were applied during the months preceding the April 15 sampling event. These pesticides were applied to corn, cherries, and tomatoes. Additional applications of active ingredients that could contribute to algae toxicity between April 15 and May 13 included s-metolachlor, glyphosate, imidacloprid, 2,4-D, dimethylamine salt, and pendimethalin. These were applied to the same variety of crops as previously described. As a result of the 2008 irrigation season exceedances, *Selenastrum* toxicity will be addressed in the SJCDWQC Management Plan update.

Copper concentrations exceeded the WQTL twice prior to 2008 including February 28 and July 10, 2007. Kellogg Creek was sampled twice in July as part of the Management Plan Monitoring schedule. Only one exceedance of the copper WQTL occurred during the 2008 irrigation season. A copper concentration of 98 µg/L was detected in the sample collected on July 8, 2008 (Table 35). Other 2008 irrigation season detections ranged from 2.1 – 4.4 µg/L and none exceeded the hardness-based WQTLs. Copper can be applied by agriculture as copper, copper hydroxide, copper sulfate and copper sulfate pentahydrate. Copper can also become available to water bodies through the weathering of rocks and soils that naturally contain metals. Some automobile components also contain copper and wearing of brakes can add substantial amounts of copper to surface waters that pass through or near urban areas. Since metals do not degrade in the environment, it is possible that copper can stay bound in soils and mobilized and moved to surface waters as a result of storm runoff or irrigation return flows. PUR data for the subwatershed include a single application of 53 pints of product containing copper hydroxide on 29 acres of grapes on April 2, 2008 and 500 pounds of product containing copper sulfate on 50 acres of walnuts on March 29, 2008. Copper exceedances have been addressed in the Site Subwatershed Management Plan for Kellogg Creek.

Low DO (below 7 mg/L) was measured during July and August (Table 35). DO exceedances are common in the Coalition region, particularly during the warmer summer months. DO has been measured below the WQTL at the Kellogg Creek @ Hoffman Ln site eight times prior to the 2008 irrigation season (monitoring at this site began in May of 2005). A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for Kellogg Creek.

Littlejohns Creek @ Jack Tone Rd

Table 36. Littlejohns Creek @ Jack Tone Rd and Littlejohns Creek @ 26 Mile Rd sample sites - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH	*Selenastrum capricornutum*, growth: % of control	Copper*, µg/L	Carbofuran, µg/L	Chlorpyrifos, µg/L
Littlejohns Creek @ Jack Tone Rd	4/15/2008	NM			6			0.034
Littlejohns Creek @ Jack Tone Rd	4/23/2008	RS			44			
Littlejohns Creek @ 26 Mile Rd	5/13/2008	MPM	4.54	6.32†				
Littlejohns Creek @ Jack Tone Rd	5/13/2008	NM	6.7			4.2 (4.1)	0.41	
Littlejohns Creek @ Jack Tone Rd	6/10/2008	NM						0.077
Littlejohns Creek @ 26 Mile Rd	7/15/2008	MPM	5.5					
Littlejohns Creek @ Jack Tone Rd	7/15/2008	NM						0.025
Littlejohns Creek @ 26 Mile Rd	8/12/2008	MPM	6.45					
Littlejohns Creek @ Jack Tone Rd	8/13/2008	Sediment	6.19					
Littlejohns Creek @ 26 Mile Rd	9/16/2008	MPM	3.65					
Littlejohns Creek @ Jack Tone Rd	9/16/2008	NM	6.34			4.2 (3.5)		

NM – normal monitoring; MPM – Management Plan monitoring; RS – resample; Sediment – sediment monitoring
*WQTL based on hardness and shown in parenthesis
†post-sampling calibration of the multi-meter used at this site indicated that the pH probe was reading low.

Toxicity to *Selenastrum* occurred in samples collected during the first irrigation monitoring event on April 15, 2008 (6% growth compared to the control, Table 36). A TIE was run on this sample and results indicated that cationic chemical(s) and unknown toxicants were responsible for the toxicity. There were also low-level concentrations of diuron (0.2 µg/L) and simazine (0.087 µg/L) in the April 15 sample. The concentrations of these constituents were too low to account for all of the *Selenastrum* toxicity experienced. The Phase III TIE concluded that copper and zinc were the cause of the sample toxicity however unknown toxicants were likely present. Resampling occurred one week after the toxicity event and the sample was again toxic to algae. PUR data include 132 applications of pesticides that may have contributed to the toxicity. Pesticides applied include copper sulfate (pentahydrate), copper hydroxide, carfentrazone-ethyl, glufosinate, ammonium, rimsulfuron, pendimethalin, s-metolachlor, oxytetracycline, calcium complex, sethoxydim, potassium salt, n6-benzyl adenine, paraquat dichloride, amino ethoxy vinyl glycine hydrochloride, isopropylamine salt, copper oxide (ous), oxyfluorfen, flumioxazin, glyphosate, diuron, simazine, and 2,4-d dimethylamine salt. There have been three samples previous to the 2008 irrigation season which have tested toxic to *Selenastrum* resulting in upstream Management Plan Monitoring at Littlejohns Creek @ Escalon Bellota Rd in July and August. Neither the normal monitoring site nor the Management Plan Monitoring site caused toxicity to algae in July or August.

Two exceedances of the copper WQTL occurred in samples collected during the 2008 irrigation season, on May 13 and September 16, 2008 (Table 36). Prior to this season, copper exceedances occurred four times at the Littlejohns Creek site and have been addressed in the SJCDWQC Management Plan. In May and April upstream monitoring occurred for metals at Littlejohns Creek @ Escalon Bellota; none of the upstream samples exceeded the hardness-based copper WQTL. In addition, upstream monitoring for all metals was conducted at Littlejohns Creek @ 26 Mile Rd from May to September to determine the contribution of metals from foothill sources. Copper can be applied by agriculture as copper, copper hydroxide, copper sulfate and copper sulfate pentahydrate. Copper can also become available to water bodies through the weathering of rocks and soils that naturally contain metals. Some automobile components also contain copper and wearing of brakes can add substantial amounts of copper to surface waters that pass through or near urban areas. Since metals do not degrade in the environment, it is possible that copper can stay bound in soils and mobilized and moved to surface waters as a result of storm runoff or irrigation return flows. PUR data indicate 66 relevant applications prior to the May copper exceedance applied mostly to walnuts and some to nursery crops and almonds. Copper applications included copper hydroxide, copper sulfate, copper salts and copper oxide. Between May 5 and September 16 there were no additional copper applications. Copper is a priority C constituent in the Management Plan for Littlejohns Creek @ Jack Tone Rd.

One exceedance of the carbofuran WQTL occurred in samples collected on March 13, 2008. This was the first detection of carbofuran at this site. Carbofuran is a prohibited discharge pesticide and any detection of the constituent in a water sample is considered an exceedance. It is also a restricted use pesticide and is highly toxic to *Ceriodaphnia dubia*. There was no toxicity detected in the sample. PUR data include no applications one month prior to the exceedance, but two applications did occur on March 11, 2008 (32 gallons of product containing carbofuran on 124 acres of alfalfa). Carbofuran has not yet been addressed in a Site Subwatershed Management Plan for the Littlejohns Creek site. If additional exceedances occur, then the exceedances will be included in an updated SJCDWQC Management Plan.

Chlorpyrifos was detected above the WQTL in April, June and July samples from Littlejohns Creek @ Jack Tone Rd (Table 36). Littlejohns Creek @ Escalon Bellotta was sampled for chlorpyrifos during the July and August monitoring events, however there were no exceedances experienced in those samples. Exceedances of the chlorpyrifos WQTL have occurred at the normal monitoring (downstream) site four times previous to this season. Six of the seven chlorpyrifos exceedances at this site have occurred during irrigation season monitoring events. None of the chlorpyrifos exceedances have been associated with toxicity. PUR data indicate three relevant applications of chlorpyrifos prior to the April 15, 2008 exceedance where 1,290 pounds of product containing chlorpyrifos were applied on 170 acres of corn. Twelve relevant applications occurred prior to the exceedance on June 10 when 319 gallons of chlorpyrifos containing product were applied on 678 acres of corn and walnuts. Five relevant chlorpyrifos applications occurred prior to the July 15 exceedance during which 53 gallons of product were applied on 241 acres of walnut, almond, alfalfa and corn. Chlorpyrifos is a priority A constituent in the Littlejohns Creek Site Subwatershed Management Plan.

Exceedances of the DO WQTL occurred in May, July, August and September (Table 36). Exceedances are common in the Coalition region, particularly during the warmer summer months. DO has been measured below the WQTL at the Littlejohns Creek site ten times prior to the 2008 irrigation season (since August of 2004). All exceedances have occurred during the irrigation season. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for the Littlejohns Creek.

There was one exceedance of the pH WQTL (<6.5) during monitoring on May 13, 2008 (Table 36). Post calibration data indicate that the pH meter may have provided inaccurate pH measurements (described above). There were no additional pH exceedances at this site after May. Prior to the 2008 irrigation season, one exceedance of pH occurred on March 1, 2005. A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. As result of the 2008 irrigation season exceedances, pH will be addressed in the Littlejohns Creek @ Jack Tone Road in the SJCDWQC Management Plan update.

Lone Tree Creek @ Jack Tone Rd

Table 37. Lone Tree Creek @ Jack Tone Rd, Lone Tree Creek @ Valley Home Rd and Lone Tree Creek @ Brennan Rd sample sites - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH, pH units	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL	Copper*, µg/L
Lone Tree Creek @ Jack Tone Rd	4/15/2008	NM	5.85		83	650	
Lone Tree Creek @ Jack Tone Rd	4/23/2008	RS			72		
Lone Tree Creek @ Jack Tone Rd	5/13/2008	NM	4.65	6.10†	7	1300	
Lone Tree Creek @ Valley Home Rd	5/13/2008	MPM	5.29	5.91†			
Lone Tree Creek @ Jack Tone Rd	6/10/2008	NM				690	
Lone Tree Creek @ Valley Home Rd	6/10/2008	MPM	6.62				
Lone Tree Creek @ Jack Tone Rd	7/15/2008	NM				460	
Lone Tree Creek @ Valley Home Rd	7/15/2008	MPM	6.07				7 (6.5)
Lone Tree Creek @ Brennan Rd	8/12/2008	MPM	6.66				
Lone Tree Creek @ Jack Tone Rd	8/12/2008	NM				310	
Lone Tree Creek @ Valley Home Rd	8/12/2008	MPM	4.2				
Lone Tree Creek @ Valley Home Rd	9/16/2008	MPM	5.93				

NM – normal monitoring; MPM – Management Plan monitoring; RS – resample
*WQTL based on hardness and shown in parenthesis

†post-sampling calibration of the multi-meter used at this site indicated that the pH probe may have been reading low.

Toxicity to *Selenastrum* occurred in samples collected during the first and second irrigation monitoring events on April 15 and May 13, 2008 (83% and 7% growth compared to the control, Table 37). The April resample was again toxic to algae (72% growth compared to the control) however the May resample was not (Table 37). A TIE was conducted on the May 13 sample however by the time of the evaluation the sample no longer exhibited toxicity. There were no exceedance-level concentrations of any pesticides or metals during either toxicity event. Low-level concentrations of most of the tested metals were detected during both events, but it is unknown if these contributed to the algae toxicity. In the April and May samples, there were detections of diuron (0.32 µg/L and 0.21 µg/L, respectively) and simazine (0.25 µg/L and 2.1 µg/L, respectively). These concentrations are too low to be the sole cause of toxicity. PUR data for the subwatershed includes 238 applications of 18 active ingredients upstream of the sample site prior to the April 15 sample and 214 applications of 25 active ingredients prior to May 13. The active ingredients applied include 2,4-D dimethylamine salt, 2,4-D diethanolamine salt, 4(2,4-DB) dimethylamine salt, amino ethoxy vinyl glycine hydrochloride, aminopyralid triisopropanolamine salt, carfentrazone-ethyl, clethodim, copper hydroxide, copper oxide, copper sulfate pentahydrate, diquat dibromide, diuron, flumioxazin, glufosinate-ammonium, glyphosate, halosulfuron-methyl, imazethapyr, methyl bromide, norfluorazon, oryzalin, oxyfluorfen, paraquat dichloride, pendimethalin, sethoxydim, simazine, and s-metolachlor. Most applications were to almonds, with some applications to grapes, walnuts, outdoor transplants, alfalfa, rice, and pasture. *Selenastrum* toxicity has occurred at this site seven times prior to the 2008 irrigation season (since August of 2004). Prior to 2008 all algae toxicities occurred in samples collected during the storm season and therefore no additional or upstream sampling occurred during the irrigation season of 2008. *Selenastrum* toxicity is a priority D constituent in the Site Subwatershed Management Plan for Lone Tree Creek.

One exceedance of the hardness-based copper WQTL occurred in the sample collected on July 15, 2008 from the upstream Management Plan monitoring site, Lone Tree Creek @ Valley Home Rd (Table 37). Due to past copper exceedances, upstream monitoring occurred for all metals at Lone Tree Creek @ Brennan Rd (July through September) and Lone Tree Creek @ Valley Home Rd (May through September). Sampling at Valley Home Rd was conducted to help identify the amount of metals coming from the foothills. At the normal monitoring site, Lone Tree Creek @ Jack Tone Rd, there were no exceedances during the 2008 irrigation season, but there have been seven prior exceedances of copper (since May of 2006). Copper can be applied as copper, copper hydroxide, copper sulfate and copper sulfate pentahydrate. Copper can also become available to water bodies through the weathering of rocks and soils that naturally contain metals. Some automobile components also contain copper and wearing of brakes can add substantial amounts of copper to surface waters that pass through or near urban areas. Since metals do not degrade in the environment, it is possible that copper can stay bound in soils and mobilized and moved to surface waters as a result of storm runoff or irrigation return flows. PUR data includes the application of 520 pounds of product containing copper sulfate on rice on May 16, and 8 pounds of product containing copper sulfate and

copper oxychloride on outdoor nursery transplants between May 16 and June 13. Copper is a priority C constituent in the Site Subwatershed Management Plan for Lone Tree Creek.

Exceedances of the *E. coli* WQTL occurred in five of the six normal monitoring samples collected from the Lone Tree Creek @ Jack Tone Rd site (Table 37). Possible sources of *E. coli* in the creek include irrigated pasture, dairies, leaky sewer lines or septic systems, applied manure, biosolids, liquid dairy waste, and a large array of wildlife. The Lone Tree Creek drains a large area of irrigated farmland upstream of the sample site, including many dairies and parcels of land allocated to pasture. Irrigation runoff from dairies or pasture land may be contributing to the *E. coli* in the creek. Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the Site Subwatershed Management Plan for Lone Tree Creek as a priority E constituent.

Low DO concentrations were measured in April, May, and June at Lone Tree Creek @ Jack Tone Rd, from May to September at the Valley Home Rd sampling site, and in August at the Brennan Rd sampling site (Table 37). Exceedances are common in the Coalition region, particularly during the warmer summer months. DO has been measured below the WQTL at the Lone Tree Creek @ Jack Tone Rd site during both irrigation and storm monitoring events. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for the Lone Tree Creek.

Exceedances of the lower pH WQTL occurred at both the Jack Tone Rd and the Valley Home Rd monitoring sites on May 13, 2008 (Table 37). Post calibration data indicate that the pH meter may have provided inaccurate pH measurements (described above). After the May monitoring event, there were no pH exceedances at either site. There have been two pH exceedances previous to the 2008 irrigation season however both of these measurements exceeded the upper WQTL. A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special Studies*.

Mokelumne River @ Bruella Rd

Table 38. Mokelumne River @ Bruella Rd sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL
Mokelumne River @ Bruella Rd	4/15/2008	NM	44	390
Mokelumne River @ Bruella Rd	4/23/2008	RS	19	
Mokelumne River @ Bruella Rd	5/7/2008	MPM	10	
Mokelumne River @ Bruella Rd	5/13/2008	NM, MPM-RS	27	
Mokelumne River @ Bruella Rd	5/21/2008	RS	73	

Mokelumne River @ Bruella Rd	7/8/2008	MPM	82	

NM – normal monitoring; MPM – Management Plan monitoring; RS – resample

Toxicity to *Selenastrum* occurred in six samples collected from Mokelumne River @ Bruella Rd in April, May and July (Table 38). In April, samples tested toxic in both the original grab sample on April 15 and in the resample one week later. Samples tested toxic three weeks in a row during the month of May, including samples collected for Management Plan Monitoring on May 7, normal monitoring on May 13 (which doubled as a resample for the May 7 toxicity), and resampling on May 21. One sample also tested toxic during Management Plan Monitoring on July 8. Additional sampling was conducted as per the SJCDWQC Management Plan at the Mokelumne River @ Bruella Rd site in May, July and August to test for *Selenastrum* toxicity. Only the July sample experienced toxicity to algae (82% growth as compared to the control, Table 38). TIEs were conducted on the April 15 and May 13 samples. The April 15 TIE indicated that non-polar organic chemical(s) were responsible for the toxicity; the May 13 TIE was inconclusive due to a lack of toxicity at the time of the evaluation. There were no exceedance-level detections of any pesticides or metals in the April 15 and May 13 samples. PUR data include 81 applications of pesticides prior to the first *Selenastrum* toxicity on April 15, 2008 including amino ethoxy vinyl glycine hydrochloride, bromoxynil octanoate, carfentrazone-ethyl, copper hydroxide, copper oxychloride, copper sulfate (pentahydrate), diuron, glufosinate-ammonium, glyphosate, isopropylamine salt, potassium salt, imidacloprid, metaldehyde, norflurazon, oxyfluorfen, paraquat dichloride, and simazine. Between April 15 and April 23, 2008, there were 23 additional applications of the same active ingredients listed above with the addition of glyphosate-trimesium. Active ingredients applied prior to the algae toxicity on May 7 included those previously listed with the addition of 1,3-dichloropropene, flumioxazin, and oryzalin. Between May 7 and May 13, 2008 there were two additional applications of 1,3-dichloropropene. Nine applications occurred during the eight days between the May 13 and May 21, 2008 toxicities. Within one month prior to the July 7 sampling, there were 53 applications of herbicides relevant to *Selenastrum* toxicity, including the active ingredients glyphosate-trimesium, glufosinate-ammonium, carfentrazone-ethyl, glyphosate, isopropylamine salt, glyphosate, potassium salt, paraquat dichloride, flumioxazin, simazine, imidacloprid, copper oxychloride sulfate and oxyfluorfen. In addition, 25 applications of copper hydroxide occurred between April 16 and May 2. *Selenastrum* toxicity has occurred four times prior to the 2008 irrigation season (since August of 2004). The Site Subwatershed Management Plan for Mokelumne River addresses *Selenastrum* toxicity as a priority D constituent.

Exceedances of *E. coli* occurred for the first time at this site, in samples collected on April 15, 2008 (Table 38). Possible sources of *E. coli* in Mokelumne River include irrigated pasture, dairies, leaky sewer lines or septic systems, applied manure, biosolids, liquid dairy waste, and a large array of wildlife. The Mokelumne River drains a large area of irrigated farmland upstream of the sample site, mostly vineyards, but also including dairies and land allocated to pasture. Irrigation runoff from dairies or pasture land may have contributed to the *E. coli* detected in the creek. Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has not yet been addressed in the Site Subwatershed

Management Plan for Mokelumne River. If additional exceedances occur at this site, then *E. coli* will be addressed in the SJCDWQC Management Plan update.

Mormon Slough @ Jack Tone Rd

Table 39. Mormon Slough @ Jack Tone Rd sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH	*Ceriodaphnia dubia*, survival: % of control	*Selenastrum capricornutum*, growth: % of control	Chlorpyrifos, µg/L	Methyl parathion, µg/L
Mormon Slough @ Jack Tone Rd	4/15/2008	NM	6.34			18		
Mormon Slough @ Jack Tone Rd	4/23/2008	RS				26		
Mormon Slough @ Jack Tone Rd	5/7/2008	MPM	6.7					
Mormon Slough @ Jack Tone Rd	5/13/2008	NM	4.5		0	4	0.066	
Mormon Slough @ Jack Tone Rd	7/15/2008	NM		8.61			0.047	
Mormon Slough @ Jack Tone Rd	8/12/2008	NM	4.82				0.025	0.15
Mormon Slough @ Jack Tone Rd	8/12/2008	FD					0.027	0.15
Mormon Slough @ Jack Tone Rd	8/13/2008	Sediment		8.59				
Mormon Slough @ Jack Tone Rd	9/9/2008	MPM	6.92	8.57			0.034	
Mormon Slough @ Jack Tone Rd	9/16/2008	NM		8.58			0.036	

FD – field duplicate; NM – normal monitoring; MPM – Management Plan monitoring; RS – resample; Sediment – sediment sampling

Water column toxicity to *Ceriodaphnia dubia* occurred in samples collected on May 13, 2008 at the Mormon Slough @ Jack Tone Rd site (0% survival, Table 39). The resample, collected one week later, was not toxic to *Ceriodaphnia*. A TIE was conducted on this sample however there was no toxicity detected in the baseline treatment and therefore the evaluation could not be conducted. Chlorpyrifos was detected at exceedance levels (0.066 µg/L) in samples collected during this toxicity event. The LC_{50} of chlorpyrifos to *Ceriodaphnia* ranges from 0.055 to 0.08 µg/L (USEPA ECOTOX database) and may have been partially responsible for the toxicity. There was also toxicity to algae in samples collected at the same time. Of the six normal monitoring events at the Mormon Slough site, four samples contained exceedance level concentrations of chlorpyrifos; however *Ceriodaphnia* toxicity occurred only during the May 13 event. The highest concentration of chlorpyrifos detected was in the May 13 samples. PUR data include 605 applications of active ingredients relevant to *Ceriodaphnia* toxicity. Active ingredients included (s)-cypermethrin, 2,4-d dimethylamine salt, abamectin, acephate, aluminum phosphide, azinphos-methyl, bifenazate, boscalid, carbaryl, chlorpyrifos, copper, copper hydroxide, copper oxide (ous), copper oxychloride, copper oxychloride sulfate, copper sulfate (pentahydrate), dinotefuran, e-8-dodecenyl acetate, esfenvalerate, fenarimol, fludioxonil, glyphosate, isopropylamine salt, imidacloprid, kresoxim-methyl, lambda-cyhalothrin, malathion, maneb, methoxyfenozide, myclobutanil, paraquat dichloride, piperalin, propiconazole, pyraclostrobin, pyriproxyfen, quinoxyfen, streptomycin sulfate, sulfur, tebuconazole, and trifloxystrobin. Prior to 2008, one sample tested toxic to *Ceriodaphnia* on September 4, 2007.

This toxicity also corresponded to a chlorpyrifos exceedance at the site (0.21 µg/L). As a result of the 2008 irrigation exceedance, *Ceriodaphnia* toxicity will be included in the SJCDWQC Management Plan update.

Toxicity to *Selenastrum* occurred in samples collected during the first and second irrigation monitoring events on April 15 and May 13, 2008 (18% and 4% growth compared to the control, Table 39). The April resample was again toxic to algae however the May resample was not. TIEs were conducted on both the April 15 and May 13 samples. Results from the April evaluation indicated that the source of toxicity was non-polar organics and cationic chemical(s). The Phase III TIE results suggest that cyanazine (0.1 TUc) and total metals account for a portion of the sample toxicity; however unknown toxicants were likely present. Evaluation of the May 13 sample indicated that the source of toxicity was cationic chemical(s). The Phase III TIE suggests that total metals were the cause of a portion of the sample toxicity; however unknown toxicants were likely present. There were no associated exceedances of pesticides or metals in the water column during either of the toxicity events. PUR data include 347 applications of pesticides relevant to the first toxicity experienced on April 15, 2008. Applied active ingredients included 2,4-d, diethanolamine salt, 2,4-d, dimethylamine salt, amino ethoxy vinyl glycine, hydrochloride, bensulide, carfentrazone-ethyl, copper hydroxide, copper oxide (ous), copper oxychloride sulfate, copper sulfate (pentahydrate), flumioxazin, glyphosate, isopropylamine salt, potassium salt, imidacloprid, metribuzin, oryzalin, oxyfluorfen, paraquat dichloride, pendimethalin, and s-metolachlor. In the eight days between the initial toxicity and *Selenastrum* toxicity resample on April 23, 2008, an additional 58 relevant applications occurred. Applications relevant to the May 13, 2008 toxicity included active ingredients listed above as well as copper, glufosinate-ammonium, rimsulfuron, and simazine. Prior to 2008, one sample tested toxic to *Selenastrum*, on July 10, 2007. As a result of the toxicity exceedances during irrigation 2008 monitoring, *Selenastrum* toxicity will be included in the SJCDWQC Management Plan update.

Chlorpyrifos was detected above exceedance concentrations in samples collected in May, July, August and September at the Mormon Slough site (Table 39). Four of these exceedances occurred during normal monitoring events and one exceedance occurred during Management Plan Monitoring. Previous to the 2008 irrigation season, chlorpyrifos exceedances occurred twice at this site, on May 16, 2006 and September 4, 2007. Additional Management Plan Monitoring for chlorpyrifos occurred during the May and September sampling events; only the September sample contained concentrations of chlorpyrifos above the WQTL. All of the exceedances of the chlorpyrifos WQTL at this site have occurred during irrigation season monitoring events. PUR data indicate that applications of chlorpyrifos occurred primarily during the months of April, May, July and August. Fourteen applications were relevant to the exceedance recorded on May 13 (0.066 µg/L) when 190 gallons of product containing chlorpyrifos was applied on 702.5 acres of walnuts. Four applications occurred one month prior to the July 15, 2008 exceedance when 53 gallons of product were applied to 185 acres of alfalfa and walnuts. Chlorpyrifos use peaked in late July with 16 applications occurring after July 17 resulting in 399 gallons of product applied on 805 acres of walnuts. Twenty-six applications occurred between July 17 and August 12 when 481.75 gallons of product were applied on

944.25 acres of alfalfa and 52 acres of walnuts. Six applications relevant to the September 9 exceedance were reported when 38.25 gallons of product were applied to 81.5 acres of walnuts. An additional two applications occurred between September 9 and September 16 on 45 acres of walnuts. Chlorpyrifos is a priority A constituent in the Site Subwatershed Management Plan for Mormon Slough @ Jack Tone Rd.

One exceedance of methyl parathion occurred for the first time at this site in samples collected on August 12, 2008 (Table 39). The pesticide was detected in both the grab sample and the field duplicate sample during this event. PUR data include 13 applications one month prior to the exceedances with 688 gallons of product applied on 712 acres of walnuts. If additional exceedances of methyl parathion occur at this site, it will be addressed in an updated SJCDWQC Management Plan.

Exceedances of the DO WQTL occurred during April, May, August and September of the 2008 irrigation season (Table 39). DO exceedances are common in the Coalition region, particularly during the warmer summer months. All DO exceedances at the Mormon Slough site have occurred during irrigation monitoring events. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for the Mormon Slough site.

Exceedances of the upper pH WQTL occurred during July, August and September of the irrigation season (Table 39). There have been no pH exceedances at this site prior to the 2008 irrigation season. A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. This parameter has not yet been addressed in a Management Plan for Mormon Slough. These exceedances will be included in the SJCDWQC Management Plan update.

Roberts Island Drain @ Holt Rd

Table 40. Roberts Island Drain @ Holt Rd sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL	TDS, mg/L	Chlorpyrifos, µg/L
Roberts Island Drain @ Holt Rd	4/15/2008	NM		1122	22		680	
Roberts Island Drain @ Holt Rd	4/23/2008	RS	5.41	914				
Roberts Island Drain @ Holt Rd	5/13/2008	NM	5.21	1285	23	240	960	
Roberts Island Drain @ Holt Rd	5/21/2008	RS	5.74	878	43			
Roberts Island Drain @ Holt Rd	6/10/2008	NM		937			550	
Roberts Island Drain @ Holt Rd	7/15/2008	NM	6.47				460	
Roberts Island Drain @ Holt Rd	7/15/2008	FD					470	

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Selenastrum capricornutum*, growth: % of control	*E. coli*, MPN/100mL	TDS, mg/L	Chlorpyrifos, µg/L
Roberts Island Drain @ Holt Rd	8/12/2008	NM	6.98					0.034
Roberts Island Drain @ Holt Rd	8/13/2008	Sediment	6.28					
Roberts Island Drain @ Holt Rd	9/16/2008	NM	6	814		410	500	

FD – field duplicate; NM – normal monitoring; RS – resample; Sediment – sediment sampling

Toxicity to *Selenastrum* occurred in samples collected during the first and second irrigation monitoring events on April 15 and May 13, 2008 (22% and 23% growth compared to the control, Table 40). Toxicity resampling occurred one week after both of these toxicity events. The April resample was not toxic to algae however the May resample collected on May 21 was (43% growth compared to the control). TIEs were conducted on both the April 15 and May 23 samples. Results from the evaluation of the April 15 samples indicated that the source of toxicity was cationic chemical(s) and unknown toxicants. The Phase III TIE suggests that metals were responsible for the toxicity. Evaluation of the May 13 samples indicated that cationic chemical(s), non-polar organics and unknown toxicants were responsible for the sample toxicity. The Phase III TIE indicates that total metals were the cause of a portion of the toxicity; however unknown toxicants were likely present. There were no exceedances of pesticides or metals in the water column during either of the toxicity events. PUR data indicate that on March 19 and March 22, 45.5 gallons of product containing 2,4-D, dimethylamine salt was applied on 197 acres of wheat. Between April 20 and May 7 eight active ingredients were applied on alfalfa and corn including 4(2,4-DB), dimethylamine salt, 2,4-D, dimethylamine salt, clethodim, diglycolamine salt of 3,6-dichloro-o-anisic acid, bromoxynil (heptanoate and octoanoate), imazamox ammonium salt, and imazethapyr ammonium salt. Prior to the 2008 irrigation season, two samples tested toxic to *Selenastrum* on July 10, 2007 and February 23, 2008. As a result of the 2008 toxicity exceedances, *Selenastrum* toxicity will be included in the SJCDWQC Management Plan update.

One exceedance of chlorpyrifos occurred at the Roberts Island Drain site on August 12, 2008 (Table 40). Previous to the 2008 irrigation season, one chlorpyrifos exceedance occurred on September 9, 2006. PUR data indicate that 29.5 gallons of product containing chlorpyrifos were applied on 118 acres of corn on July 15. Chlorpyrifos has not yet been addressed in a Site Subwatershed Management Plan for Roberts Island Drain @ Holt Rd. As result of the 2008 storm and irrigation season exceedances, chlorpyrifos will be included in the SJCDWQC Management Plan update.

Exceedances of *E. coli* occurred for the first time at this site, in samples collected on May 13 and September 16, 2008 (Table 40). Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies.* As result of the 2008 irrigation season

exceedances, *E. coli* will be addressed for Roberts Island Drain @ Holt Rd in the SJCDWQC Management Plan update.

Exceedances of the DO WQTL occurred in April, May, July, August and September during the 2008 irrigation season (Table 40). Exceedances are common in the Coalition region, particularly during the warmer summer months. Prior to the 2008 irrigation season, 17 exceedances have occurred at the Roberts Island Drain @ Holt Rd site; three of which occurred during storm monitoring. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for Roberts Island Drain @ Holt Rd.

Exceedances of the TDS WQTL occurred in five out of six samples collected during the irrigation season. Exceedances of the SC WQTL corresponded to these exceedances in all samples except those collected on July 15, 2008. In addition, there were two exceedances of SC during resampling events in which TDS was not analyzed (Table 40). TDS describes all solids (usually mineral salts) that are dissolved in water and are frequently associated with exceedances of SC. In general, exceedances of SC have occurred more frequently at the Roberts Island Drain site, than exceedances of TDS. Potential sources of TDS and SC are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. These sources are described further below under *Constituent Specific Analyses/Special Studies.* A shallow ground water table appears to be the cause of elevated salinity in many SJCDWQC water bodies within the Sacramento/San Joaquin Delta, and is likely the cause of elevated TDS and SC in the Roberts Island Drain. Exceedances of SC and TDS have occurred frequently at this Roberts Island Drain @ Holt Rd site since monitoring in 2006. SC and TDS have been addressed in the Site Subwatershed Management Plan for Roberts Island Drain @ Holt Rd as priority E constituents.

Roberts Island Drain along House Rd

Table 41. Roberts Island Drain along House Rd sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Ceriodaphnia dubia*, survival: % of control	*Selenastrum capricornutum*, growth: % of control	*Hyalella azteca*, survival: % of control	*E. coli*, MPN/100mL	TDS, mg/L	Arsenic, µg/L	Chlorpyrifos, µg/L
Roberts Island Drain along House Rd	4/15/2008	NM	6.82	1225		15			790		
Roberts Island Drain along House Rd	4/23/2008	RS	3.82	1207		77					
Roberts Island Drain along House Rd	5/13/2008	NM		1540		10			980	13	
Roberts Island Drain along House Rd	5/21/2008	RS	5.77	964		42					

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Ceriodaphnia dubia*, survival: % of control	*Selenastrum capricornutum*, growth: % of control	*Hyalella azteca*, survival: % of control	*E. coli*, MPN/100mL	TDS, mg/L	Arsenic, µg/L	Chlorpyrifos, µg/L
Roberts Island Drain along House Rd	6/10/2008	NM	4.38	871					590		
Roberts Island Drain along House Rd	6/10/2008	FD							520		
Roberts Island Drain along House Rd	7/15/2008	NM	5.55					>2400			
Roberts Island Drain along House Rd	8/12/2008	NM		925					610		0.044
Roberts Island Drain along House Rd	8/13/2008	Sediment	4.85	774							
Roberts Island Drain along House Rd	8/13/2008	Sediment FD					83				
Roberts Island Drain along House Rd	9/16/2008	NM	5.00		0						1.7
Roberts Island Drain along House Rd	9/18/2008	Sediment RS	4.65	767			85				
Roberts Island Drain along House Rd	9/23/2008	NM-RS	2.85	961	0						

FD – field duplicate; NM – normal monitoring; RS – resample; Sediment – sediment sampling

Water column toxicity to *Ceriodaphnia dubia* occurred in samples collected on September 16, 2008 at the Roberts Island Drain along House Rd site (0% survival, Table 41). Resamples collected one week later also caused complete mortality. A TIE and dilution series were conducted on the original samples in order to determine the source and magnitude of the toxicity. Results from these tests indicated that the source of toxicity was an organophosphate pesticide (32 TUa). The September water sample contained 1.7 µg/L of chlorpyrifos (Table 41). The Phase III TIE suggests that chlorpyrifos was responsible for a majority of the toxicity in the sample (21.3 TUa) however unknown cationic chemicals were also present in the sample. Prior to 2008, one sample tested toxic to *Ceriodaphnia* on July 10, 2007 and was not associated with a chlorpyrifos exceedance. PUR data relevant to the *Ceriodaphnia* toxicity on September 16 indicate that 16.8 gallons of product containing lambda-cyhalothrin were applied to corn between July 18 and July 28 in the subwatershed. Lambda-cyhalothrin was not detected in the water samples collected on September 16. The last reported use of chlorpyrifos was on July 15 and is relevant to the August 12 chlorpyrifos exceedance discussed below. *Ceriodaphnia* toxicity has not yet been addressed in the Site Subwatershed Management Plan for Roberts Island Drain along House Rd. As a result of the toxicity experienced during the 2008 irrigation season, *Ceriodaphnia* toxicity will be included in the SJCDWQC Management Plan update.

Toxicity to *Selenastrum* occurred for the first time at this site during the 2008 irrigation season. Toxicity occurred in samples collected during the first and second irrigation monitoring events on April 15 and May 13, 2008 (15% and 10% growth compared to the control, Table 41). Both resamples were also toxic (Table 41). TIE results for samples collected on April 15 indicated that the cause of *Selenastrum* toxicity was cationic metals. Results for the May 13 samples indicated that cationic metals, non-polar organic chemicals, and unknown toxicants were the source of toxicity. The Phase III TIE suggests that metals account for some of the toxicity in the sample. Chemical analyses of the April and May samples indicated an exceedance of the

arsenic WQTL on May 13, however there were no other exceedance-level concentrations of metals or pesticides during either of these events. There were no detections of any of the pesticides during either of the toxicity events. However, chemicals for which the Coalition does not analyze may also have contributed to the toxicity, particularly in the May 13 sample. PUR data indicate that 32.1 gallons of product containing 2,4 dimethylamine salt were applied on wheat on March 19 and March 22, and 4.19 gallons of product containing bromoxynil octanoate were applied to oats on March 20. On April 20 and May 13, imazethapyr ammonium salt, imazamox ammonium salt, 4(2,4DB) dimethylamine salt, and clethodim were applied on alfalfa. Possible sources of arsenic and lead in the Coalition region are described in detail below under *Constituent Specific Analyses/Special Studies*. *Selenastrum* toxicity has not yet been addressed in a Site Subwatershed Management Plan for the Roberts Island Drain along House Rd site. As a result of the 2008 irrigation season exceedances, *Selenastrum* toxicity will be addressed in the SJCDWQC Management Plan update.

Sediment toxicity to *Hyalella azteca* occurred in samples collected on August 13, 2008 (Table 41). Both a grab sample and a field duplicate sample were collected during this event and toxicity only occurred in the field duplicate sample (83% survival compared to the control) and not in the grab sample (99% survival compared to the control, Table 41). Sediment samples were not analyzed for pesticides or metals; however water samples collected the previous day at the same site, resulted in a chlorpyrifos exceedance (0.044 µg/L). Resampling occurred on September 18 and samples were toxic to *Hyalella* (85% survival compared to the control, Table 41). Water samples collected two days prior to the sediment resampling event resulted in a concentration of chlorpyrifos above the WQTL (1.7 µg/L). Without sediment chemistry analysis it is unknown how much chlorpyrifos was bound in the sediment and contributed to the *Hyalella* toxicity. There were no other concentrations of pesticides or metals above WQTLs in water samples collected just prior to either of the sediment toxicity events (original sample and resample events). All of the metals were detected at low concentrations in all water samples collected from this site. Most of the metals were detected at their lowest concentrations during August and September sampling. PUR data indicate that in March 3.9 gallons of product containing lambda-cyhalothrin were applied on alfalfa, and in July, 8.1 gallons of product containing spiromesifen and 12.9 gallons of product containing lambda-cyhalothrin were applied on corn. There were no additional applications relevant to *Hyalella* toxicity prior to the resample toxicity event on September 18. *Hyalella* toxicity has been addressed in the Site Subwatershed Management Plan for Roberts Island Drain along House Rd as a priority D constituent.

Two exceedances of the chlorpyrifos WQTL occurred in samples collected from the Roberts Island Drain along House Rd site on August 12 and September 16, 2008 (Table 41). These were the first chlorpyrifos exceedances to occur at this site. PUR data indicate that 29.5 gallons of product containing chlorpyrifos were aerially applied to corn on July 15; this was the only date of chlorpyrifos application reported for 2008. Chlorpyrifos has not yet been addressed in the Site Subwatershed Management Plan for Roberts Island Drain along House Rd. As result of the 2008 irrigation season exceedances, chlorpyrifos will be addressed in the SJCDWQC Management Plan update.

One exceedance of the arsenic WQTL occurred at this site on May 13, 2008 (Table 41). Samples from this site have been tested for metals since the irrigation season of 2006; however this was the first arsenic exceedance to occur at this site. Arsenic is not currently applied by agriculture in the Coalition region. Refer to the explanation provided below, under *Constituent Specific Analyses/Special Studies*, for details on the historical use of arsenic by agriculture. At this point the source of arsenic in the Roberts Island Drain is unclear, although it is likely that the native soils in the drain contain arsenic. This constituent has not yet been addressed in the Site Subwatershed Management Plan for this site. If additional exceedances of arsenic occur at this site, then the exceedances will be addressed in the subsequent SJCDWQC Management Plan update.

One exceedance of the *E. coli* WQTL occurred at this site in samples collected on July 15, 2008 (Table 41). Possible sources of *E. coli* in Roberts Island Drain include irrigated pasture, leaky sewer lines or septic systems, applied manure, biosolids and a large array of wildlife. Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the Site Subwatershed Management Plan for Roberts Island Drain as a priority E constituent.

Low DO concentrations occurred in during sampling events from April to September of the 2008 irrigation season (Table 41). Exceedances of the DO WQTL are common in the Coalition region, particularly during the warmer summer months. Prior to the 2008 irrigation season, 14 exceedances of the WQTL had occurred at the Roberts Island Drain along House Rd site; two occurred during storm monitoring. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for Roberts Island Drain along House Rd.

Exceedances of the TDS WQTL occurred in four out of six samples collected during the irrigation season. Exceedances of the SC WQTL corresponded with the TDS exceedances. In addition, there were five exceedances of SC during resampling and sediment sampling events for which TDS was not analyzed (Table 41). TDS describes all solids (usually mineral salts) that are dissolved in water and are frequently associated with exceedances of SC. Potential sources of TDS and SC are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. These sources are described further below under *Constituent Specific Analyses/Special Studies.* A shallow ground water table appears to be the cause of elevated salinity in many SJCDWQC water bodies within the Sacramento/San Joaquin Delta, and is likely the cause of elevated TDS and SC in the Roberts Island Drain. Exceedances of SC and TDS have occurred frequently at this Roberts Island Drain along House Rd site since monitoring began there in 2006. SC and TDS have been addressed in the Site Subwatershed Management Plan for Roberts Island Drain as priority E constituents.

Sand Creek @ Hwy 4 Bypass

Table 42. Sand Creek @ Hwy 4 Bypass sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Selenastrum capricornutum*, growth: % of control	*Hyalella azteca*, survival: % of control	*E. coli*, MPN/100 mL	TDS, mg/L	DDD, µg/L	DDE, µg/L	DDT, µg/L	Dieldrin, µg/L	Disulfoton, µg/L
Sand Creek @ Hwy 4 Bypass	4/15/2008	NM	5.97	2029	44		330	1500					
Sand Creek @ Hwy 4 Bypass	4/23/2008	RS	5.97	1913	54								
Sand Creek @ Hwy 4 Bypass	5/7/2008	MPM	5.21	1707								0.012	
Sand Creek @ Hwy 4 Bypass	5/13/2008	NM	5.77	1859			290	1400					0.11
Sand Creek @ Hwy 4 Bypass	6/3/2008	MPM	5.26	1898									
Sand Creek @ Hwy 4 Bypass	6/10/2008	NM	2.92	1845			370	1100		0.006			0.2
Sand Creek @ Hwy 4 Bypass	7/8/2008	MPM	3.52	1758									
Sand Creek @ Hwy 4 Bypass	7/15/2008	NM	4.77	1059			250	1200					
Sand Creek @ Hwy 4 Bypass	8/12/2008	NM	5.36	1885	38		460	2800	0.0075	0.078	0.011	0.0058	0.18
Sand Creek @ Hwy 4 Bypass	8/13/2008	Sediment	6.1	1818		2							
Sand Creek @ Hwy 4 Bypass	8/19/2008	NM-RS	4.91	1897									
Sand Creek @ Hwy 4 Bypass	9/16/2008	NM		1709			310	1200					
Sand Creek @ Hwy 4 Bypass	9/18/2008	Sediment RS	6.73	1854		0							

NM – normal monitoring; MPM – Management Plan Monitoring; RS – resample; Sediment – sediment monitoring

Selenastrum toxicity occurred in samples collected from Sand Creek @ Hwy 4 Bypass on April 15 and August 12, 2008 (44% and 38% survival compared to the control, Table 42). These were the first samples from this site to experience *Selenastrum* toxicity. Resamples collected in April were toxic and resamples collected in August were not (Table 42). TIE results indicated that the cause of *Selenastrum* toxicity in the April samples was non-polar organic chemicals and the Phase I TIE conducted on the August samples was inconclusive. There were no pesticide or metal concentrations above WQTLs in the concurrent chemical analyses of the April 15 samples. The Phase III TIE conducted on the August sample concluded that metals were the cause of a portion of the sample toxicity however unknown toxicants were likely present. Chemical analysis of the August samples resulted in exceedances of the DDD, DDE, DDT, dieldrin and disulfoton WQTLs (Table 42) which are unlikely to contribute to the toxicity. Metals were detected at low concentrations (below the WQTLs) during every monitoring event at this site. PUR data indicate that between March 23 and 27, 114 gallons of product containing MCPA dimethylamine salt were aerially applied on 430 acres of barley in the subwatershed. In addition on April 4, 11 gallons of product containing s-metolachlor were applied on 86 acres of processing tomatoes. The golf course upstream of the sample site reported using glyphosate, quinclorac, dicamba, 2,4, 2-ethylhexyl ester, mecoprop-p, and carfentrazone-ethyl in April 2008. Prior to the August 12 exceedance, PUR data include one additional application in which

1 quart of product containing glyphosate was applied on ¼ acre of walnuts on July 10. *Selenastrum* toxicity has not yet been addressed in a Site Subwatershed Management Plan for the Sand Creek @ Hwy 4 Bypass site. As a result of the 2008 irrigation season exceedances, *Selenastrum* toxicity will be addressed in the SJCDWQC Management Plan update.

Sediment toxicity to *Hyalella azteca* occurred in samples collected on August 13, 2008 (2% survival compared to the control, Table 42). Sediment samples were not analyzed for pesticides or metals, however water samples collected the previous day contained concentrations of DDD (0.0075 µg/L), DDE (0.078 µg/L), DDT (0.011 µg/L), disulfoton (0.18 µg/L) and dieldrin (0.0058 µg/L) above their respective WQTLs (Table 42). Toxicity resampling occurred on September 18 and resulted in complete mortality of *Hyalella*. Water samples collected two days prior to the resample did not result in exceedances of any pesticides or metals. Without sediment chemistry analysis the cause of the *Hyalella* toxicity is unknown. Metals and pesticides that have a tendency to bind to sediment and were applied in the upstream subwatershed may have contributed to sediment toxicity in the creek. PUR data indicate that on July 10, one quart of product containing glyphosate was applied to ¼ acre of walnuts in the subwatershed while the golf course reported using 120 ounces of product containing azoxystrobin in July and August. No additional applications associated with *Hyalella* toxicity occurred between the August 13 and the September 18 sampling. *Hyalella* toxicity has been addressed in the Site Subwatershed Management Plan for Sand Creek @ Highway 4 Bypass as a priority D constituent.

Exceedances of the DDE, DDD and DDT WQTLs occurred at this site in samples collected on August 12 (Table 42). DDT is an organochlorine pesticide that was used abundantly in the past, but is not currently registered for agricultural use. Due to the long half-life of the constituent, DDT and its breakdown products (DDD and DDE) are still found in Coalition water bodies. Current agricultural pesticide applications are not the source of these exceedances and therefore PUR data are not relevant to these detections. DDE and DDT are included in the Sand Creek @ Hwy 4 Bypass Site Subwatershed Management Plan as priority E constituents.

Due to previous exceedances of the dieldrin WQTL (May 16 and June 20, 2006) Management Plan Monitoring was conducted at Sand Creek @ Hwy 4 Bypass in May and June for both dieldrin and *Ceriodaphnia* toxicity. Dieldrin was detected at a concentration above the WQTL in samples collected on May 7 and August 12, 2008 (Table 42). There was no detection of dieldrin in the June Management Plan Monitoring sample collected on June 3, 2008. Dieldrin is an organochlorine insecticide that is not currently registered for agricultural use. There was no associated *Ceriodaphnia* toxicity during either the May or August event. Dieldrin is included in the Site Subwatershed Management Plan for Sand Creek as a priority C constituent. Actions taken to address the dieldrin exceedances in this report will be included in the SJCDWQC Management Plan update.

There were three detections of disulfoton above the WQTL at the Sand Creek @ Hwy 4 Bypass site, on May 13, June 10 and August 12, 2008 (Table 42). These were the first exceedances of disulfoton to occur at this site. Disulfoton is a selective, systemic organophosphate insecticide

and is used on products such as cotton, sugar beets, corn, small grains (i.e. wheat, cereal grains), ornamentals, and potatoes. All products formulated at greater than 2% disulfoton are classified as Restricted Use Pesticides. PUR data indicate that disulfoton was not used in 2008 for agriculture or on the golf course. As a result of the exceedances detected during the 2008 irrigation season, disulfoton will be included in the Sand Creek @ Hwy 4 Bypass Site Subwatershed Management Plan update.

Exceedances of the *E. coli* WQTL occurred in six samples collected from this site from April to September (Table 42). Possible sources of *E. coli* in Sand Creek include leaky sewer lines or septic systems, applied manure, biosolids and a large array of wildlife. The Sand Creek @ Hwy 4 Bypass site is downstream to a small area of irrigated farmland and non-irrigated pasture land. Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the Site Subwatershed Management Plan for Sand Creek as a priority E constituent.

Low DO concentrations were measured every month of the 2008 irrigation sampling season (Table 42). Exceedances of the DO WQTL are common in the Coalition region, particularly during the warmer summer months. Field measures taken from Sand Creek have resulted in exceedances during most sampling events since monitoring began at the site in 2006. There have been no exceedances of the DO WQTL at this site during storm monitoring. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for Sand Creek @ Hwy 4 Bypass.

Exceedances of the TDS WQTL occurred in all six samples that were tested for this constituent during the irrigation season (Table 42). Exceedances of the SC WQTL corresponded to these exceedances in all samples. In addition, there were seven exceedances during Management Plan Monitoring, resampling and sediment sampling events in which TDS was not analyzed (Table 42). TDS describes all solids (usually mineral salts) that are dissolved in water and are frequently associated with exceedances of SC. Potential sources of TDS and SC are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. These sources are described further below under *Constituent Specific Analyses/Special Studies.* SC and TDS have been addressed in the Site Subwatershed Management Plan for Sand Creek as priority E constituents.

South Webb Tract Drain

Table 43. South Webb Tract Drain sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	Arsenic, µg/L
South Webb Tract Drain	9/16/2008	NM	1.32	19

NM – normal monitoring

South Webb Tract was approved as a replacement site for Marsh Creek in September 2008. Monitoring at the South Webb Tract Drain was initiated on September 16, 2008, and therefore was sampled only once during the 2008 irrigation season. Arsenic was detected above the WQTL in September samples (Table 43). Arsenic is not currently applied by agriculture in the Coalition region. As a result, PUR data were not reviewed as follow up to this exceedance. Further explanation on the possible sources of arsenic in the Coalition region is provided below, under *Constituent Specific Analyses/Special Studies*. A Site Subwatershed Management Plan has not yet been developed for the South Webb Tract Drain site. If two or more exceedances of arsenic occur at this site, then the exceedances will be addressed in the subsequent SJCDWQC Management Plan update.

DO was measured below the WQTL during the September 16, 2008 event (Table 43). DO exceedances are common in the Coalition region, particularly during the warmer summer months. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. If additional exceedances of DO occur at this site, then this constituent will be addressed in a Site Subwatershed Management Plan for the South Webb Tract Drain site.

Terminous Tract Drain @ Hwy 12

Table 44. Terminous Tract Drain @ Hwy 12 sample site - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	SC, umhos/cm	*Selenastrum capricornutum*, growth: % of control	TDS, mg/L	Arsenic, µg/L	Chlorpyrifos, µg/L	DDT, µg/L
Terminous Tract Drain @ Hwy 12	4/15/2008	NM		727	51				
Terminous Tract Drain @ Hwy 12	4/23/2008	RS		737					
Terminous Tract Drain @ Hwy 12	5/13/2008	NM	6.96	1003	0.5	550			
Terminous Tract Drain @ Hwy 12	5/21/2008	RS		1010					
Terminous Tract Drain @ Hwy 12	6/10/2008	NM	5.08	751		470			
Terminous Tract Drain @ Hwy 12	7/15/2008	NM	4.45						0.008
Terminous Tract Drain @ Hwy 12	8/12/2008	NM	2.56					0.021	
Terminous Tract Drain @ Hwy 12	9/16/2008	NM	4.71	858		540	11	0.02	

NM – normal monitoring; RS – Resample

Selenastrum toxicity occurred in samples collected from Terminous Tract Drain @ Hwy 12 on April 15 and May 13, 2008 (51% and 0.5% growth compared to the control, Table 44). Resampling occurred one week after each of the toxicity events and neither resample was toxic. The May sample TIE treatments indicated that the source of *Selenastrum* toxicity was cationic and non-polar organic chemicals. There were no exceedance level concentrations of any pesticides or metals in the concurrent chemical analyses during either of the toxicity events.

The Phase III TIE conducted on the May sample suggests that metals were the cause of a portion of the sample toxicity however unknown toxicants were likely present. PUR data indicate that between March 18 and April 11 there were 34 applications on potatoes, asparagus, and turf grass. Applied active ingredients include glyphosate, metribuzin, bromoxynil (heptanoate and octanoate), 2,4-D dimethylamine salt, and carfentrazone-ethyl. Between April 17 and May 10 there were 23 additional applications on potatoes, tomatoes, wine grapes, and turf grass. Applied active ingredients include metribuzin, bromoxynil (heptanoate and octanoate), carfentrazone-ethyl, glyphosate, s-metolachlor, pendimethalin, linuron, and glufosinate-ammonium. *Selenastrum* toxicity has occurred twice at this site prior to the 2008 irrigation season. *Selenastrum* toxicity has been addressed in the Site Subwatershed Management Plan for the Terminous Tract Drain. Toxicity experienced during the 2008 monitoring seasons will be addressed in the SJCDWQC Management Plan update.

Two exceedances of the chlorpyrifos WQTL occurred in samples collected from the Terminous Tract Drain site on August 12 and September 16, 2008 (Table 44). These were the first chlorpyrifos exceedances to occur at this site. PUR data indicate that 79.6 gallons of product containing chlorpyrifos were applied on 315.4 acres of corn in the subwatershed between July 19 and July 24; there were no reported applications between July 24 and September 16. Chlorpyrifos has not yet been addressed in the Site Subwatershed Management Plan for Terminous Tract Drain @ Hwy 12. As result of the 2008 irrigation season exceedances, chlorpyrifos will be addressed in the SJCDWQC Management Plan update.

One exceedance of the arsenic WQTL occurred in samples collected on September 16, 2008 (Table 44). Samples from this site have been tested for metals since the irrigation season of 2006 and exceedances of arsenic have occurred four times prior to the 2008 irrigation season. Arsenic is not currently applied by agriculture in the Coalition region. Refer to the explanation provided below, under *Constituent Specific Analyses/Special Studies*, for details on the historical use of arsenic in agriculture. At this point the source of arsenic in the Terminous Tract Drain is unclear, although it is likely that the native soils in the drain contain arsenic. Arsenic has been addressed the Site Subwatershed Management Plan Terminous Tract Drain as a priority E constituent. The exceedances in this report will be addressed in the next SJCDWQC Management Plan update.

One exceedance of the DDE WQTL occurred at this site in a sample collected on July 15, 2008 (Table 44). DDE is a breakdown product of DDT, an organochlorine pesticide that was used abundantly in the past but is not currently registered for agricultural use. Due to the long half-life of DDT and its breakdown products, these constituents are still found in Coalition water bodies. Current agricultural pesticide applications are not the source of these exceedances and therefore PUR data is not relevant to these detections. This was the first exceedance of DDE to occur at this site and therefore has not yet been addressed in the Site Subwatershed Management Plan for the Terminous Tract Drain. If additional exceedances of DDE occur at this site, then the exceedances will be addressed in an updated SJCDWQC Management Plan.

Low DO occurred in five out of seven monitoring events in May, June, July, August and September (Table 44). Exceedances of the DO WQTL are common in the Coalition region, particularly during the warmer summer months. Field measures taken from the Terminous Tract Drain have resulted in exceedances during most sampling events since monitoring began at the site in 2005. Though exceedances are more common during the irrigation season, four exceedances occurred during storm monitoring. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for Terminous Tract Drain @ Hwy 12.

Exceedances of the TDS WQTL occurred in samples collected in May, June and September. Exceedances of the SC WQTL corresponded to each of these exceedances. In addition, one exceedance of the SC WQTL occurred in a sample that did not experience an exceedance of TDS, and two exceedances of the SC WQTL occurred during resampling in which TDS was not measured (Table 44). TDS describes all solids (usually mineral salts) that are dissolved in water and are frequently associated with exceedances of SC. Potential sources of TDS and SC are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. These sources are described further below under *Constituent Specific Analyses/Special Studies.* SC and TDS have been addressed in the Site Subwatershed Management Plan for this site as priority E constituents.

Unnamed Drain to Lone Tree Creek @ Jack Tone Rd

Table 45. Unnamed Drain to Lone Tree Creek @ Jack Tone Rd and Unnamed Drain to Lone Tree Creek @ Wagner Rd sample sites - 2008 Irrigation season exceedances.

Site Name	Sample Date	Season	DO, mg/L	pH, pH units	*Ceriodaphnia dubia*, survival: % of control	*Selenastrum capricornutum*, growth: % of control	*Hyalella azteca*, survival: % of control	*E. coli*, MPN/100mL	Copper*, µg/L	Lead*, µg/L	Carbofuran, µg/L	Chlorpyrifos, µg/L	Thiobencarb, µg/L
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	4/15/2008	NM						250	23 (8.4)	6.1 (2.7)			
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	5/13/2008	NM	5.61	6.17†		34		460	7.8 (6.5)		0.64	0.41	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	6/10/2008	NM										0.12	0.12
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	7/15/2008	NM						690	6.9 (5.7)			0.028	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	8/12/2008	NM						260	6.8 (5.9)				
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	8/13/2008	Sediment					87.2						
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	9/16/2008	NM	6.7		0				6.5 (4.3)	1.3 (1)		0.12	

Site Name	Sample Date	Season	DO, mg/L	pH, pH units	*Ceriodaphnia dubia*, survival: % of control	*Selenastrum capricornutum*, growth: % of control	*Hyalella azteca*, survival: % of control	*E. coli*, MPN/100mL	Copper*, µg/L	Lead*, µg/L	Carbofuran, µg/L	Chlorpyrifos, µg/L	Thiobencarb, µg/L
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	9/16/2008	FD			0				6.2 (2.6)	1.3 (0.46)		0.12	
Unnamed Drain to Lone Tree Creek @ Wagner Rd	9/16/2008	MPM	6.6									0.14	
Unnamed Drain to Lone Tree Creek @ Jack Tone Rd	9/23/2008	RS			65								

FD – field duplicate; NM – normal monitoring; MPM – Management Plan Monitoring; Sediment – Sediment monitoring; RS – Resample
*WQTL based on hardness and shown in parenthesis
†post-sampling calibration of the multi-meter used at this site indicated that the pH probe may have been reading low.

Water column toxicity to *Ceriodaphnia dubia* occurred in samples collected on September 16, 2008 at the Unnamed Drain to Lone Tree Creek @ Jack Tone Rd site (0% survival, Table 45). Grab and field duplicate samples were collected during this event, and both samples resulted in complete mortality to *Ceriodaphnia*. Toxicity resampling occurred one week later and resulted in toxicity (65% relative to the control, Table 45). A TIE and dilution series were conducted on the original samples in order to determine the source and magnitude of the toxicity. Results from these tests indicated that the source of toxicity was an organophosphate pesticide. Dilutions of these samples revealed 2.0 TUa. Samples collected during the September 16 event were also analyzed for pesticides, and resulted in a chlorpyrifos exceedance of 0.12 µg/L which accounts for a majority of the sample toxicity (1.5 TUa). Other pesticides may also have contributed to the toxicity. Two samples from this site have tested toxic to *Ceriodaphnia* prior to the irrigation season of 2008 (February 11, 2007 and January 23, 2008). Both of the previous toxicities also corresponded to chlorpyrifos exceedances (chlorpyrifos detections of 0.048 µg/L and 0.045 µg/L, respectively). PUR data indicate 179 applications of pesticides relevant to the *Ceriodaphnia* toxicity between April 30 and September 16. Pesticides were applied to many crops including apples, corn, walnuts, pumpkins, tomatoes, almonds, corn for human consumption, cherries, alfalfa, wine grapes, and rice. Active ingredients applied included lambda-cyhalothrin, gamma cyhalothrin, permethrin, esfenvalerate, bifenthrin, cyfluthrin and beta-cyfluthrin, fenpropathrin, (s)-cypermethrin and cypermethrin, glyphosate, paraquat dichloride, chlorothalonil, methoxyfenozide, myclobutanil, imidacloprid, propargite, indoxacarb, and pyraclostrobin. The last reported application of chlorpyrifos was on July 23, 2008. *Ceriodaphnia* toxicity will be addressed in the Site Subwatershed Management Plan for Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.

Selenastrum toxicity occurred in samples collected from Unnamed Drain to Lone Tree Creek @ Jack Tone Rd on May 13, 2008 (34% growth compared to the control, Table 45). Resamples collected one week later were not toxic. A TIE was initiated however sample toxicity did not persist through the TIE treatments and therefore the TIE results were inconclusive. Exceedance level concentrations of copper, chlorpyrifos and carbofuran occurred in the concurrent

chemical analyses of the May 13 samples. There were also low-level concentrations (below the WQTL) of the remaining metals tested during the May 13 event. Metals were detected at low concentrations during every monitoring event at this site. The source of toxicity at this site may be constituents for which the Coalition does not analyze. PUR data include 132 applications of active ingredients pertinent to *Selenastrum* toxicity in the subwatershed between February 24 and May 13. Pesticides were applied to almonds, walnuts, grapes, cherries, tomatoes, corn, and watermelons. A soil fumigant was also applied in the subwatershed. The active ingredients applied were copper hydroxide, copper oxide, copper salts of fatty and rosin acids, s-metolachlor, oxyfluorfen, glufosinate-ammonium, paraquat dichloride, oryzalin, glyphosate, carfentrazone-ethyl, 2,4-D dimethylamine salt, pendimethalin, norflurazon, and imidacloprid. *Selenastrum* toxicity has occurred twice at this site (as well as two resample toxicities) prior to the 2008 irrigation season. These toxicity exceedances have been addressed in the Site Subwatershed Management Plan for the Unnamed Drain to Lone Tree Creek site subwatershed (priority E). Toxicity experienced during the 2008 monitoring seasons will be addressed in the SJCDWQC Management Plan update.

Sediment toxicity to *Hyalella azteca* occurred in samples collected on August 13, 2008 (87.2% survival compared to the control, Table 45). Sediment samples were not analyzed for pesticides or metals, however water samples collected the previous day resulted in an exceedance of the copper hardness-based WQTL (6.8 µg/L). Exceedances of the copper WQTL occurred consistently across the irrigation season at this site. Resampling occurred on September 18 and did not result in toxicity again at the site. Without sediment chemistry analysis, the cause(s) of *Hyalella* toxicity is (are) unknown. Water samples collected during both August and September events resulted in exceedances of copper as well as low level concentrations of most of the metals. There were also low level concentrations (below the WQTL) of chlorpyrifos (0.014 µg/L) and dimethoate (0.46 µg/L) in samples collected on August 12. The concentration of pesticides and metals in the sediment is unknown. Pesticides for which the Coalition does not analyze may also be a source of sediment toxicity in the creek. PUR data include 238 reports of pesticide use in the site subwatershed pertinent to *Hyalella* toxicity between March 10 and August 9. Pesticides were applied on alfalfa, apples, corn, walnuts, pumpkins, tomatoes, almonds, cherries, grapes, rice, and watermelons. Active ingredients applied were lambda-cyhalothrin, permethrin, esfenvalerate, bifenthrin, cyfluthrin and beta-cyfluthrin, fenpropathrin, spiromesifen, oxyfluorfen, glyphosate, cypermethrin and (s)-cypermethrin, abamectin, propargite, pyraclostrobin, chlorpyrifos, s-methoprene, methyl parathion, thiophanate-methyl, trifloxystrobin, malathion, and mancozeb. *Hyalella* toxicity has occurred during two previous sediment sampling events at this site. These exceedances have not yet been addressed in the Site Subwatershed Management Plan for Unnamed Drain to Lone Tree Creek. As a result of the 2008 exceedances, *Hyalella* toxicity will be addressed in the SJCDWQC Management Plan update.

Upstream Management Plan Monitoring occurred within the Unnamed Drain to Lone Tree Creek subwatershed for chlorpyrifos in July and September 2008. The upstream location selected was Unnamed Drain to Lone Tree Creek @ Wagner Rd to aid in identifying possible sources of past chlorpyrifos exceedances. Chlorpyrifos was detected above the WQTL in

samples collected from Unnamed Drain @ Jack Tone Rd in May, June, July and September (Table 45). The sample collected during the July event resulted in an exceedance at the normal monitoring (downstream) site but not at the upstream Management Plan Monitoring site, while September sampling resulted in exceedances at both sites (Table 45). Previous to the 2008 irrigation season, chlorpyrifos exceedances have occurred six times at Unnamed Drain to Lone Tree Creek @ Jack Tone Rd. These exceedances have occurred during both irrigation and storm monitoring events. PUR data for sections of land within the normal monitoring site subwatershed indicate 22 applications of chlorpyrifos between April 19 and July 12 on corn, walnuts, almonds, and alfalfa. Chlorpyrifos containing product was applied in granular (5168 lbs) and liquid form (259.1 gallons). There were no applications of chlorpyrifos in the one month prior to the September 16 sample; the last applications were on July 19 and July 23 on almonds and walnuts. There was no reported use of chlorpyrifos on sections of land upstream of the Management Plan monitoring site at Wagner Rd. Chlorpyrifos is a priority A constituent in the Site Subwatershed Management Plan for Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.

Carbofuran was detected at exceedance levels for the first time at the Unnamed Drain to Lone Tree Creek site in samples collected on May 13, 2008 (Table 45). Carbofuran is a prohibited discharge and restricted use pesticide. There was no *Ceriodaphnia* toxicity detected in these samples, however toxicity to *Selenastrum capricornutum* did occur. Carbofuran is not known to be toxic to *Selenastrum* and it is unlikely that the level of carbofuran in the sample water contributed to the toxicity at this site. PUR data indicate 51.8 gallons of product containing carbofuran were applied to alfalfa on March 11 and March 12. Carbofuran has not been addressed in the Management Plan for the Unnamed Drain to Lone Tree Creek. If additional exceedances occur at this site, then actions will be taken to address the exceedances in the subsequent SJCDWQC Management Plan update.

One exceedance of the thiobencarb WQTL occurred in samples collected on June 10, 2008 (Table 45). Thiobencarb is a thiocarbamate herbicide and is a prohibited discharge pesticide. Agricultural use of thiobencarb is limited to rice in California; as a result any detections of thiobencarb in the Unnamed Drain will be managed by the California Rice Commission. There have been two previous exceedances of thiobencarb in samples collected from this site. All exceedances of thiobencarb at this site have occurred during the month of June (2006, 2007 and 2008). PUR data indicate that there were two applications of thiobencarb within one month prior to the June 10 exceedance, on May 20 and 23. During this time, 1,037 lbs of product (Bolero 15G) were applied on 39 acres of rice. Previous years of PUR data have also included applications of products containing thiobencarb on rice during the months of May and June.

Copper was detected above the hardness-based WQTL in samples collected in April, May, July, August and September (Table 45). These copper exceedances were the first to occur at this site. Copper concentrations detected in the May samples co-occurred with *Selenastrum* toxicity and could account for 0.4 TUc (EC_{50} = 21 µg/L, EPA ECOTOX). No other exceedances from the 2008 irrigation season are associated with *Selenastrum* toxicity. PUR data includes 49 copper

applications in the subwatershed between January 3 and June 23. Copper containing products were applied to almonds, cherries, grapes, onions, rice, and walnuts. The copper was applied as copper hydroxide, copper oxide, copper oxychloride, copper sulfate, and copper salts of fatty and rosin acids with a majority of the copper products being applied to walnuts. All of the applications took place on or before May 16 with the exception of the single application to onions on June 23. Copper exceedances have not yet been addressed in the Site Subwatershed Management Plan for the Unnamed Drain to Lone Tree Creek. Exceedances experienced during the 2008 Irrigation season will be included in the SJCDWQC Management Plan update.

Lead was detected at concentrations above the WQTL during the April 15 and September 16, 2008 sampling events including a field duplicate sample collected in September (Table 45). These were the first exceedances of the lead WQTL to occur at the Unnamed Drain site. Lead in surface waters is not a result of current agricultural applications; however there are a number of possible sources of lead in the Coalition region. These sources are described in detail below, under *Constituent Specific Analyses/Special Studies.* As a result of the two exceedances lead will be addressed in the SJCDWQC Management Plan update.

Exceedances of the *E. coli* WQTL occurred in four of six samples analyzed for this constituent during the irrigation season (Table 45). Possible sources of *E. coli* in the Unnamed Drain to Lone Tree Creek include irrigated pasture, dairies, leaky sewer lines or septic systems, applied manure, biosolids, liquid dairy waste, and a large array of wildlife. The Unnamed Drain site is downstream to a large area of irrigated farmland, numerous dairies and pastureland. Irrigation runoff from dairies or pasture may have contributed to the *E. coli* detected in the drain. Sources of *E. coli* are described further below under *Constituent Specific Analyses/Special Studies. E. coli* has been addressed in the Site Subwatershed Management Plan for Unnamed Drain to Lone Tree Creek @ Jack Tone Rd as a priority E constituent.

Low DO was measured at the normal monitoring site during sampling on May 13 and September 16, 2008 and also at the upstream Management Plan Monitoring site during sampling in September (Table 45). Exceedances of the DO WQTL are common in the Coalition region, particularly during the warmer summer months. Two exceedance of the DO WQTL have occurred at this site previous to the 2008 irrigation season, on June 20 and July 18, 2006. There have been no exceedances during storm monitoring at this site. A discussion of parameters that may affect DO in surface waters is provided below under *Constituent Specific Analyses/Special Studies*. DO is a priority E constituent in the Site Subwatershed Management Plan for Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.

Exceedances of the lower pH WQTL occurred at both the Jack Tone Rd and the Valley Home Rd monitoring sites on May 13, 2008 (Table 45). Based on post-calibration reading, the multi-meter pH may have been reading inaccurately as described previously. After the May monitoring event, there were no pH exceedances at this site. There have been no pH exceedances previous to the 2008 Irrigation season at this site. A discussion of parameters that may affect pH in surface waters is provided below under *Constituent Specific Analyses/Special*

Studies. If additional exceedances of pH occur at this site, then pH will be addressed in the subsequent SJCDWQC Management Plan update.

Constituent Specific Evaluations/Special Studies

pH

The determinants of pH in surface waters are not well understood, and pH can vary diurnally with changes in photosynthetic rates and the resulting changes in the concentration of CO_2 and O_2 in the water. Control of pH in surface waters is a function of the balance between the buffering capacity of the water, inputs of organic acids from soil leaching, and the relative amount of photosynthesis. In an attempt to understand the underlying mechanism behind the pH in Coalition surface waters, a preliminary analysis was undertaken to determine the statistical relationship between pH and dissolved oxygen (DO), hardness, temperature, and specific conductance (SC). Multiple regression analyses were performed using pH as the response variable and DO, hardness, temperature, and SC as the predictor variables. Neither hardness nor SC were statistically significant predictors of pH. DO and temperature were significant predictors of pH. However, the adjusted coefficient of determination was only 0.23 indicating that 23% of the variation in pH was accounted for by the variation in DO or temperature. The estimated model is:

pH = 6.3395 + .0899*DO+ 2.4807E-02*Temp

The equation indicates that raising temperature or the concentration of dissolved oxygen raises pH. This result, coupled with the lack of significance of hardness, suggests that pH dynamics in surface waters in the Coalition region are controlled by photosynthetic rate and the production of dissolved oxygen. Interestingly, SC was predictable from hardness indicating that the levels of SC in the surface waters in the Coalition region are primarily a function of $CaCO_3$, which dissociates to Ca^{2+} and CO_3^{2-}. These analyses suggest that the primary cation in the surface waters is Ca^{2+} which is from natural sources.

DO

Exceedances of the dissolved oxygen (DO) water quality objective are common and have been present throughout the Coalition region since monitoring was implemented. DO and pH are expected to vary diurnally and can exceed the standards as a result of natural processes in the water column such as changing water temperature, photosynthesis and respiration. Changes in DO can be exacerbated by the addition of nutrients which stimulate production of organic material which eventually dies and is released into the water column and sediment where it is broken down by microbial activity. The respiration of the bacteria during the breakdown process is termed Biological Oxygen Demand (BOD).

The Coalition conducted a special study which attempted to determine if BOD was the cause of low DO concentrations. The results of this study were included in Appendix VIII of the December 30, 2007 Semi Annual Monitoring Report. The majority of the samples contained no

measurable BOD. The reasons for this could be the long holding time prior to initiation of the test or already depleted dissolved oxygen concentrations in the water column. BOD and Total Organic Carbon (TOC) were positively correlated and TOC was used as a surrogate for BOD in a multiple regression analysis. Water temperature, BOD, and nitrate in the water column were all significant predictors of dissolved oxygen. As water temperature and BOD increased, dissolved oxygen decreased. As nitrate increased, dissolved oxygen increased although the explanation for this latter relationship is not clear. It is clear that both water temperature and BOD are significant factors causing the decrease in DO although other, as yet unknown factors are also important.

SC/TDS

Potential sources of TDS (and by extension, the determinants of SC) are minerals leached from soils by upstream surface water and ground water, or drain water from irrigated agriculture. The two general sources of minerals/salts in agricultural landscapes are fertilizers and native soils. A commercial fertilizer can be made up of dozens of different chemicals, each of which ionize and contribute to the SC of the solution. Different brands of fertilizer can use different chemicals to make up the total formula suggesting that there will not be a universal signal for fertilizer-generated SC or TDS.

Water bodies in close proximity to the San Joaquin River have a depth to ground water that tends to be very shallow. Data developed by the Modesto and Turlock Irrigation Districts suggests that the exceedances of TDS/SC in this region are a function of ground water. Geologically, the ground water from both the east and west side of the Valley moves toward the San Joaquin River trough, the low point in the Valley that is naturally high in salts. The movement of water down gradient toward the San Joaquin River creates a shallow ground water table, as evidenced by the numerous wetlands that are in the vicinity of the river. This shallow ground water appears to be the cause of the salinity problems in many ESJWQC water bodies close to the river.

Nitrate

Potential sources of nitrate in surface waters include runoff of fertilizers, organic matter from irrigated pasture, leaking septic systems, waste-treatment facility effluent, and inputs from animal waste. These sources can move to surface waters through above ground runoff or shallow subsurface flows. Animal waste that enters surface waters can be converted to nitrate by nitrifying bacteria. Possible sources of animal waste in a water body include dairies, poultry facilities, pasture and/or wildlife. From years of movement of nitrate from dairies into ground water, there is a significant amount of nitrate in the aquifers beneath the Coalition region. Many of these aquifers are very shallow and many of the drains in the western portion of the Coalition were constructed in the 1800s to lower the water table and allow farming. More recently, tile drains have been placed in some areas of the Coalition, and these further remove shallow ground water from the subsurface and move it to surface drainages. As a result, nitrate from dairies is now intercepted by field and surface drains resulting in consistent exceedances of the nitrate WQTL. Because of its extreme solubility, it is likely that any applications of nitrate

fertilizers would result in immediate runoff to surface waters and it is unlikely that applications in the spring would result in exceedances of the WQTL throughout the irrigation season.

Ammonia
Ammonia can enter a water body through two sources, direct discharge from agricultural fertilizers or animal waste, or from discharges from waste water treatment plants. Ammonia in fertilizer is typically converted to nitrite and then nitrate in soils over a short period of time and discharge of fertilizer would have to be immediate to detect ammonia in the receiving water body. Previous exceedances of the ammonia WQTL have been attributed to discharge from dairies.

E. coli
E. coli is an indicator of fecal contamination in surface waters. Potential sources of *E. coli* include runoff from irrigated pasture, dairies, leaky sewer lines, leaky septic systems, runoff from applications of manure, biosolids and liquid dairy waste, and direct deposition of fecal material from a large array of wildlife. A study designed to identify the source of fecal contamination in Coalition water bodies was initiated in August 2006. Obligate anaerobic bacteria of the genus *Bacteroides* were extracted from water samples and their DNA analyzed to determine the source(s) of the fecal matter. Anaerobic *Bacteroides* were used because they persist in the environment for only a short period of time (days), meaning any detection of *Bacteroides* DNA in the sample is from a recent contamination event. As a facultative anaerobe, *E. coli* can reproduce and persist in an oxygenated environment for an unknown period of time, thus detecting *E. coli* in a water sample is an indicator of fecal contamination but the timing of the contamination is not possible to determine.

For the study, water sampling occurred at 27 sites (4 baseline and 23 monitoring) within the Coalition region during non-monitoring events. Results of the study indicate that the source of the fecal contamination is a combination of human, cows, and chickens depending on the location. The sampling occurred only during late summer low flow conditions and should be repeated during winter storm events. Samples can be analyzed for additional molecular markers and chemical markers that can confirm the contamination by human sewage, but those analyses will require a much larger research effort that is outside the capabilities of the Coalition.

Arsenic
The registrations on many products with this active ingredient have been cancelled. However, there are four products currently registered for use on citrus, for weed control around ditches, for use on ornamental plants, for nonagricultural weed control, and for weed control around buildings, driveways, sidewalks, rights-of-way, and fencerows. Several products are available for use by homeowners and nonagricultural users (e.g. county road maintenance) (http://www.pesticideinfo.org/List_Products.jsp?Rec_Id=PC34358&Chem_Name=Sodium%20cacodylate&PC_Code=012502) and the product may have been purchased for use by local homeowners for use on their property. Arsenic is found in sodium cacodylate which is applied by agriculture for broadleaf weed control and as a cotton defoliant. California Department of

Pesticide Regulation records indicate no agricultural use of sodium cacodylate across the Coalition region between 1998 and 2008.

Lead

Lead is a legacy of any of a number of potential sources including deposition from leaded gasoline, disposal of lead-containing products such as paints, electronic components, and batteries, and old applications of lead arsenate pesticides. Currently, there are no pesticides applied that contain lead, although lead arsenate was used in the past. Lead arsenate was used generally only until the 1960s and has been banned on all food crops since 1991. Currently, the most probable source is contaminated soils that originated from old pesticide applications, disposal of products containing lead, aerial deposition of particulate lead from industrial processes, or the deposition of automobile exhaust. Lead is predominantly particulate bound and not bioavailable in that form. Major roads and highways within subwatersheds may contribute to the leaching of lead into waterways. In addition, disposal of lead paint in the vicinity, burial of old buildings with lead paint, or leaching lead from lead arsenate deposition could all contribute to lead detections. The Coalition is currently not able to identify the specific source(s) of individual detections at sample sites, but lead in surface waters is not likely a result of agricultural management practices.

Summary of Management Practices

One of the primary goals of the Coalition is to gather information on management practices that are demonstrated to benefit water quality and to provide this information and support to growers to facilitate the implementation of these management practices. Over the last several years, the Coalition has collaborated with groups such as the Natural Resources Conservation Service (NRCS), University of California Agricultural Cooperative Extension (UC Extension), the Coalition for Urban and Rural Environmental Stewardship (CURES), pesticide registrants and pest control advisors (PCAs) to gather information on the most up-to-date management practices to reduce the potential for pesticide runoff. Information is provided to growers regularly throughout the year by means of Coalition outreach meetings, mailings, personal communication with growers, and the Coalition website. Each management practice is viewed as one tool in a collective tool box and the management practices (tools) that are most beneficial to a particular farming operation will depend on factors including (but not limited to) the size of the farm, the drainage system, soil type, crop type and the crop pests that must be controlled.

A working list of management practices is provided in Table 46 below. Management practices are described based on the goal (e.g. water conservation, waste discharge reduction) and the mechanism of the practice. The SJCDWQC Management Plan will include specific information on management practices that have been provided to the Coalition members and growers. Management practices are continually developing and changing and therefore the information will be updated in the SJCDWQC Management Plan as new data become available.

Table 46. Table of best management practices (BMPs), target constituents, mechanism and possible improvements to water quality.

BMP	BMP Endpoint	BMP Target(s)	BMP Mechanism	Effected water/sediment quality monitoring parameter(s)
Sediment basin	Reduce discharge	PI, PS, K, S, NP	Removal of sediment, pesticides bound to sediments; allow time for biodegradation of pesticides	Color, turbidity, SC, TDS, metals, short half-life pesticides, high Koc pesticides, total phosphorous
Vegetated buffers	Reduce discharge	PI, PS, K, S, NP, NN	Remove sediment, nutrients, pesticides bound to sediments, or any contaminants with low solubility	Color, turbidity, SC, TDS, metals, pesticides, nutrients
Cover crop, dormant season vegetation	Reduce discharge	K, S, NP	Removal of sediment, pesticides bound to sediments, or any contaminants with low solubility; protect soils and soil nutrients for growing season	Color, turbidity, SC, TDS, metals, pesticides, nutrients
Sprayer calibration	Reduce discharge	D	Reduce potential for spray drift	All pesticides
Polyacrylamide (PAM)	Reduce discharge	PI, K, S, NP	Removes sediment from the water column, removes pesticides and metals bound to sediments	Color, turbidity, metals, pyrethroid pesticides, total phosphorous
Dormant season field retainers	Reduce discharge	PS, S	Reduce/eliminate storm runoff	Color, turbidity, SC, TDS, copper, pyrethroid pesticides, organophosphate pesticides
Microspray irrigation	Reduce water use & discharge	D,W	Increase water use efficiency, eliminate potential for irrigation tail water return	All pesticides, sediment-bound metals
Tail water return system	Reduce water use & discharge	PI , PS, K, S, W, NP, NN	Re-use of irrigation water, eliminate discharge altogether	Color, turbidity, SC, TDS, metals, all pesticides, all nutrients

BMP Targets Code:

D: Chemical (pesticide)drift
PS: Dormant spray pesticide storm runoff
S: Sediment runoff
NP: Nutrients: phosphorous
PI: Pesticide runoff from irrigation
K: High K_{oc} pesticide runoff
W: Water use efficiency
NN: Nutrients: nitrate, nitrite or Kjeldhal nitrogen

Management Practice Implementation

When more than one exceedance(s) of water quality trigger limits (WQTLs) occurs at a sample site, the Coalition is required to develop a Management Plan to address those exceedances. In addition, if a single exceedance of either chlorpyrifos or diazinon (TMDL constituents) occurs the Coalition will address those exceedances in the SJCDWQC Management Plan. The SJCDWQC Management Plan contains goals and actions that are designed to address problems specific to a subwatershed. Performing grower outreach and encouraging the implementation of management practices are important components of the plan. The Management Plan provides a prioritization scheme and process by which management actions can be adopted. Based on this plan, growers are encouraged to adopt management practices during presentations at county and/or subwatershed meetings and in higher priority subwatersheds, and during contacts on an individual grower and/or grower group basis. In some cases, Coalition representatives visit individual farms to investigate potential sources of exceedances and to personally speak with growers or applicators about practices. All the growers with whom the Coalition has met have expressed willingness to cooperate and change practices to avoid contributing to problems in the future.

The Coalition is in the process of documenting implementation of management practices in the Coalition region. This is being done by asking growers to complete a management practices survey if they operate in watersheds under Management Plans. Conversations with growers indicate that they are changing practices but often do not report the changes to the Coalition. Changing chemicals, application methods (e.g. timing of application, calibrating nozzles), or implementing structural management practices are occurring in the Coalition region but are difficult to track. Data obtained from general surveys sent to members of the Coalition have been summarized to a parcel level and a General Survey Summary Report was submitted to the Regional Board on December 31, 2008.

As described in the June 30, 2008 SAMR, the SJCDWQC Coalition obtained Proposition 50 (Prop50) and California Department of Pesticide Regulation (CDPR) grants to aid in outreach, education, and implementation of management practices within the Coalition region. During the irrigation season the Coalition used the grant monies to conduct outreach to growers and to provide additional materials on various management practices that can be used to mitigate pesticide runoff.

Actions Taken to Address Water Quality Impacts

Monitoring of ambient surface waters is conducted by the Coalition for the purpose of characterizing discharges from agriculture. Over the long term, monitoring data provide insight on the general trends in water quality at each of the sample sites. Results from each event within a monitoring season can identify constituents, agricultural lands, crops and/or particular pesticides that need to be managed to reduce or eliminate input from agriculture. A series of actions taken to determine the potential sources of exceedances include: 1) the use of PURs to identify relevant applications that occurred upstream of the sample site and within a specified time period prior to the sampling event, 2) an analysis of monitoring data to determine the potential mechanism associated with exceedances of physical and field parameters such as DO, pH, and TDS, and 3) special studies where appropriate and cost effective to determine the sources of constituents such as *E. coli* or the potential causes of exceedances such as low DO.

Coalition members received results of the monitoring at grower outreach meetings and, in some cases, by personal communication. The Coalition also provided growers with information on management practices to reduce irrigation and storm runoff into receiving water bodies. Additional relevant management practices were presented in a handbook of management practices developed by CURES and mailed to all members in October, 2008.

As follow-up to exceedances, the Coalition notified the Regional Board of all exceedances in Exceedance and Communication Reports (Table 47, Appendix V). Any discrepancies or omissions have been described in the *Data Interpretation* section. The Coalition also provides growers with information on management practices to reduce storm water runoff and discharge of irrigation water and sediments into receiving water bodies. Additional relevant management practices are presented at meetings, such as alternative products, structural changes to manage drain water or pesticide application practices for minimizing spray drift. Appendix VII includes meeting handouts and agendas.

Outreach and Education

Based on the results of the monitoring, the Coalition held workshops, meetings, and presentations to provide useful information to all growers in the Coalition region. Outreach and education activities are an important component of the Coalition monitoring program. The Coalition continues to make a strong effort to provide information to growers at regular meetings, as well as at meetings conducted by the County Agricultural Commissioner and by personal contact. Coalition presentations over the past irrigation season provided members with general information, site subwatershed specific monitoring results, and management practices that have proven to be effective to reduce the discharge of pesticides to water bodies. All outreach and education activities are documented in Table 48.

As part of the Prop 50 project, Coalition and UC Cooperative Extension representatives conducted an East County Codling Moth Pheromone Mating Disruption Study in Contra Costa County which compared using pheromone mating disruption of codling moths to standard practice of using organophosphate and pyrethroid insecticides. Two initial meetings were held on April 9 and 25, 2008 for the six walnut growers representing 300 acres participating in the experiment. The first meeting discussed management practices required to successfully use pheromone mating disruption; the second was a field meeting to discuss monitoring codling moths and the steps to use to decide if supplemental insecticides sprays are necessary and which sprays are most appropriate. The results of the management practice evaluation were presented by Terry Prichard and Mike Devenchenzi, PCA, to participating growers at a follow-up meeting held December 11, 2008.

Grower outreach meetings to address Coalition-wide exceedances of WQTLs were held on May 1 and 2, 2008 in Stockton and Tracy. The meetings included presentations on water quality data from the 2007 irrigation season, management practices to address common water quality exceedances in reference to the upcoming irrigation season, and reminders of grower responsibility and expectations.

Crop specific grower outreach meetings were held on July 15 and 16, 2008 in the Lone Tree Creek site subwatershed area. These meetings addressed recent water quality exceedances and reviewed best management practices specific to Lorsban (chlorpyrifos) and copper applications. Coalition representatives Mike Wackman and Terry Prichard presented information to 18 alfalfa, corn and tomato growers on July 15, followed by 27 walnut and grape growers attending on July 16.

A grower outreach meeting for growers within the Duck Creek subwatershed was held on November 19, 2008 to discuss agronomic practices and product options as well as irrigation practices and strategies specific to pressurized or surface irrigation. Coalition representatives also participated in a second Duck Creek subwatershed grower outreach meeting held on November 24, 2008 to discuss best management practices and collect management practice survey information. Forty-four percent of coalition members that were invited attended the meeting, 39% of growers representing an entity invited attended, and 23% of non-coalition members invited attended; 19 surveys were completed.

On November 21, individual grower outreach meetings were held to discuss chlorpyrifos exceedances linked with individual grower use in the Lone Tree Creek area. Rachelle Antinetti, Terry Prichard, and Joe Gasper (PCA) met with various large growers on their respective properties to assess runoff conditions and discuss potential management practices. During the fall of 2008, additional individual grower meetings were conducted. A team consisting of Mike Wackman, Terry Prichard, Rachelle Antinetti, Parry Klassen, and a UC Farm Advisor discussed the importance of understanding current irrigation and pesticide application practices and implementing management practices to achieve water quality objectives specific to the individual grower. Five growers, representing 28,000 acres in the Central Delta, were initially contacted with the focus to work with growers farming larger acreage. A steering committee

comprising these five growers and their PCAs was then formed to coordinate further outreach in the Central Delta area.

A total of eleven Agricultural Commissioner's Meetings were held to update and review pesticide laws and regulations from November 18 to December 18, 2008 in the Lodi, Ripon, Manteca, Escalon, Linden, Stockton, and Tracy areas. Meeting attendance included 1,258 growers and 87 licensees.

Grower meetings are often followed by individual discussions of monitoring results and management practices that may help prevent future problems. Follow-up discussions have led to implementation of management practices by growers, especially in site subwatersheds where exceedances have occurred more than once for a particular pesticide. The Coalition is developing ways to track implementation of new management practices and will focus on priority subwatersheds (Lone Tree Creek, Duck Slough, and Unnamed Drain to Lone Tree Creek) during 2008 and 2009. This information will be included in the update to the SJCDWQC Management Plan which will be submitted in April, 2009.

The Coalition also hosts a Coalition website: http://www.sjdeltawatershed.org/. This website serves as a clearing house for Coalition activities and outreach on management practices. Information provided on the website is a useful supplement to regular grower contacts and meetings. Interested parties can find information on site subwatershed land uses, past exceedances, management plans (in development), links to BMP websites, and grower meeting dates.

Pest Control Advisors, Agricultural Commissioners and Registrants

In order for the Coalition to be most effective in providing recommendations on management practices that reduce or eliminate discharge, collaboration with County Agricultural Commissioners, Pest Control Advisors (PCA), and pesticide registrants is important. During the 2008 irrigation season, the Coalition worked with each of these entities on a number of occasions. County Agricultural Commissioners have been active participants in the SJCDWQC Steering Committee meetings and both Ag Commissioners and PCAs attended workshops and outreach meetings.

Activities, Events and Deliverables

Table 47 and 48 provide Coalition activities, events and deliverables that have occurred during the 2008 irrigation monitoring season. Table 47 includes the Exceedance and Communication report date (by constituent group) in association with the sample date for which the exceedance occurred (see also Appendix V). Table 48 lists Coalition activities chronologically including the activity category (Grower Notification, BMP Outreach and Education, or General Surveys), description, constituents addressed, and the individual(s) responsible for conducting the activity (see also Appendix VII).

Table 47. Calendar of events and deliverables for the SJCDWQC relevant to the 2008 irrigation season.

Sample Event	Sample Date	Monitoring Type	Field		Toxicity		Pesticides		Metals	
			Exceedance Report	Communication Report	Exceedance Report	Communication Report	Exceedance Report	Communication Report	Exceedance Report	Communication Report
Irrigation1	4/15/2008	NM	4/16/2008	-	4/22/2008	6/25/08	5/19/2008	-	5/22/2008	7/25/08
Irrigation1	4/23/2008	NM-RS	4/24/2008	-	4/29/2008	6/25/08	-	-	-	-
Irrigation1	4/30/2008	MPM	-	-	-	-	-	-	-	-
Irrigation2	5/7/2008	MPM	5/8/2008	-	5/16/2008	-	6/6/2008	-	-	-
Irrigation2	5/13/2008	NM (+MPM-RS)	5/14/2008	-	5/20/2008	-	7/2/2008	9/5/08	6/23/2008	8/26/08
Irrigation2	5/21/2008	NM-RS	5/21/2008	-	6/2/2008	-	-	-	-	-
Irrigation3	6/3/2008	MPM	6/4/2008	-	-	-	-	-	-	-
Irrigation3	6/10/2008	NM	6/12/2008	-	-	-	7/28/2008	9/30/08	7/18/2008	9/19/08
Irrigation4	7/8/2008	MPM	7/9/2008	-	7/14/2008	-	-	-	7/30/2008	-
Irrigation4	7/15/2008	NM	7/16/2008	9/18/08	7/21/2008	-	9/4/2008	11/7/08	8/18/2008	-
Irrigation4	7/15/2008	MPM-RS	7/16/2008	-	-	-	-	-	-	-
Irrigation4	7/15/2008	MPM	7/16/2008	-	-	-	-	-	8/18/2008	-
Irrigation4	7/22/2008	NM-RS	7/23/2008	-	7/28/2008	-	-	-	-	-
Irrigation5	8/5/2008	MPM	-	-	-	-	-	-	-	-
Irrigation5	8/12/2008	NM	8/13/2008	-	8/18/2008	-	10/2/2008	12/10/08	9/17/2008	-
Irrigation5	8/12/2008	MPM	8/13/2008	-	8/18/2008	-	10/2/2008	-	9/17/2008	-
Irrigation5	8/19/2008	NM-RS	8/20/2008	-	-	-	-	-	-	-
Irrigation5	8/13/2008	SED	8/14/2008	-	9/18/2008	-	-	-	-	-
Irrigation5	9/18/2008	SED-RS	9/19/2008	-	10/28/2008	-	-	-	-	-
Irrigation6	9/9/2008	MPM	9/10/2008	-	-	-	10/8/2008	-	-	-
Irrigation6	9/16/2008	NM	9/17/2008	11/21/08	9/22/2008	-	10/29/2008	-	10/31/08	1/8/09
Irrigation6	9/16/2008	MPM	9/17/2008	-	-	-	10/29/2008	-	-	-
Irrigation6	9/23/2008	NM-RS	9/24/2008	-	10/1/2008	-	-	-	-	-

MPM = Management Plan Monitoring; NM = Normal Monitoring (water column); SED = Sediment sampling including resampling due to toxicity; RS = Resampling due to toxicity

Table 48. Table of SJCDWQC actions and deliverables dealing with exceedances and management practices relevant to the 2008 irrigation monitoring season.

County/Locations	Date	Category	Description	Constituents Addressed	Who
San Joaquin County Tailwater Pond	Spring 2008	Collaborations and Special Studies	Prop50 study to assess tailwater ponds as an alternative to surface water discharge and evaluate pond management in relation to surface water discharge.	Chlorpyrifos	Terry Pritchard (Prop50)
San Joaquin County walnut orchards	Spring 2008	Collaborations and Special Studies	Prop50 study to reduce frequency and volume of spraying needed to combat walnut blight disease by using a combination of disease model prediction and spraying.	Copper Hydroxide	Terry Pritchard (Prop50)
San Joaquin County	April 2008	Collaborations and Special Studies	Prop50 study investigating the effect of using weed seeker booms attached to application sprayers to reduce the volume and use of soil active herbicides, such as simazine and diuron.	Simazine and diuron	Terry Pritchard (Prop50)
All	April 1, 2008	Grower Notification	Mailing to all members of Coalition newsletter.	All Constituents	Mike Wackman
San Joaquin County	April 9, 2008	Collaborations and Special Studies	Meeting for walnut growers participating in experiment (East County Codling Moth Pheromone Mating Disruption) to discuss management practices required to successfully use pheromone mating disruption.	Organophosphates, pyrethroid insecticides	Terry Pritchard (Prop50)
Duck Creek Subwatershed	April 23 and June 1, 2008	Collaborations and Special Studies	Prop50 study evaluating a common practice of applying chlorpyrifos with the seed in a bed to determine the risk of significant concentrations in furrow irrigation runoff waters from a corn field.	Chlorpyrifos	Terry Pritchard (Prop50)
San Joaquin County	April 25, 2008	Collaborations and Special Studies	Field meeting to discuss monitoring codling moths and the steps to decide if supplemental insecticides sprays are necessary and which are most appropriate.	Organophosphates, pyrethroid insecticides	Terry Pritchard (Prop50)
All subwatershed sites in Stockton area	May 1, 2008	BMP Outreach and Education	Grower outreach meeting discussing exceedances from the previous irrigation season and BMPs for the upcoming irrigation season.	All Constituents	MLJ-LLC, Mike Wackman, Terry Prichard

County/Locations	Date	Category	Description	Constituents Addressed	Who
All subwatershed sites in Tracy area	May 2, 2008	BMP Outreach and Education	Grower outreach meeting discussing exceedances from the previous irrigation season and BMPs for the upcoming irrigation season.	All Constituents	MLJ-LLC, Mike Wackman, Terry Prichard
Lockeford	May 15, 2008	BMP Outreach and Education	Air Quality and Water Quality Workshop	All Constituents	San Joaquin County Resource Conservation Service
San Joaquin County Tomato Field	June 28, 2008	Collaborations and Special Studies	Prop50 study to determine most efficient method to protect tomato plants by comparing two spraying methods as well as an alternative non-copper material, Actigard.	Copper Hydroxide	Terry Pritchard (Prop50)
Lone Tree Creek Subwatershed	July 2008	Grower Notification	Announcement in San Joaquin Farm Bureau News of Lone Tree Creek Grower Meeting July 15 and 16, 2008 to discuss Lorsban and copper exceedances and respective BMPs.	Chlorpyrifos, Copper	Mike Wackman
Lone Tree Creek Subwatershed	July 2008	Grower Notification	Mailing announcing grower meeting July 15 and 16, 2008 to discuss Lorsban and copper exceedances and respective BMPs.	Chlorpyrifos, Copper	Mike Wackman
Lone Tree Creek Subwatershed	July 15, 2008	BMP Outreach and Education	Alfalfa, corn, and tomato grower meeting to address recent exceedances in area and review BMPs.	Chlorpyrifos (Lorbsan), Copper	Mike Wackman, Terry Prichard
Lone Tree Creek Subwatershed	July 16, 2008	BMP Outreach and Education	Walnut and grape growers meeting to address recent exceedances in area and review BMPs.	Chlorpyrifos (Lorbsan), Copper	Mike Wackman, Terry Prichard
Central Delta Region	Fall 2008	BMP Outreach and Education	Individual grower meeting to tour grower's farm then discuss the importance of understanding current irrigation and pesticide application practices and implementing management practices in achieving water quality objectives specific to individual grower.	All Constituents	Mike Wackman, Terry Prichard, Rachelle Antinetti, Parry Klassen, UC Farm Advisor specific to crop(s) grown
All	October 2008	BMP Outreach and Education	Handbook containing information on BMP sent out to all Coalition members. Developed by CURES.	All Constituents	CURES
All	October 24, 2008	Grower Notification	Mailing announcing Agricultural Commissioner Office's annual grower meeting.	All Constituents	Mike Wackman

County/Locations	Date	Category	Description	Constituents Addressed	Who
Lodi Area	November 18, 2008; December 9, 2008 (2 meetings)	BMP Outreach and Education	Agricultural Commissioner's meetings to update and review pesticide laws and regulations.	All Constituents	MLJ-LLC, Mike Wackman
Duck Creek (above Jack Tone Rd)	November 19, 2008	BMP Outreach and Education	Grower meeting to address measured water quality standard exceedances and discuss BMPs and pesticide product options.	All Constituents	Mike Wackman, Terry Prichard
Ripon/Manteca/Escalon Areas	November 20, 2008 (2 meetings)	BMP Outreach and Education	Agricultural Commissioner's meetings to update and review pesticide laws and regulations.	All Constituents	MLJ-LLC, Mike Wackman
Lone Tree Creek Subwatershed	November 21, 2008	BMP Outreach and Education	Individual grower meeting to discuss chlorpyrifos exceedances linked with individual grower use; visited grower fields to view runoff conditions and discuss potential management practices.	All Constituents	Rachelle Antinetti, Terry Prichard, and Joe Gasper (PCA)
Duck Creek Subwatershed	November 24, 2008	BMP Outreach and Education	Grower meeting to give presentation on better management practices and collect management practice surveys.	All Constituents	Mike Wackman, Terry Prichard
Linden Area	November 24, 2008	BMP Outreach and Education	Agricultural Commissioner's meetings to update and review pesticide laws and regulations.	All Constituents	MLJ-LLC, Mike Wackman
Escalon Area	November 25, 2008	BMP Outreach and Education	Agricultural Commissioner's meetings to update and review pesticide laws and regulations.	All Constituents	MLJ-LLC, Mike Wackman
Stockton Area	December 2 and 18, 2008 (2 meetings)	BMP Outreach and Education	Agricultural Commissioner's meetings to update and review pesticide laws and regulations.	All Constituents	MLJ-LLC, Mike Wackman
Tracy Area	December 4, 2008	BMP Outreach and Education	Agricultural Commissioner's meetings to update and review pesticide laws and regulations.	All Constituents	MLJ-LLC, Mike Wackman
East San Joaquin County	December 11, 2008	Collaborations and Special Studies	Meeting for walnut growers (6 growers representing 300 acres) participating in experiment to discuss results of the management practice evaluation which compared the used of pheromone mating disruption of codling moth in contrast to standard practice of using OP and pyrethroid insecticides.	Organophosphates, pyrethroid insecticides	Terry Pritchard (Prop50)

Exceedance, Communication, and Evaluation Reports

Exceedance and Communication Reports

Exceedance reports were submitted for exceedances experienced during the 2008 irrigation season monitoring events. Any discrepancies or omissions are described in the section *Data Interpretation* and summarized in Table 25. Communication Reports have been submitted for all exceedances that occurred for the first time at a site. A copy of both Exceedance and Communication Reports is provided in Appendix V.

Evaluation Reports

Evaluation Reports were not required for exceedances experienced during the 2008 irrigation season events. Management Plans have superseded Evaluation Reports and were submitted for each site subwatershed where two or more exceedances of a specific constituent were experienced. The SJCDWQC Management Plan (submitted September 30, 2008) will be reviewed and edited on a yearly basis to incorporate results from the previous years sampling and special studies. An updated Management Plan that will update sourcing, outreach, and evaluation of water quality for each site subwatershed will be submitted on April 1, 2009.

Conclusions and Recommendations

Over the 2008 irrigation season, the Coalition was able to meet its monitoring program objectives:

- Determine the concentration and load of waste in discharges to surface waters.
  - The completeness of the analytical data was sufficient to determine concentration and load for all samples collected.
  - Quality control issues were present for a small number of samples, but the batches were evaluated using all LABQA results and were determined to be acceptable.
- Evaluate compliance with existing narrative and numeric water quality triggers to determine if implementation of additional management practices is necessary to improve and/or protect water quality.
  - The data for all constituents for which criteria exist were compared to the appropriate water quality trigger.
  - Exceedances resulted in notification of the CVRWQCB within the time period specified in the MRP.
  - If samples existed in which the constituent exceeded the objective, it was determined that outreach would be performed and growers were encouraged to implement additional management practices as described in the SJCDWQC Management Plan.
  - A series of meetings with growers was held in which additional management practices were presented and growers were encouraged to implement the practices to protect water quality.
- Assess the impact of water discharges from irrigated agriculture to surface water.
  - Comparisons of monitoring data with water quality trigger limits allowed a determination that several water bodies in the Coalition region were impacted by irrigated agriculture.
  - The data collected are insufficient to determine the relationship between toxicity, the presence of chemicals, and the level of biological impairment.
- Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality in receiving waters of the Coalition region.
  - The Coalition compiled responses from its general surveys in a General Survey Summary Report (submitted December 31, 2008).
  - The SJCDWQC Management Plan describes the process by which the Coalition will track management practices.
- Determine the effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality.
  - While the Coalition still does not have adequate data to evaluate the effectiveness of management practices implemented in the Coalition region, positive steps are being taken to obtain the necessary data. These steps include:

        - Obtain Coalition region-specific information on management practice effectiveness.
        - Create Coalition region-specific management practice handbooks for Coalition members.
        - Obtain information from growers in regards to implemented management practices and when they were implemented in high priority subwatersheds.
        - Create a database to track implemented management practices.
        - Link implemented management practices to changes in water quality as outlined in the Management Plan.
    - The Coalition initiated development of a member/parcel/crop relational database whose goal is to enable tracking of members by parcel, TRS, and crop on a real-time basis.
        - Classifying growers by location or crop will facilitate more immediate notification of exceedances and tracking of potential sources.
        - Knowledge of current crops grown by members allows the Coalition to provide growers with crop specific management practices.

To meet the Coalition's monitoring and reporting objectives, it is necessary for the monitoring data collected during the irrigation 2008 season to meet completeness objectives as outlined in the MRP.

- Six months of irrigation season monitoring were conducted.
- Chemical testing met the Regional Board's Reporting Limit requirements.
- Discharge measurements were collected from all sites at which it was possible to collect measurements.

The monitoring program provided the following technical conclusions:

- The most common exceedances were dissolved oxygen, *E. coli*, TDS/SC, chlorpyrifos, and *Selenastrum* toxicity. Exceedances of the copper WQTL were relatively common as well.
    - Exceedances of the DO WQTL and *Selenastrum* toxicity occurred uniformly across all sites in the Coalition region.
    - Exceedances of the chlorpyrifos, *E. coli*, SC/TDS, and copper WQTLs were distributed across fewer watersheds such that large numbers of exceedances were experienced at fewer locations.
    - Exceedances of chlorpyrifos will trigger management plans for the Robert's Island @ Holt Rd, Robert's Island along House Rd, and the Terminous Tract @ Highway 12 watersheds.
    - *Selenastrum* toxicity will trigger management plans for Duck Creek @ Highway 4, French Camp Slough @ Airport Way, Grant Line Canal @ Clifton Court Rd, Kellogg Creek along Hoffman Lane, Mormon Slough @ Jack Tone Rd, Robert's Island @ Holt

Rd, Robert's Island along House Rd, Sand Creek @ Highway 4 Bypass, and Terminous Tract @ Highway 12.
    - *Ceriodaphnia* toxicity will trigger management plans for Duck Creek @ Highway 4, Mormon Slough @ Jack Tone Rd, Robert's Island along House Rd, and Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.
    - *Hyalella* toxicity will trigger a management plan at Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.
    - Exceedances of the copper WQTL will trigger management plans for Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.
    - Other exceedances triggering management plans are DDT/DDD/DDE at Roberts Island Drain along House Road, dieldrin at French Camp Slough @ Airport Way, disulfoton at Sand Creek @ Highway 4 Bypass, pH at Littlejohns Creek @ Jack Tone Rd and Mormon Slough @ Jack Tone Rd, *E. coli* at Robert's Island Drain @ Holt Rd, and lead at Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.
- Additional exceedances of management plan constituents include:
    - Chlorpyrifos at Duck Creek @ Highway 4, French Camp Slough @ Airport Way, Littlejohns Creek @ Jack Tone Road, Mormon Slough @ Jack Tone Rd, and Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.
    - *Hyalella* toxicity at Robert's Island Drain along House Rd and Sand Creek @ Highway 4 Bypass.
    - *Selenastrum* toxicity at Grant Line Canal @ Calpak Rd, Littlejohns Creek @ Jack Tone Road, Lone Tree Creek @ Jack Tone Rd, Mokelumne River @ Bruella Rd, and Unnamed Drain to Lone Tree Creek @ Jack Tone Road.
    - Copper at Kellogg Creek @ Highway 4, Littlejohns Creek @ Jack Tone Road, and Lone Tree Creek @ Jack Tone Rd.
    - Arsenic at Grant Line Canal @ Clifton Court Rd, Grant Line Canal near Calpak Rd, and Terminous Tract @ Highway 12.
    - Dieldrin at Sand Creek @ Highway 4 Bypass.
    - DDT/DDD/DDE at Sand Creek @ Highway 4 Bypass.
    - *E. coli* at French Camp Slough @ Airport Way, Grant Line Canal @ Clifton Court Rd, Grant Line Canal near Calpak Rd, Lone Tree Creek @ Jack Tone Rd, Robert's Island Drain along House Rd, Sand Creek @ Highway 4 Bypass, and Unnamed Drain to Lone Tree Creek @ Jack Tone Rd.
    - pH at Duck Creek @ Highway 4, French Camp Slough @ Airport Way, Grant Line Canal along Clifton Court Rd, and Lone Tree Creek @ Jack Tone Rd.
    - DO at every site except Mokelumne River @ Bruella Road.
    - TDS/SC at Grant Line Canal @ Clifton Court Rd, Grant Line Canal near Calpak Rd, Roberts Island Drain @ Holt Rd, Roberts Island Drain along House Rd, Sand Creek @ Highway 4 Bypass, and Terminous Tract @ Highway 12.
- Dieldrin, a nonregistered product was detected at French Camp Slough @ Airport Way and Sand Creek @ Highway 4 Bypass.
- Methyl parathion, a nonregistered product, as detected at Mormon Slough @ Jack Tone Rd.

- The large numbers of additional exceedances at management plan sites suggest that the Coalition has characterized the discharge at these sites adequately.
- Of the 39 pesticides for which the Coalition analyzes, only nine were detected at concentrations that exceeded WQTLs. Three of these exceedances (dimethoate, methyl parathion, thiobencarb) occurred only once during the irrigation season. Exceedances of the chlorpyrifos (29), malathion (2), dieldrin (3), carbofuran (3), disulfoton (3) and DDT/DDD/DDE (5) WQTLs were observed more than once.
- Exceedances of the chlorpyrifos WQTL accounted for just over 60% of the exceedances of pesticide WQTL during the irrigation season.

Outreach during the irrigation season is necessarily reduced because growers are busy with their farming operations and do not have time to attend meetings. However, the Coalition conducted a series of meetings with small groups of growers throughout the summer. Outreach during the 2008 irrigation season included six grower meetings and three member contacts (Table 48). After the large group meetings during the previous years, the Coalition determined that individual grower contacts or small group meetings should be investigated as a more efficient way to discuss implementation of management practices that could affect change in water quality. The grower notifications targeted the entire Coalition and specific commodities (walnuts, alfalfa, corn, and tomatoes) in an attempt to maximize the efficiency of the outreach. Despite the notifications, additional exceedances occurred in these regions and most probably from applications to these commodities. These results suggest that changing practices could be a long process. If each grower must be contacted individually and provided with information implicating them as contributors to exceedances, the process of individual contacts could be slow.

Conclusions from these results are:

- The outreach strategy used to date (large group meetings) has not been as effective as necessary to reduce exceedances of WQTLs. Exceedances from many of the manageable pesticide applications such as chlorpyrifos have not been eliminated, and toxicity to *Selenastrum, Ceriodaphnia,* and *Hyalella* remain common.
- The problematic constituents from past year's monitoring remain the primary exceedances experienced in the Coalition region.
- Dairies may play a larger role in causing exceedances of numerous constituents than previously thought.

The Coalition performed several analyses during the preparation of the Management Plan submitted during the fall of 2008. These analyses were designed to determine the potential sources (parcels) and potential methods of application that resulted in exceedances of WQTLs. These analyses will not be reviewed here but generally:

- Greatly elevated concentrations of soluble chemicals such as chlorpyrifos and malathion are most likely the result of irrigation return flows, concentrations slightly over the WQTL most likely are the result of spray drift.

- Increased concentrations of soluble chemicals such as chlorpyrifos generally are associated with increased applications in watersheds indicating that elevated concentrations are the result of numerous growers and/or large acreages contributing to the exceedance.
- Using these results, individual growers can be contacted and the appropriate management practices discussed to more effectively target outreach.
- Sufficient data now exist to target specific crops and specific times of the year to focus outreach.
- It is unlikely that additional Management Plan monitoring will be helpful in providing the Coalition with information critical to discussions with growers. Discharges in priority watersheds have been characterized sufficiently and growers identified for outreach such that additional monitoring will not be cost effective.

During the 2008 irrigation season the Coalition finished the development of the baseline survey of management practices currently used in the Coalition region. The results were summarized and provided to the CVRWQCB on January 31, 2009. These results will allow the Coalition to track new practices implemented over the next several years.

Recommendations

Based on the results of the monitoring and outreach efforts during the 2008 irrigation season, the Coalition makes the following recommendations:

- ❖ Although large group notifications and meetings are the only way to fulfill MRP requirements that growers must be notified of exceedances, they do not serve as a process by which the Coalition can track the adoption of new management practices. Large group notifications and meetings should continue as a means of educating growers about Coalition monitoring results.
- ❖ Growers in all high priority watersheds should be identified for individual or small group contacts.
- ❖ Although continued monitoring will be conducted, intensive monitoring in all watersheds will not provide sufficient information to justify the expense. New monitoring results have not revealed any additional problems and have not always provided sufficient information to identify the sources of the exceedances. Additional management plan monitoring should be evaluated on a case by case basis to determine if the monitoring effort should be reduced.
- ❖ It is important for the Coalition to focus on tracking implementation of new management practices and identifying locations where adoption of additional practices are lagging. These high risk areas should be targeted for additional outreach efforts.