December 31, 2007

# *San Joaquin County and Delta Water Quality Coalition*

# Semi-Annual Monitoring Report
# December 31, 2007



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## List of Acronyms

| | |
|---|---|
| AI | Active Ingredient |
| 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 |
| COD | Chemical Oxygen Demand |
| CVRWQCB | Central Valley Regional Water Quality Control Board |
| DDD | Dichlorodiphenyldichloroethane |
| DDE | Dichlorodiphenyldichloroethylene |
| DDT | Dichlorodiphenyltrichloroethane |
| DF | Dilution factor |
| DHS | (California) Department of Health Services |
| DNA | Deoxyribonucleic Acid |
| DQO | Data Quality Objective |
| DO | Dissolved Oxygen |
| DWR | (California) Department of Water Resources |
| E | Environmental sample |
| EC | Electrical Conductivity |
| $EC_{25}$ | Effect Concentration of 25% mortality |
| EPA | Environmental Protection Agency |
| FB | Field Blank |
| FD | Field Duplicate |
| FD RPD | Relative percent difference between the environmental sample and the associated field duplicate sample |
| IRIS | Integrated Risk Information System |
| $K_{oc}$ | Organic Carbon Partitioning Coefficient |
| L | Liter |
| $LC_{50}$ | Lethal Concentration at 50% mortality |
| LCS | Laboratory Control Spike |
| LCSD | Laboratory Control Spike Duplicate |
| MCL | Maximum Contaminant Level |
| MDL | Method Detection Limit |
| mg | Milligram |
| MLJ-LLC | Mighael L. Johnson, LLC |

| | |
|---|---|
| MPM | Management Plan Monitoring |
| MPN | Most Probable Number |
| MRP | Monitoring and Reporting Program Order No. R5-2005-00833 |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| MUN | Municipal and Domestic Supply (beneficial use) |
| NA | Not Applicable |
| ND | Not Detected |
| 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. |
| NSG | Not significantly different than control; greater than 80% threshold |
| NSL | Not significantly different than control; less than 80% threshold |
| NTU | Nephelometric Turbidity Units |
| OP | Organophosphate |
| PCA | Pesticide Control Advisor |
| PBO | Piperonyl Butoxide |
| pH | Power of Hydrogen |
| POTW | Publicly Owned Treatment Works |
| PQL | Practical Quantification Limit |
| PR | Percent Recovery |
| PTFE | Polytetraflouroethylene (Teflon™) |
| PUR | Pesticide Use Report |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RCD | Resource Conservation District |
| RfD | Reference Dose |
| RL | Reporting Limit |
| RPD | Relative Percent Difference |
| RS | Resample |
| SAMR | Semi-Annual Monitoring Report |
| 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 |
| SOD | Sediment Oxygen Demand |
| SOP | Standard operating procedure |
| SS | Special Study Monitoring |

| | |
|---|---|
| TDS | Total Dissolved Solids |
| TIE | Toxicity Identification Evaluation |
| TKN | Total Kjeldahl Nitrogen |
| TOC | Total Organic Carbon |
| TRS | Township, Range, Section |
| $TU_a$ | Toxic Unit (acute) |
| UC | University of California |
| UCD | University of California, Davis |
| µg | Microgram |
| USEPA | United States Environmental Protection Agency |
| VOA | Volatile Organic Analyte |
| WCT | Water Column Toxicity |
| WQT | Water Quality Trigger |

## 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

**land owners** – 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

The San Joaquin County and Delta Water Quality Coalition (SJCDWQC or 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. There are three major San Joaquin River tributaries in the Coalition area; the Stanislaus River, Calaveras River, and Mokelumne River. Intermediate sized water bodies in the Coalition area are tributaries to the San Joaquin River, the Sacramento River, or the Sacramento-San Joaquin Delta. These water bodies are characterized as intermediate based on their drainage area and flow, and include Littlejohns Creek, Duck Creek, Lone Tree Creek, Bear Creek, French Camp Slough, Dry Creek, Marsh Creek, Middle River, Mormon Slough, Mosher Creek, Old River and Pixley Slough. 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. Irrigated agriculture is the predominant land use in the Coalition area, although urban areas in the region are continually growing. Other significant non-irrigated land uses include some acreage in feedlots and impoundments.

Water quality monitoring was conducted by the SJCDWQC during the 2007 irrigation season between the months of April and September. Ambient water was sampled once per month (at a minimum) at 15 monitoring sites and sediment was collected for analysis from all sites during the month of August except for Marsh Creek @ Concord Ave which was dry. Three additional sites were monitored as part of special studies conducted by the Coalition. Only one site (Marsh Creek @ Concord Ave) was dry during the six regular irrigation monitoring events and therefore did not undergo sample collection and analysis in May, June, July and August. The primary objective of the irrigation season monitoring program was to characterize discharge from agriculture during the months when irrigation was taking place. Field data were recorded during each sampling event, and ambient water samples were analyzed for pesticides, 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.

In addition to the regular monitoring, supplemental monitoring was implemented for the purpose of management plans and special studies. Management plan monitoring occurred to better understand the source(s) of exceedances at a sample site and to determine if outreach efforts had been effective in eliminating exceedances. These additional monitoring events were conducted during months in which exceedances were experienced in the past. Monitoring associated with special studies occurred when exceedances could not be directly attributed to agricultural practices, but were occurring frequently at a site. These studies helped to narrow the sources of exceedances to determine if and where agricultural management practices could be beneficial. For example, during irrigation 2007, samples collected in April, June, and August were analyzed for Biological Oxygen Demand (BOD) to help identify the causes of low dissolved oxygen (DO) in Coalition water bodies.

During the 2007 irrigation season, 19 pesticide exceedances of water quality triggers occurred, six of which involved chlorpyrifos. Other pesticides that exceeded water quality triggers in water samples included DDE, DDT, carbofuran, disulfoton, dieldrin, bifenthrin and cypermethrin. Water column toxicity was experienced in samples ten times, of which none of the samples showed persistent toxicity in the resample. Six of the samples were toxic to *Selenastrum capricornutum*, and four to *Ceriodaphnia dubia*. Four sediment samples were toxic to *Hyalella azteca* (two samples experienced persistent toxicity in the resample). There were 37 exceedances of the DO water quality trigger (7.0 mg/L) spread across eight of the 15 sites. There were two exceedances of pH (showing high/basic pH levels). There were 29 exceedances of the specific conductance (EC) water quality trigger experienced at more than half of the sites monitored. The TDS water quality trigger was exceeded in 25 samples and was associated with EC exceedances in all but one sample. Exceedances of the color water quality trigger were experienced at almost every single site at every monitoring event through the 2007 irrigation season. There were 26 exceedances of the *E. coli* water quality trigger and 17 exceedances of metals involving copper, arsenic and boron.

The Coalition has conducted irrigation season monitoring for four consecutive years however, monitoring requirements have changed over successive irrigation seasons and not all constituents have been monitored all 4 years. Ambient water monitoring for metals and most pesticides did not take place until 2006, and trends in the results for these constituents are not apparent at this time. Furthermore, while Coalition monitoring data is relatively extensive, variables such as soil moisture and the frequency of agricultural pest outbreaks are not known. These variables can have an effect on the

risk of agricultural discharge. As a result, and trend analysis must be considered preliminary at this time.

Outreach and education activities are a central component of the Coalition monitoring program. As results from the monitoring program and special studies became available, these results were presented to growers to inform them of site subwatershed trends and water quality problems, as well as management practices (BMPs) that could help to amend these problems. The Coalition has made a strong effort to provide information to growers at regular Coalition meetings, Agricultural Commissioner meetings, commodity-specific meetings, as well as by personal contact. Prior to the onset of irrigation monitoring, the Coalition participated in UC Davis Extension meetings for wine grape, asparagus, and alfalfa growers. In addition, monitoring results, Coalition information, and BMPs were presented at an annual bean grower meeting in Tracy on March 8, a walnut grower meeting in the Lone Tree Creek site subwatershed on May 17 and in the Littlejohns Creek site subwatershed on May 18, a Lodi Chamber of Commerce Leadership class on June 12, and a meeting with growers in the Terminous Tract Drain site subwatershed to address a malathion detection from February sampling in the site subwatershed. Outreach was also conducted after the completion of the 2007 irrigation season throughout the Contra Costa and San Joaquin Counties every Tuesday during the month of October. In total, five meetings occurred in Knightsen, Tracy, east Stockton, central Stockton and Lodi. Individual growers have also been contacted by mail (last mailing occurred on May 17, 2007). Management Practice Surveys were included in mailings and are handed out at all Coalition meetings. Results from these surveys have been compiled by site subwatersheds and for the entire Coalition region. A Coalition website contains information for Coalition members or 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/).

The Coalition has worked with local County Agricultural Commissioners, Pesticide Control Advisors (PCA) and pesticide registrants over the irrigation season to determine where and how exceedances could be addressed. A collaborative effort has been helpful in determining where BMPs are most appropriate and in the dissemination of information to growers. It is the goal of the Coalition that monitoring, outreach and support will lead to the implementation of BMPs by individual growers, and that over time monitoring results will demonstrate improvements in water quality.

Discrepancies exist between exceedances reported in this document and those submitted as exceedance reports to the CVRWQCB during the 2007 irrigation

monitoring season. The discrepancies are a result of either data entry errors or a change of water quality triggers, and include detections that were either not reported in official exceedance reports or that were reported incorrectly. Discrepencies have occurred for dissolved oxygen (1), specific conductance (1), pH (1), lead (1), arsenic (2), color (1), total dissolved solids (2), DDT (1), diuron (2), and *Selenastrum* (1).

# 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 Conditional Waiver). The document herein reports on the Coalition monitoring program for the period of March 1, 2007 through October 30, 2007, and covers activities associated with the 2007 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 acreage is from the 2002 Agricultural Report). Contra Costa, Alameda and Calaveras County acreages are estimates because not all of the county area is within the Coalition area.

The northern border of the Coalition area corresponds to the county line between San Joaquin and Sacramento Counties. The eastern portion of the Coalition area was expanded in April of 2004 and now includes portions of Calaveras County that are the upper Calaveras River, Bear Creek, and Mokelumne River subwatersheds. These subwatersheds extend from San Joaquin County into Calaveras County. Agricultural land use in this part of the Coalition area is primarily orchards and vineyards and includes a very small amount of irrigated agriculture. The southern border of the Coalition area is the Stanislaus River with the exception of the Del Puerto and West Stanislaus Irrigation Districts at the southern edge of the Coalition area, which are not covered by the Coalition. As such, 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 hills 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 eastern and western parts of the California Central Valley (Valley). Drainage water is either exported to the San Francisco Bay through the Delta, or conveyed southward via the State Water Project and the Delta Mendota Canal. There are three major rivers in the Coalition area other than the San Joaquin River: Stanislaus River, Calaveras River, and Mokelumne River. These east side tributaries of the San Joaquin River drain a major

portion of the Sierra Nevada Mountain range from east to west. The watershed of the Coalition area is the crest of the Sierra Nevada, and the drainage area is bounded by the San Joaquin River on the west, the Stanislaus River on the south, and the Mokelumne River on the north. Intermediate sized water bodies in the Coalition 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.

**Figure 1. Agriculture lands in the SJCDWQC area.**

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 here is in jpg format and consequently does not support a reasonable level of detail. The legend for land use is presented in Figure 2. ArcGIS coverage has previously been provided.

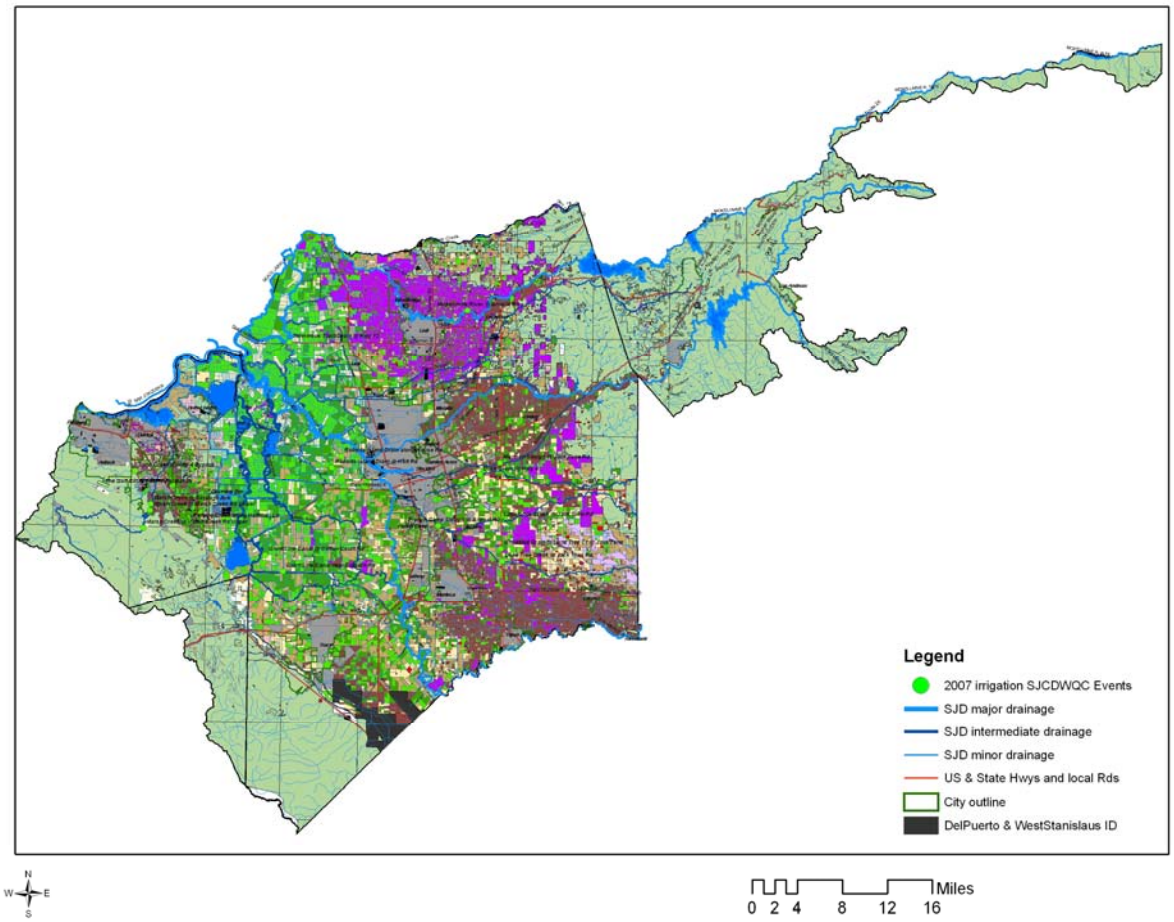


**Figure 2. Legend for agriculture lands in the SJCDWQC area.**

## *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, we use 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).

With respect to water quality, 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 | | | | | |

| County Name | Crop | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | | | |
| | 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 | | | | | | | | |

| County Name | Crop | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | | | | |
| | 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 | | | | | | | | |

| County Name | Crop | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | | | | | | | | |
| | 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 cooler crops. 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 due to subsidence 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 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[1] | 2, 3, 6-14 |
| Duck Creek @ Highway 4 | Sacramento San Joaquin Delta[2] | 1-12, 14, 15 |
| French Camp Slough @ Airport Way | | |
| Grant Line Canal near Calpack Rd | | |
| Grant Line Canal @ Clifton Court Rd | | |
| Kellogg Creek along Hoffman Lane | | |
| Littlejohns Creek @ Jack Tone Rd | | |
| Lone Tree Creek @ Jack Tone Rd | | |
| Marsh Creek @ Concord Ave** | | |
| Marsh Creek @ Marsh Creek Rd Lower | | |
| Marsh Creek @ Marsh Creek Rd Upper | | |
| Mormon Slough @ Jack Tone Road | | |
| Roberts Island Drain @ Holt Rd | | |
| Roberts Island Drain along House Rd | | |
| Sand Creek @ Hwy 4 Bypass | | |
| Terminous Tract Drain @ Hwy 12 | | |
| Unnamed Drain to Lone Tree Creek @ Jacktone Rd | | |

[1] Comanche Reservoir to Delta reach

[2] "Beneficial uses vary throughout the Delta and will be evaluated on a case-by-case basis" (wording from the Central Valley Region Basin Plan).

* See below Beneficial Use code list.

** Marsh Creek has been assigned only recreational beneficial uses

**Beneficial Use List**

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

Thirty-five site subwatersheds in the Coalition area have been classified into three categories (large, intermediate or small) based on water flow and the drainage area of the site subwatershed (Table 3). The large site subwatersheds within the Coalition area are the four major rivers (San Joaquin, Mokelumne, Calaveras, and Stanislaus). In the case of the large site subwatersheds, only the portion of the entire drainage area that is within the Coalition boundaries is included in the reported site subwatershed area, and as a result the stated areas of the large site subwatersheds can be similar to or even less than some of the site subwatersheds classified as intermediate sized. Due to snowmelt and reservoir releases, the four large site subwatersheds have greater base flow than the site subwatersheds classified as intermediate or small. There are 16 intermediate sized site subwatersheds that include several locations along Bear Creek, Duck Creek, French Camp Slough, Littlejohns Creek, Lone Tree Creek, Marsh Creek, Mormon Slough, Mosher Creek, and Pixley Slough. These are primarily natural creeks and sloughs in the eastern portion of San Joaquin County or larger sloughs at the eastern edge of the Delta. The smaller site subwatersheds in the Coalition area are either Delta island drains or small natural creeks. There are hundreds of small Delta Island drains that could be designated as small site subwatersheds. However, because many of these small drains collect water from a limited number of fields, sometimes only one field, they are not designated as individual site subwatersheds in this report.

In previous documents addressing size of water bodies, some of the water bodies in Table 3 have been designated as both intermediate and small. As the Coalition refines its understanding of flow, movement of water, and boundaries of the drainage area, the categorization of each water body is reviewed. Water bodies are reclassified as appropriate based on the size of all water bodies in the Coalition region. Consequently, Kellogg Creek, Sand Creek, and Grant Line Canal were previously listed as intermediate sized water bodies, but were reclassified as small in the December 2006 SAMR. That classification has been retained for this SAMR.

Figure 3 provides the size of currently sampled site subwatersheds within the Coalition region. Site subwatersheds are designated by size and are provided by county in Figures 4-6 below. Due to the size limitation of this document, the detail shown on the maps is minimal. Size delineation is provided on Figure 3. Maps are available as an ArcGIS coverage and can be manipulated to provide any level of detail desired.

**Table 3. Site subwatershed size designations.**

Site subwatersheds are classified as large, intermediate and small based on the size of the water body. The list below indicates both currently sampled sites and proposed sites, which are representative of waters in the Coalition region. The sample sites are ideally located at the farthest downstream location of a primarily agricultural area. The site subwatershed is formed from the location of the sample site.

| Site Subwatershed | Size Designation |
|---|---|
| Calaveras River @ Belotta Intake | Large |
| Calaveras River @ Eight Mile Rd. | Large |
| Calaveras River @ North Alpine Rd. | Large |
| Calaveras River @ Shelton Rd. | Large |
| Mokelumne River @ Bruella Rd. | Large |
| Bear Creek @ Hwy 99 | Intermediate |
| Bear Creek @ Lower Sacramento Rd. | Intermediate |
| Bear Creek @ N. Alpine Rd. | Intermediate |
| Duck Creek @ Highway 4 | Intermediate |
| French Camp Slough @ Airport Way | Intermediate |
| Littlejohns Creek @ Jack Tone Rd. | Intermediate |
| Lone Tree Creek @ Austin Rd. | Intermediate |
| Lone Tree Creek @ Brennan Rd | Intermediate |
| Lone Tree Creek @ Jack Tone Rd. | Intermediate |
| Marsh Creek @ Balfour Rd. | Intermediate |
| Marsh Creek @ Concord Ave. | Intermediate |
| Marsh Creek @ Marsh Creek Rd Lower | Intermediate |
| Marsh Creek @ Marsh Creek Rd Upper | Intermediate |
| Mormon Slough @ Jack Tone Rd. | Intermediate |
| Mosher Creek @ Eight Mile Rd. | Intermediate |
| Pixley Slough @ Eight Mile Rd. | Intermediate |
| Grant Line Canal near Calpack Rd | Small |
| Grant Line Canal @ Clifton Court Rd | Small |
| Kellogg Creek @ Hoffman Rd | Small |
| Kellogg Creek @ Hwy 4 | Small |
| Paddy Creek @ Hibbard Rd | Small |
| Potato Slough @ Hwy 12 | Small |
| Roberts Island Drain @ Holt Rd | Small |
| Roberts Island Drain along House Rd | Small |
| Sand Creek @ Hwy 4 bypass | Small |
| Terminous Tract Drain @ Hwy 12 | Small |
| Terminous Tract @ field drain off Glasscock Rd | Small |
| Terminous Tract on Hwy 12 west of Guard Rd | Small |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd. | Small |
| Unnamed Drain to Walthall Slough – Nile Rd. @ S. Airport Way | Small |

**Figure 3. Site subwatershed size designation showing only 2007 irrigation site subwatersheds in the Coalition region.**

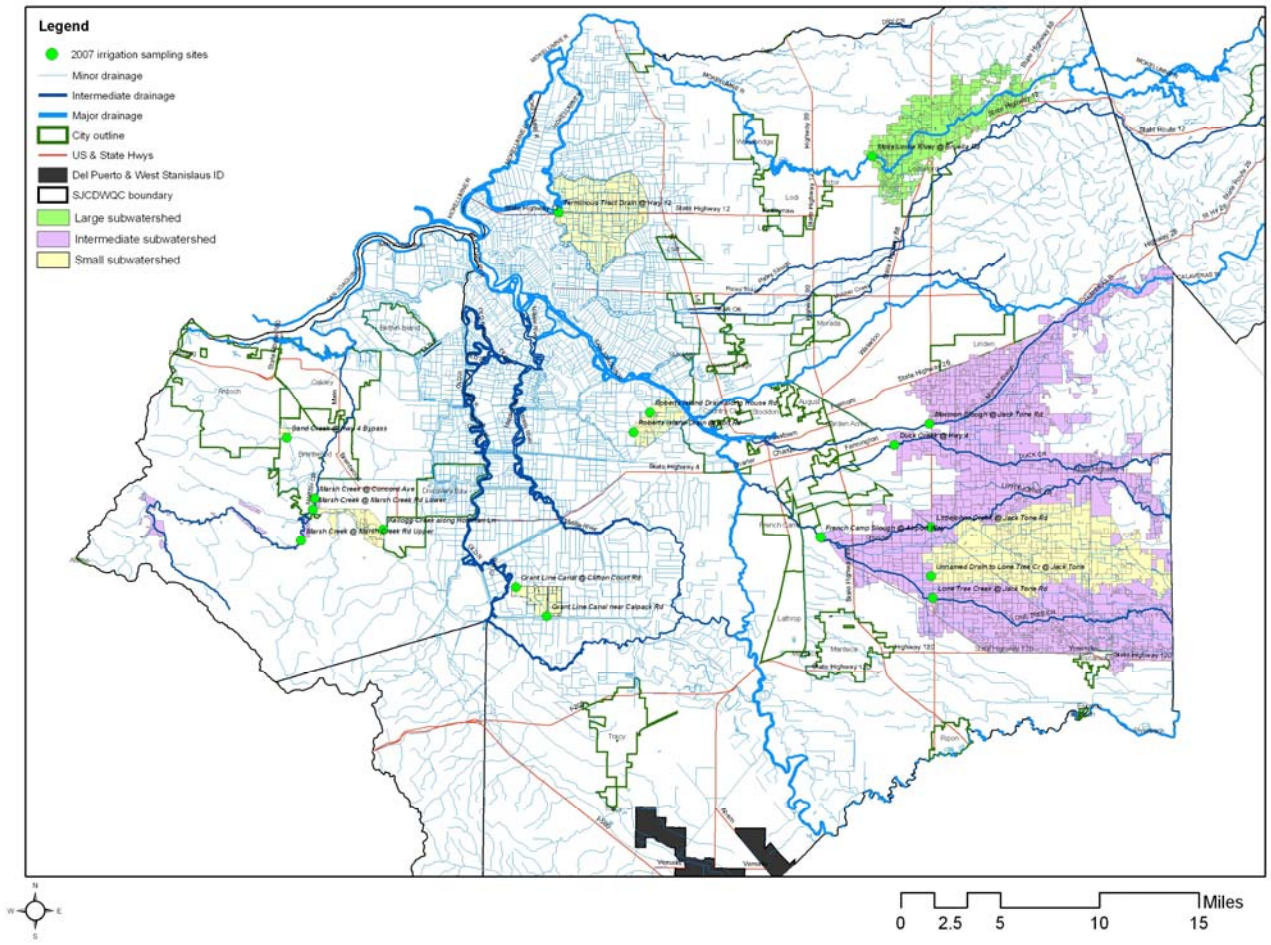


**Figure 4. Site subwatershed size designation – Contra Costa County.**

The legend for this map is provided in Figure 3 above.

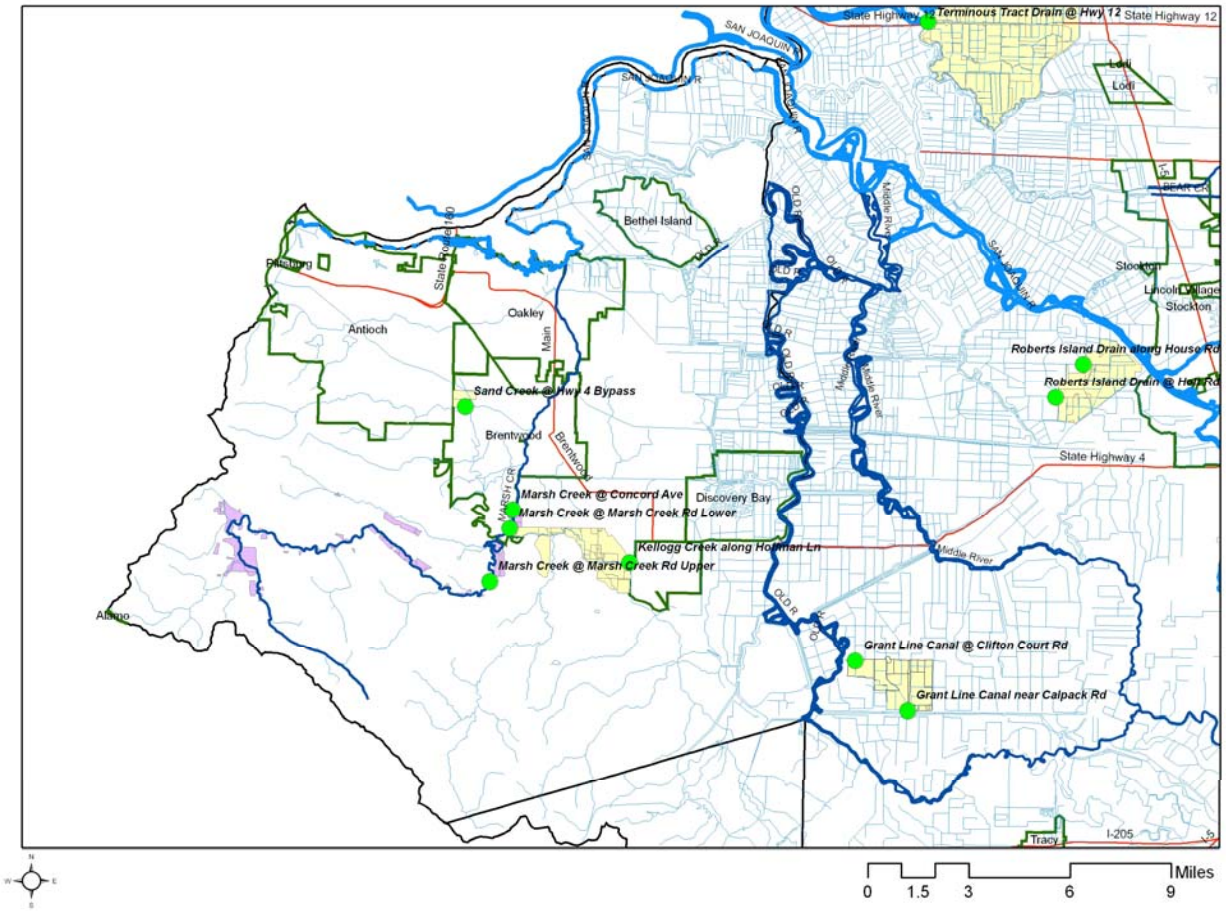


**Figure 5.** Site subwatershed size designation – northern San Joaquin County.

The legend for this map is provided in Figure 3 above.

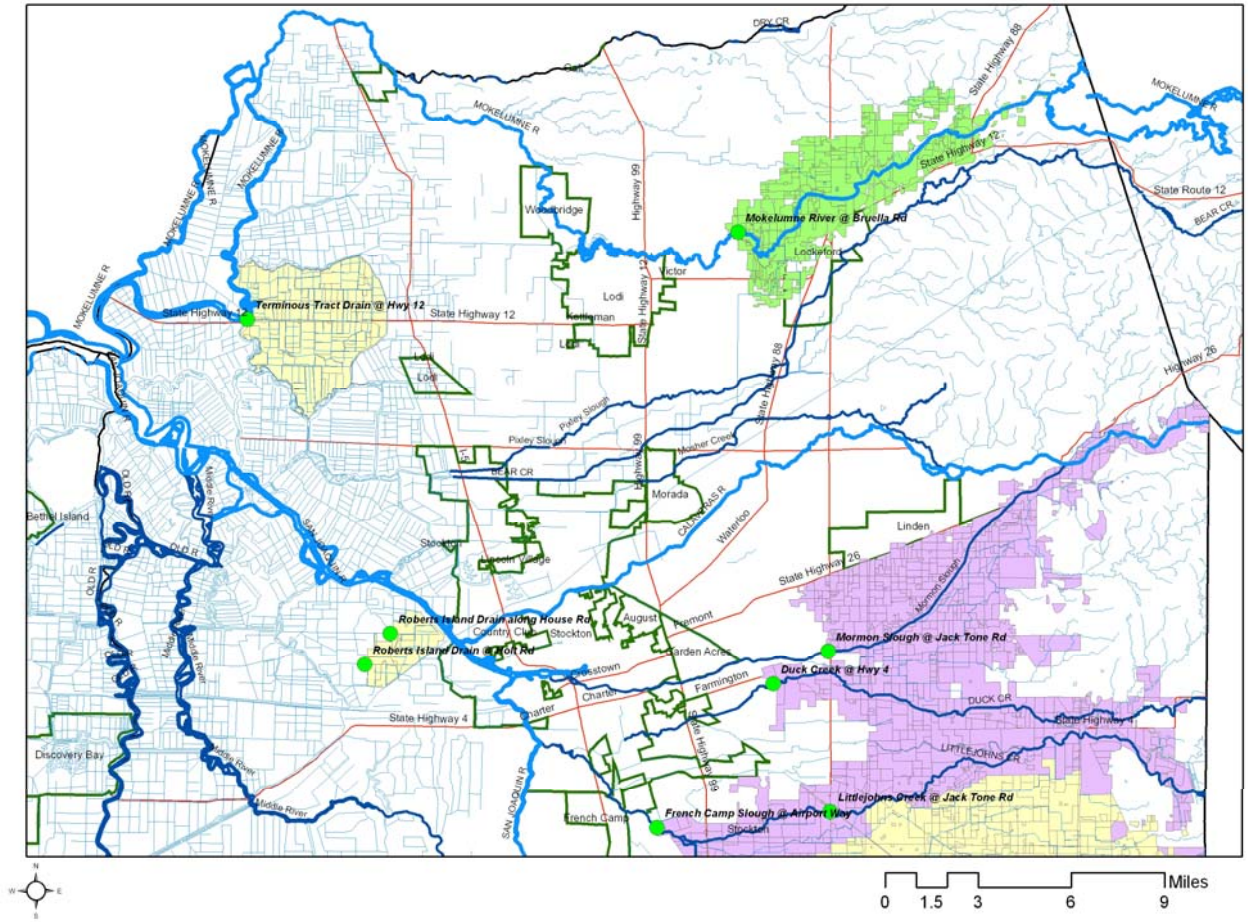
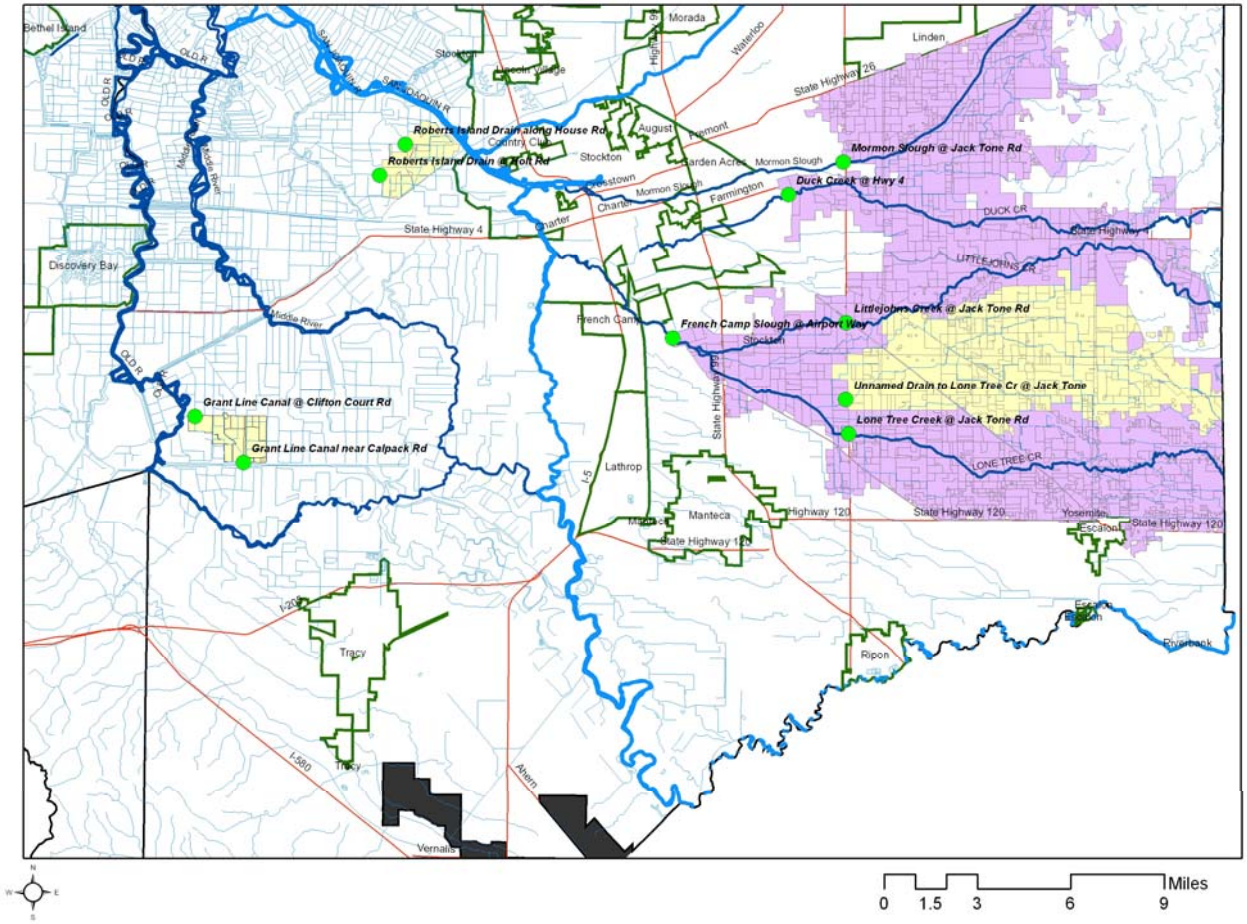


**Figure 6.** Site subwatershed size designation – southern San Joaquin County.

The legend for this map is provided in Figure 3 above.



## Monitoring Objectives

Coalition monitoring is conducted in both the winter storm runoff season and the summer irrigation season. This report covers only monitoring conducted between the months of April and September 2007, during the irrigation season. Irrigation season sampling is designed to characterize the discharge from agriculture when irrigation is taking place. 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 triggers 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 site subwatersheds 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 18 sites in the Coalition region, during the 2007 irrigation season Fifteen of these sites were included as part of the normal monitoring program and the additional 3 sites were sampled for specific purposes. 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 (TOC), nutrients, dissolved oxygen (DO), pH, specific conductance (EC), water toxicity to three test species including *Ceriodaphnia dubia*, *Pimephales promelas* and *Selenastrum capricornutum* and sediment toxicity to test species *Hyalella azteca*. Monitoring constituents are established in the Coalition Group Conditional Waiver and are discussed in more detail below.

### *Pesticides and Toxicity*

Pesticides can end up in the water column or sediment as a result of applications that occur throughout the summer, and irrigation return flows which 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 triggers 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, color, 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 EC are difficult to track to sources. All of these parameters are non-conserved meaning that they can increase or decrease in value 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 they are 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 that is occurring from irrigated pasture or manure applications for fertilizer.

As a result of *E. coli* detections in samples collected for Coalition monitoring, a follow-up study was conducted to identify the contributing sources of *E. coli* in Coalition water bodies. Results from this study indicated that the most prominent source of bacteria being discharged into water bodies is human, with smaller contributions coming from bovine and chicken.

## *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 to primarily 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 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. Consequently, the Coalition will use monitoring data to determine if exceedances are occurring, and will attempt to establish background concentrations of some metals in surface waters to determine if concentrations are a result of natural or anthropogenic inputs to the water. In addition, if it is concluded that it is necessary to determine if the metals are bioavailable, additional analyses may be used to determine the amount of soluble metals as compared to particulate bound metals.

## Sampling Sites Descriptions

The site names, codes and locations of all sites monitored during the 2007 irrigation season are provided in Table 4. A narrative description of each site subwatershed with respect to hydrology and agricultural production follows below.

**Table 4. SJCDWQC irrigation season 2007 sampling locations.**

| Site Name | Station Code | Latitude | Longitude |
|---|---|---|---|
| Duck Creek @ Hwy 4 | 531XDCAHF | 37.9491 | -121.1810 |
| French Camp Slough @ Airport Way† | 531SJC504 | 37.8817 | -121.2493 |
| Grant Line Canal near Calpack Rd† | 544XGLCCR | 37.8205 | -121.4999 |
| Grant Line Canal @ Clifton Court Rd† | 544XGLCAA | 37.8414 | -121.5288 |
| Kellogg Creek along Hoffman Ln† | 544XKCAHL | 37.8819 | -121.6522 |
| Littlejohns Creek @ Jack Tone Rd† | 531XLCAJR | 37.8896 | -121.1461 |
| Lone Tree Creek @ Jack Tone Rd† | 531XLTCJR | 37.8376 | -121.1438 |
| Marsh Creek @ Concord Ave† | 544XMCACA | 37.9039 | -121.7163 |
| Marsh Creek @ Marsh Creek Rd Lower[1] | 544MCAMRL | 37.8959 | -121.7176 |
| Marsh Creek @ Marsh Creek Rd Upper[1] | 544MCAMRU | 37.8728 | -121.7279 |
| Storm Drain to Marsh Creek @ Sand Creek Rd[2] | 544SDMCSC | 37.9460 | -121.7027 |
| 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 |
| Terminous Tract Drain @ Hwy 12† | 544XTTHWT | 38.1166 | -121.4936 |
| Unnamed Drain to Lone Tree Cr @ Jack Tone Rd | 531UDLTAJ | 37.8536 | -121.1457 |

[1] Only collected/analyzed during the first irrigation monitoring event in April
[2]Collected/analyzed one time in September as a result of a fish kill
† Sites that have been monitored for at least two years

### *Site Subwatershed Descriptions*

The Coalition sampled a total of 18 site subwatersheds as part of the monitoring program during the 2007 irrigation season. Regular monitoring occurred at 15 sample sites with the addition of three monitoring sites to determine the source of particular exceedances or toxicity. Descriptions of the site subwatersheds for all sample sites are provided below alphabetically.

Duck Creek @ Highway 4 (10,777 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 is also a relatively large amount of deciduous nuts in the site subwatershed, and truck farm/nursery and berry crops are also grown.

French Camp Slough @ Airport Way (68,502 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 south west 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 @ Calpack Rd. 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.

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.

Marsh Creek @ Concord Ave (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).

Marsh Creek @ Marsh Creek Road Lower & Upper (166 & 109 irrigated acres, respectively) – These sample sites are located just below and just above Marsh Creek reservoir. These sites were only sampled during the first irrigation sampling event as part of a monitoring effort to identify sources of boron and salts.

Storm Drain to Marsh Creek @ Sand Creek Rd (435 irrigated acres) – This site is downstream from Marsh Creek @ Concord and was a site monitored once in September to investigate a fish kill resulting from drainage from an orchard located near Brentwood Rd and Sand Creek Rd that drains water from the East Contra Costa Irrigation District.

Mokelumne River @ Bruella Road (8,671 irrigated acres) – Upstream agriculture is primarily vineyards although some orchards are immediately adjacent to the site. This site integrates the signal from a relatively large 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 (1,985 irrigated acres) – This site subwatershed is a portion of Roberts Island that is drained by the pump west of the sample site along McDonald Rd. It is located south of Roberts Island Drain along House Rd. The primary agriculture upstream of the sample site is asparagus, field crops, grains, hay (alfalfa) and pasture.

Roberts Island Drain along House Road (1,541 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 @ Hwy 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 Rd in Horse Valley, which is adjacent to one of the tributaries of Sand Creek.

Terminous Tract drain @ Hwy 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.

## *Monitoring and Analysis*

Table 5 and Table 6 specify the constituent groups monitored at each site subwatershed. The Coalition monitoring program consists of a mix of Phase I and Phase II monitoring elements at various sites. Phase II sites sample for all constituent groups and include all sites that have been monitored for at least 2 years. As a result, the sites added to the Coalition monitoring program in May 2006 (e.g. Mormon Slough @ Jack Tone Road) do not require sampling for metals or nutrients as outlined in the CVRWQCB's MRP (Table 1 of MRP). Although pesticides other than those identified by 303d listings are not required to be monitored, the Coalition is monitoring all Phase II pesticides at Phase I and Phase II sites. Additional monitoring was conducted to determine sources of salts and boron exceedances in Marsh Creek (Marsh Creek @ Marsh Creek Upper and Marsh Creek @ Marsh Creek Lower) and additional analysis of BOD was conducted at all sites twice during the irrigation season in an attempt to understand the causes of the DO exceedances. An additional site in the Marsh Creek site subwatershed was monitored to determine if agricultural causes were responsible for a fish kill. 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.

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.

**Table 5. SJCDWQC irrigation 2007 sampling constituents.**

Constituents listed below include field parameters (pH, DO, EC and temperature), biological oxygen demand (BOD), metals, nutrients, physical parameters (color, turbidity, total dissolved solids), total organic carbon (TOC), *E. coli*, water column toxicity (WCT) and sediment (sed) toxicity.

| Site Name | Field Parameters | BOD[1] | Metals | Nutrients | TOC | Physical Parameters | *E. coli* | WCT | Sed Toxicity |
|---|---|---|---|---|---|---|---|---|---|
| Duck Creek @ Hwy 4 | x | x | | | x | x | x | x | x |
| French Camp Slough @ Airport Way† | x | x | x | x | x | x | x | x | x |
| Grant Line Canal near Calpack Rd† | x | x | x | x | x | x | x | x | x |
| Grant Line Canal @ Clifton Court Rd† | x | x | x | x | x | x | x | x | x |
| Kellogg Creek along Hoffman Ln† | x | x | x | x | x | x | x | x | x |
| Littlejohns Creek @ Jack Tone Rd† | x | x | x | x | x | x | x | x | x |
| Lone Tree Creek @ Jack Tone Rd† | x | x | x | x | x | x | x | x | x |
| Marsh Creek @ Concord Ave† | x | x | x | x | x | x | x | x | x |
| Marsh Creek @ Marsh Creek Rd Lower[1] | x | | x | | | x (TDS only) | | | |
| Marsh Creek @ Marsh Creek Rd Upper[1] | x | | x | | | x (TDS only) | | | |
| Mokelumne River @ Bruella Rd† | x | x | x | x | x | x | | x | x |
| Mormon Slough @ Jack Tone Rd | x | x | | | x | x | x | x | x |
| Roberts Island Drain @ Holt Rd | x | x | | | x | x | x | x | x |
| Roberts Island Drain along House Rd | x | x | | | x | x | x | x | x |
| Sand Creek @ Hwy 4 Bypass | x | x | | | x | x | x | x | x |
| Terminous Tract Drain @ Hwy 12† | 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 |

[1] Only collected/analyzed during the first irrigation and fourth sampling event.
† indicates sites that have been monitored for at least two years.

**Table 6. SJCDWQC irrigation 2007 sampling constituents (organics).**

Constituents listed below include the five major pesticide groups including organophosphates, pyrethroids, carbamates, herbicides/triazines (herbicides), and organochlorines. In addition, glyphosate and paraquat were analyzed at all sampling sites.

| Site Name | Organo-phosphates | Pyrethroids | Carbamates | Herbicides | Organo-chlorines | Glyphosate and Paraquat |
|---|---|---|---|---|---|---|
| Duck Creek @ Hwy 4 | x | x | x | x | x | x |
| French Camp Slough @ Airport Way† | x | x | x | x | x | x |
| Grant Line Canal near Calpack Rd† | x | x | x | x | x | x |
| Grant Line Canal @ Clifton Court Rd† | x | x | x | x | x | x |
| Kellogg Creek along Hoffman Ln† | x | x | x | x | x | x |
| Littlejohns Creek @ Jack Tone Rd† | x | x | x | x | x | x |
| Lone Tree Creek @ Jack Tone Rd† | x | x | x | x | x | x |
| Marsh Creek @ Concord Ave† | x | x | x | x | x | x |
| Mokelumne River @ Bruella Rd† | x | x | x | x | x | x |
| Mormon Slough @ Jack Tone Rd | x | x | x | x | x | x |
| Roberts Island Drain @ Holt Rd | x | x | x | x | x | x |
| Roberts Island Drain along House Rd | x | x | x | x | x | x |
| Sand Creek @ Hwy 4 Bypass | x | x | x | x | x | x |
| Terminous Tract Drain @ Hwy 12† | x | x | x | x | x | x |
| Unnamed Drain to Lone Tree Cr @ Jack Tone Rd | x | x | x | x | x | x |

† indicates sites that have been monitored for at least two years

## Location Maps of Sample Sites and Land Use

All site subwatersheds in Table 7 drain agricultural land in the Coalition region. The table below includes the land use acreage for each major crop or land use type and designated as irrigated/non-irrigated (I/NI). Land use for each site subwatershed is provided and is listed by alphabetical order. Land use maps are provided as Figure 7–Figure 10 (a legend for land use is provided in Figure 11) and include parcel specific land use data 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. A narrative description of each site subwatershed monitored during the 2007 irrigation season is provided in the previous section, Sampling Sites Descriptions.

## Table 7. Land use acreage of site subwatersheds.

| 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 | Marsh Creek @ Marsh Creek Rd Lower | Marsh Creek @ Marsh Creek Rd Upper | 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 | Terminous Tract @ Hwy 12 | Unnamed Drain to Lone Creek @ Jack Tone Rd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | I | 1,618.6 | 11.4 | | | 4.0 | | 11.4 | | | | 5.1 | 6.2 | | | | | |
| Deciduous Nut And Fruit | I | 1,927.7 | 10,301.9 | | | 846.7 | 2,391.7 | 4,641.4 | 122.6 | 22.4 | 22.4 | 2,590.2 | 9,333.6 | | | 108.9 | | 919.9 |
| Deciduous Nut And Fruit | NI | | | | | | | | 21.4 | 21.4 | 21.4 | 4.3 | | | | | | |
| Field Crop | I | 3,483.8 | 7,368.8 | 873.4 | 443.1 | 218.4 | 1,246.7 | 1,832.5 | 20.8 | | | 518.4 | 1,308.5 | 927.5 | 795.5 | | 5,100.9 | 3,136.5 |
| Grain And Hay | I | | 14,977.8 | 49.1 | 313.1 | | 3,314.8 | 4,843.2 | 69.7 | 69.7 | 69.7 | 98.3 | 2,047.3 | 604.9 | 77.5 | 76.5 | 2,056.8 | 5,089.7 |
| Grain And Hay | NI | | 332.9 | | | | 326.8 | 22.7 | 135.8 | 135.8 | | | 14.9 | | | | | |
| Idle | I | 64.6 | 607.7 | | | 122.6 | 109.0 | 202.2 | 16.9 | 73.4 | 16.9 | 480.4 | 425.1 | | | | 37.1 | 289.0 |
| Idle | NI | | | | | | | | 56.5 | | 56.5 | | | | | | | |
| Barren Wasteland | NI | | | | | | | | | | | 11.4 | | | | | | |
| Raparian Vegetation | NI | | 16.3 | | | | | 6.5 | 39.4 | 10.8 | | 258.6 | 35.9 | 1.1 | | | 50.7 | 9.8 |
| Wild Vegetation | NI | 91.3 | 1,430.1 | | | | 226.4 | 144.6 | 60.2 | 60.2 | 60.2 | 1,695.2 | 694.9 | 14.6 | 286.2 | | 310.5 | 264.0 |
| Water Surface | NI | 11.6 | 81.2 | | | | 16.9 | 4.2 | 48.2 | 48.2 | 2.9 | 443.0 | 155.6 | | 10.6 | | | 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 | 91.9 | 587.8 | | 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 | 29.1 | 26.2 | 147.5 | 232.8 | 10.5 | 12.7 | | 19.4 | 972.5 |
| Truck, Nursery, Berry | I | 1,551.3 | ,811.2 | 32.1 | | 872.3 | 1,267.4 | 297.3 | | | | 324.7 | 2952. | 360.1 | 80.2 | | 1,275.6 | 1,415.2 |
| Urban | NI | 101.1 | 1,576.1 | | | 10.1 | 292.2 | 429.4 | 944.3 | 944.3 | 834.1 | 520.7 | 498.1 | 24.0 | 9.7 | | 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** | **1,415.3** | **1,110.4** | **14,321.5** | **22,872.0** | **2,034.6** | **1,860.6** | **185.4** | **10,413.0** | **24,500.5** |
| **Irrigated Acres** | | **10,776.9** | **68,501.9** | **1,676.3** | **756.2** | **2,116.4** | **12,355.6** | **22,358.6** | **229.9** | **165.6** | **109.0** | **8,670.5** | **21,218.6** | **1,984.5** | **1,541.2** | **185.4** | **9,888.5** | **23,051.2** |

* 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. Data was compiled in 2001 and land use in some parts of the SJCDWQC area may have changed since that time.

**Figure 7. Coalition map showing land use in all site subwatersheds identified for sampling in 2007 irrigation season. A legend is provided in Figure 11.**

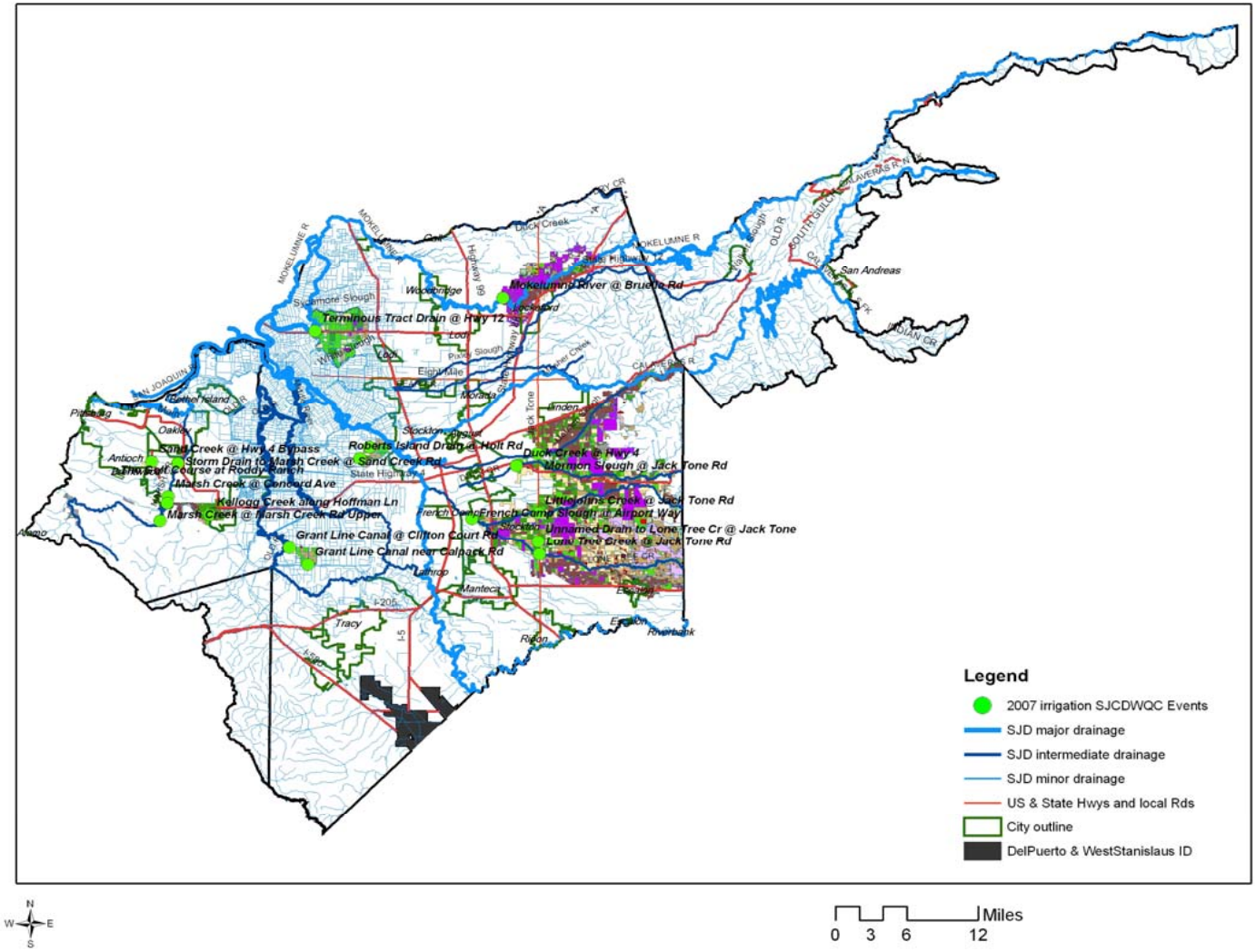


**Figure 8. Land use for monitoring sites in Contra Costa County. A legend is provided in Figure 11.**

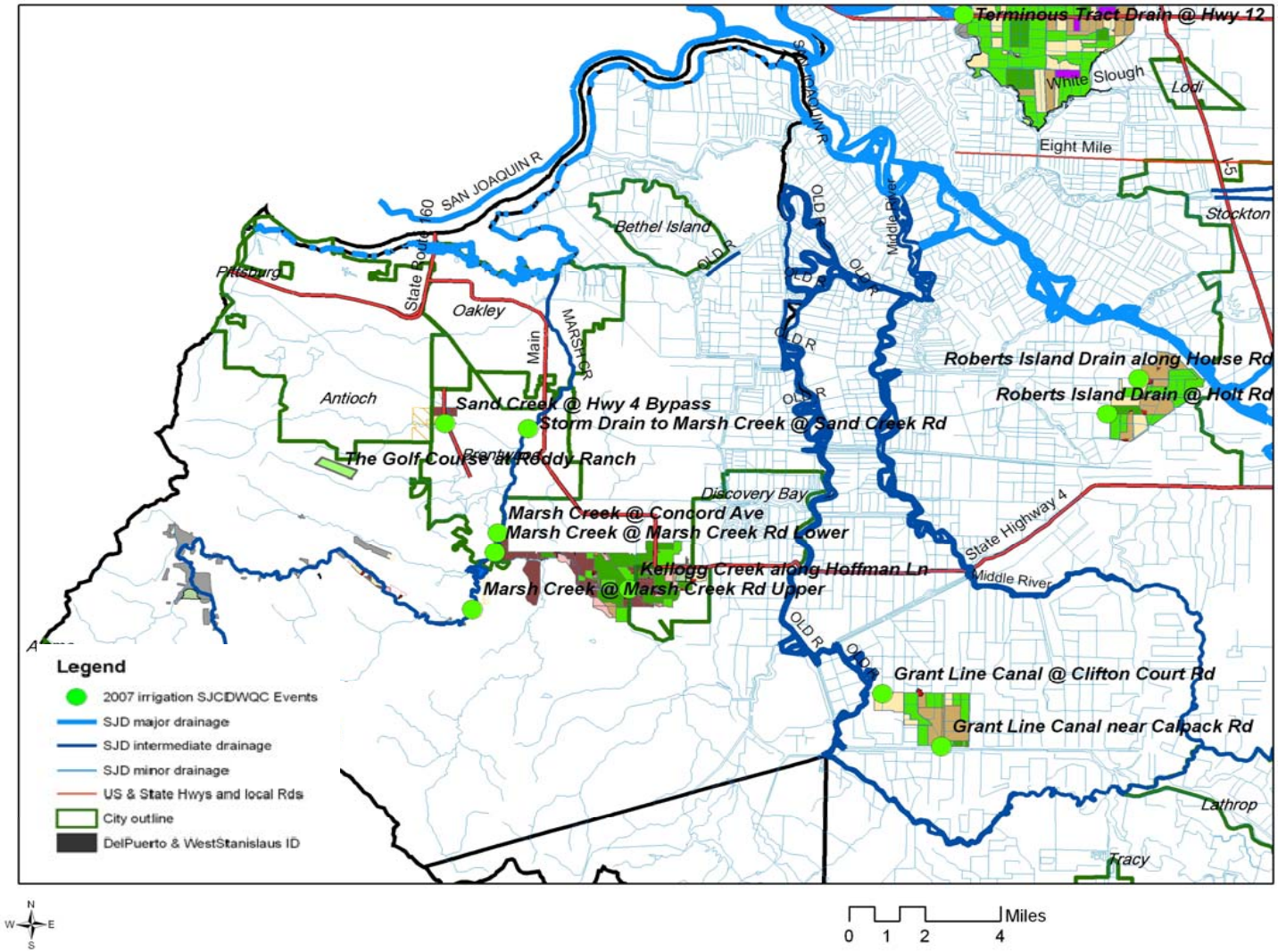


**Figure 9. Land use for monitoring sites in north San Joaquin County. A legend is provided in Figure 11.**

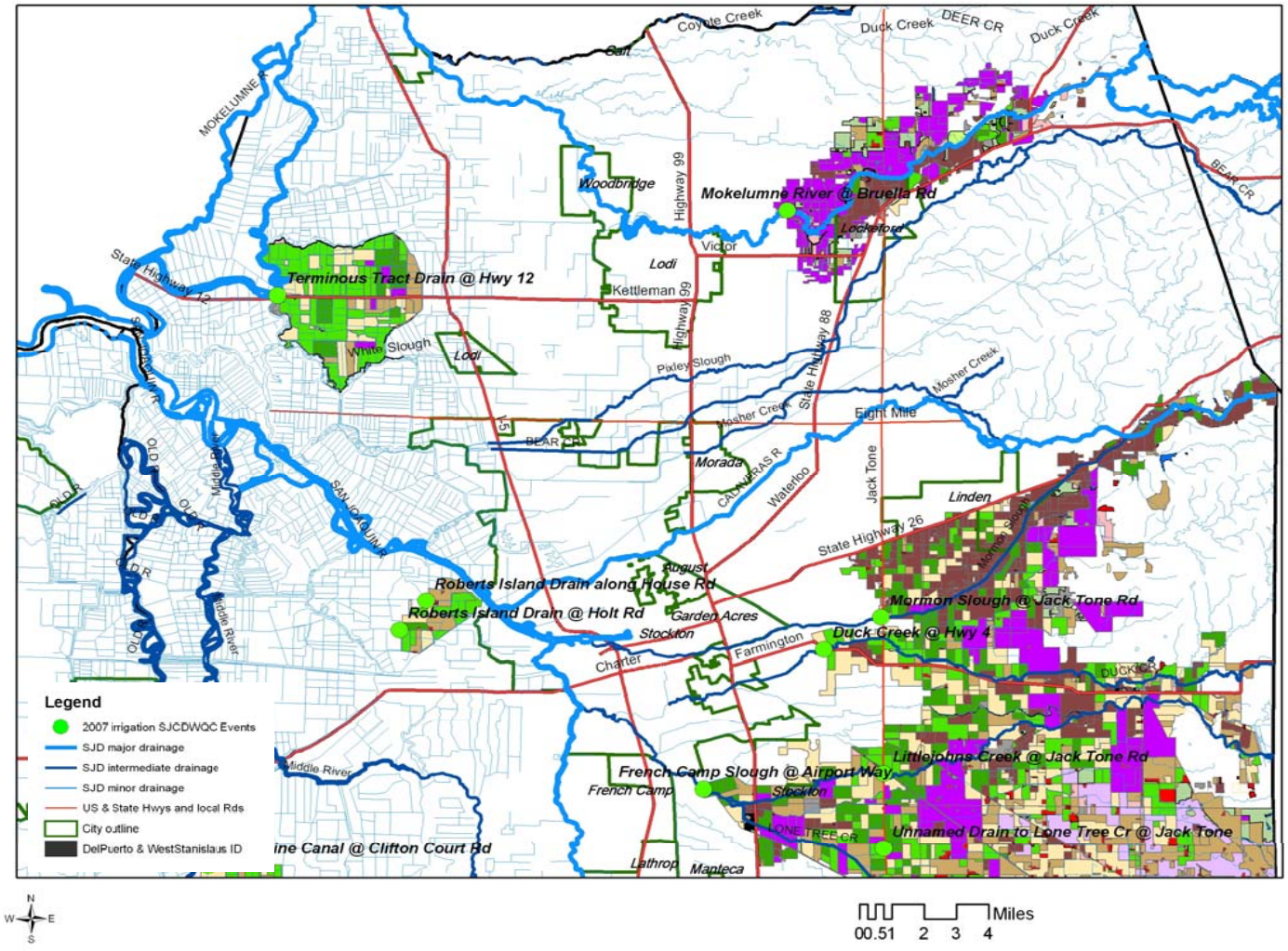


**Figure 10. Land use for monitoring sites in south San Joaquin County. A legend is provided in Figure 11.**

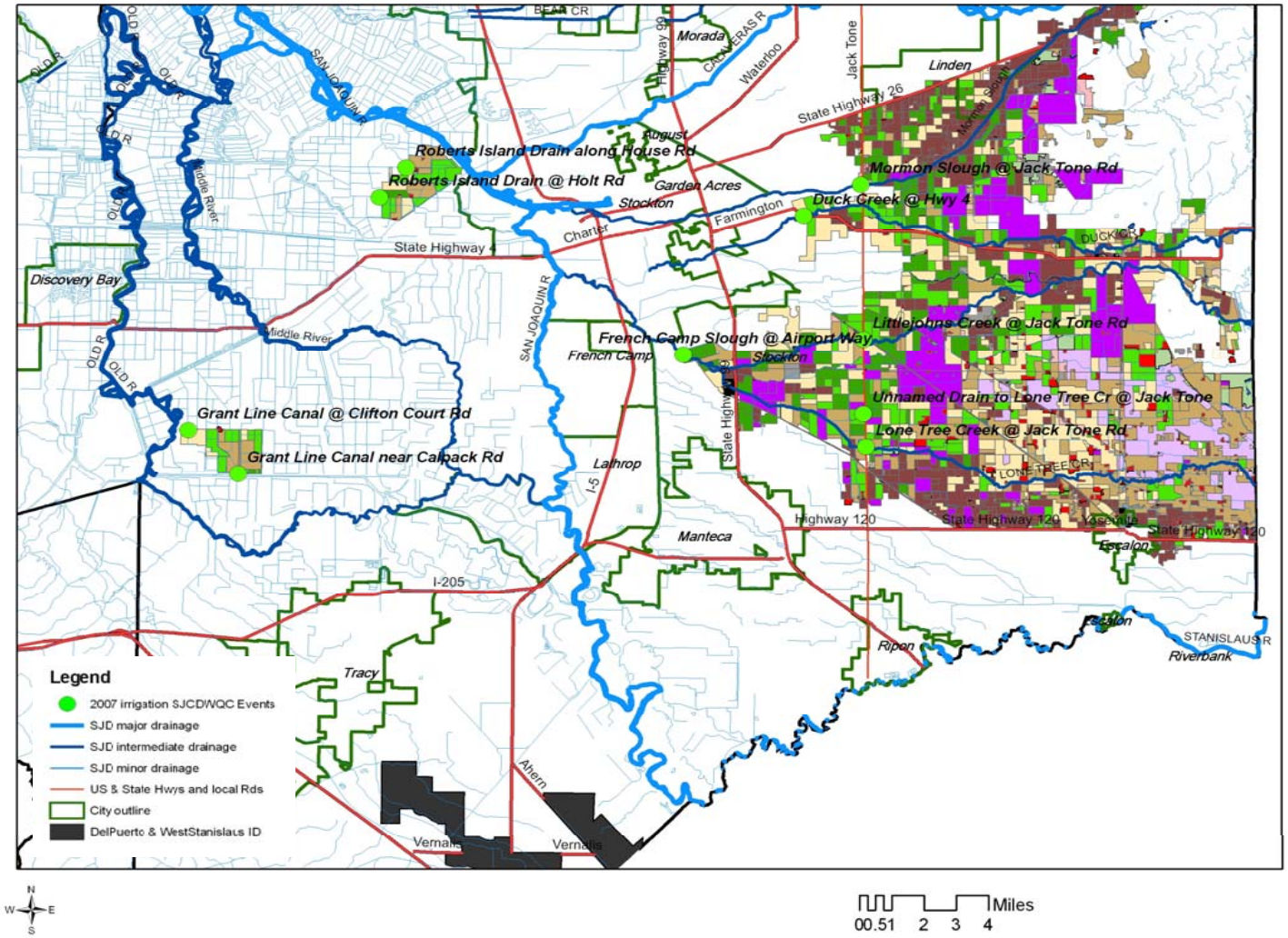


**Figure 11. Legend for land use data.**

### *Sample Details*

Monitoring results from the 2007 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. Monitoring results include results from samples taken for normal monitoring (including resampling due to toxicity), management plan monitoring and special studies (TDS, metals and BOD). Each sampling location, sampling date, sampling time and type of monitoring is listed in Table 8.

**Table 8. Sample details for samples collected during the 2007 irrigation season; sorted by station name and sample date.**

NM = Normal Monitoring (water column) including resampling due to toxicity. MPM = Management Plan Monitoring. Sediment = Sediment sampling including resampling due to toxicity.

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Duck Creek @ Hwy 4 | 531XDCAHF | NM | Irrigation1 | 04/10/07 | 12:50 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | NM | Irrigation2 | 05/22/07 | 11:40 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | NM | Irrigation3 | 06/12/07 | 11:50 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | NM | Irrigation4 | 07/10/07 | 9:40 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | NM | Irrigation5 | 08/07/07 | 10:30 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | Sediment | Irrigation5 | 08/09/07 | 10:50 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | NM | Irrigation6 | 09/04/07 | 10:40 | none | |
| Duck Creek @ Hwy 4 | 531XDCAHF | MPM | Irrigation6 | 09/25/07 | 9:00 | none | Management plan monitoring: Chlorpyrifos |
| French Camp Slough @ Airport Way | 531SJC504 | NM | Irrigation1 | 04/10/07 | 18:20 | none | |
| French Camp Slough @ Airport Way | 531SJC504 | NM | Irrigation2 | 05/22/07 | 16:50 | none | |
| French Camp Slough @ Airport Way | 531SJC504 | NM | Irrigation3 | 06/12/07 | 16:15 | none | |
| French Camp Slough @ Airport Way | 531SJC504 | MPM | Irrigation3 | 06/20/07 | 16:30 | none | Management plan monitoring: Copper |
| French Camp Slough @ Airport Way | 531SJC504 | NM | Irrigation4 | 07/10/07 | 14:00 | none | |
| French Camp Slough @ Airport Way | 531SJC504 | MPM | Irrigation4 | 07/30/07 | 13:50 | none | Management plan monitoring: Chlorpyrifos,Copper |
| French Camp Slough @ Airport Way | 531SJC504 | NM | Irrigation5 | 08/07/07 | 16:30 | none | |
| French Camp Slough @ Airport Way | 531SJC504 | Sediment | Irrigation5 | 08/09/07 | 13:00 | none | |
| French Camp Slough @ Airport Way | 531SJC504 | MPM | Irrigation5 | 08/28/07 | 16:40 | none | Management plan monitoring: Copper, Organophosphates, Chlorpyrifos |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| French Camp Slough @ Airport Way | 531SJC504 | Sediment | Irrigation5 | 08/31/07 | 17:50 | none | Resampling event due to *Hyalella azteca* toxicity on 08/09/07 |
| French Camp Slough @ Airport Way | 531SJC504 | NM | Irrigation6 | 09/04/07 | 15:20 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | NM | Irrigation1 | 04/11/07 | 18:10 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | NM | Irrigation2 | 05/22/07 | 16:00 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | NM | Irrigation3 | 06/12/07 | 17:10 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | MPM | Irrigation3 | 06/20/07 | 15:40 | none | Management plan monitoring: Copper |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | NM | Irrigation4 | 07/10/07 | 14:40 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | MPM | Irrigation4 | 07/30/07 | 16:19 | Dry | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | NM | Irrigation5 | 08/07/07 | 16:50 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | Sediment | Irrigation5 | 08/09/07 | 15:10 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | NM | Irrigation6 | 09/04/07 | 14:00 | none | |
| Grant Line Canal @ Clifton Court Rd | 544XGLCAA | MPM | Irrigation6 | 09/25/07 | 11:10 | none | Management plan monitoring: Copper |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation1 | 04/11/07 | 19:20 | none | |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation1 | 04/19/07 | 10:40 | none | Resampling event due to *Selenastrum* toxicity on 04/11/07. |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation2 | 05/22/07 | 14:30 | none | |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation3 | 06/12/07 | 16:00 | none | |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation4 | 07/10/07 | 15:50 | none | |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation4 | 07/17/07 | 13:20 | none | Resampling event due to *Selenastrum* toxicity on 07/10/07. |
| Grant Line Canal near Calpack Rd | 544XGLCCR | MPM | Irrigation4 | 07/30/07 | 16:00 | none | Management plan monitoring: Chlorpyrifos |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation5 | 08/07/07 | 18:40 | none | |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Grant Line Canal near Calpack Rd | 544XGLCCR | Sediment | Irrigation5 | 08/09/07 | 14:20 | none | |
| Grant Line Canal near Calpack Rd | 544XGLCCR | MPM | Irrigation5 | 08/28/07 | 9:30 | none | Management plan monitoring: *Ceriodaphnia*, Organophosphates, Chlorpyrifos |
| Grant Line Canal near Calpack Rd | 544XGLCCR | NM | Irrigation6 | 09/04/07 | 13:10 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation1 | 04/11/07 | 16:40 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation1 | 04/19/07 | 12:00 | none | Resampling event due to *Ceriodaphnia* toxicity on 04/11/07. |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation2 | 05/22/07 | 13:00 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation3 | 06/12/07 | 12:50 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | MPM | Irrigation3 | 06/20/07 | 14:50 | none | Management plan monitoring: FH Minnow |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation4 | 07/10/07 | 13:20 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation5 | 08/07/07 | 15:10 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | Sediment | Irrigation5 | 08/09/07 | 12:50 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | Sediment | Irrigation5 | 08/31/07 | 16:50 | none | Resampling event due to *Hyalella azteca* toxicity on 08/09/07 |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | NM | Irrigation6 | 09/04/07 | 12:00 | none | |
| Kellogg Creek along Hoffman Ln | 544XKCAHL | MPM | Irrigation6 | 09/25/07 | 10:10 | none | Management plan monitoring: FH Minnow |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation1 | 04/10/07 | 14:40 | none | |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation2 | 05/22/07 | 12:50 | none | |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation3 | 06/12/07 | 13:10 | none | |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation4 | 07/10/07 | 11:10 | none | |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation4 | 07/17/07 | 12:20 | none | Resampling event due to *Selenastrum* toxicity on 07/10/07. |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | MPM | Irrigation4 | 07/30/07 | 11:50 | none | Management plan monitoring: Chlorpyrifos |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation5 | 08/07/07 | 11:50 | none | |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | Sediment | Irrigation5 | 08/09/07 | 11:20 | none | |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | MPM | Irrigation5 | 08/28/07 | 10:10 | none | Management plan monitoring: *Selenastrum* |
| Littlejohns Creek @ Jack Tone Rd | 531XLCAJR | NM | Irrigation6 | 09/04/07 | 11:40 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | NM | Irrigation1 | 04/10/07 | 17:00 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | NM | Irrigation2 | 05/22/07 | 15:20 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | NM | Irrigation3 | 06/12/07 | 14:50 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | NM | Irrigation4 | 07/10/07 | 12:30 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | MPM | Irrigation4 | 07/30/07 | 13:00 | none | Management plan monitoring: Chlorpyrifos |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | NM | Irrigation5 | 08/07/07 | 15:00 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | Sediment | Irrigation5 | 08/09/07 | 12:20 | none | |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | MPM | Irrigation5 | 08/28/07 | 16:10 | none | Management plan monitoring: Organophosphates, Chlorpyrifos |
| Lone Tree Creek @ Jack Tone Rd | 531XLTCJR | NM | Irrigation6 | 09/04/07 | 13:20 | none | |
| Marsh Creek @ Concord Ave | 544XMCACA | NM | Irrigation1 | 04/11/07 | 13:50 | none | |
| Marsh Creek @ Concord Ave | 544XMCACA | NM | Irrigation2 | 05/22/07 | 12:20 | Dry | |
| Marsh Creek @ Concord Ave | 544XMCACA | NM | Irrigation3 | 06/12/07 | 12:10 | Dry | |
| Marsh Creek @ Concord Ave | 544XMCACA | MPM | Irrigation3 | 06/20/07 | 14:20 | none | Management plan monitoring: *Ceriodaphnia* |
| Marsh Creek @ Concord Ave | 544XMCACA | MPM | Irrigation3 | 06/27/07 | 14:40 | Dry | |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Marsh Creek @ Concord Ave | 544XMCACA | NM | Irrigation4 | 07/10/07 | 13:00 | Dry | |
| Marsh Creek @ Concord Ave | 544XMCACA | NM | Irrigation5 | 08/07/07 | 14:15 | Dry | |
| Marsh Creek @ Concord Ave | 544XMCACA | Sediment | Irrigation5 | 08/09/07 | 12:20 | Dry | |
| Marsh Creek @ Concord Ave | 544XMCACA | NM | Irrigation6 | 09/04/07 | 11:28 | Dry | |
| Marsh Creek @ Concord Ave | 544XMCACA | MPM | Irrigation6 | 09/25/07 | 9:44 | Dry | |
| Marsh Creek @ Marsh Creek Rd Lower | 544MCAMRL | SS | Irrigation1 | 04/11/07 | 15:00 | Dry | Site sampled for metals and TDS |
| Marsh Creek @ Marsh Creek Rd Upper | 544MCAMRU | SS | Irrigation1 | 04/11/07 | 15:50 | none | Site sampled for metals and TDS |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation1 | 04/10/07 | 9:50 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation2 | 05/22/07 | 9:20 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation3 | 06/12/07 | 9:30 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | MPM | Irrigation3 | 06/20/07 | 12:20 | none | Management plan monitoring: *Ceriodaphnia* |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation4 | 07/10/07 | 8:00 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation4 | 07/17/07 | 10:20 | none | Resampling event due to *Selenastrum* toxicity on 07/10/07. |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation5 | 08/07/07 | 8:20 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | Sediment | Irrigation5 | 08/09/07 | 9:20 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | MPM | Irrigation5 | 08/28/07 | 9:10 | none | Management plan monitoring: *Selenastrum* |
| Mokelumne River @ Bruella Rd | 531XMRABR | NM | Irrigation6 | 09/04/07 | 8:50 | none | |
| Mokelumne River @ Bruella Rd | 531XMRABR | MPM | Irrigation6 | 09/25/07 | 8:00 | none | Management plan monitoring: *Ceriodaphnia* |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation1 | 04/10/07 | 11:50 | none | |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation2 | 05/22/07 | 10:40 | none | |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation3 | 06/12/07 | 10:50 | none | |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation4 | 07/10/07 | 9:10 | none | |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation4 | 07/17/07 | 11:10 | none | Resampling event due to *Selenastrum* toxicity on 07/10/07. |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation5 | 08/07/07 | 9:50 | none | |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | Sediment | Irrigation5 | 08/09/07 | 10:20 | none | |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation6 | 09/04/07 | 9:50 | none | |
| Mormon Slough @ Jack Tone Rd | 544MSAJTR | NM | Irrigation6 | 09/11/07 | 10:30 | none | Resampling due to *Ceriodaphnia* toxicity on 09/04/07. |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation1 | 04/11/07 | 9:50 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation2 | 05/22/07 | 9:30 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation3 | 06/12/07 | 9:10 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation4 | 07/10/07 | 10:20 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation4 | 07/17/07 | 14:30 | none | Resampling event due to *Selenastrum*, *Ceriodaphnia* toxicity on 07/10/07. |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation5 | 08/07/07 | 11:20 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | Sediment | Irrigation5 | 08/09/07 | 10:00 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | MPM | Irrigation5 | 08/28/07 | 16:10 | none | Management plan monitoring: Pyrethroids Cyhalothrin, Lambda |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | NM | Irrigation6 | 09/04/07 | 8:50 | none | |
| Roberts Island Drain @ Holt Rd | 544RIDAHT | MPM | Irrigation6 | 09/25/07 | 8:50 | none | Management plan monitoring: Cyhalothrin, Lambda |
| Roberts Island Drain along House Rd | 544RIDAHR | NM | Irrigation1 | 04/11/07 | 8:20 | none | |
| Roberts Island Drain along House Rd | 544RIDAHR | NM | Irrigation2 | 05/22/07 | 8:20 | none | |
| Roberts Island Drain along House Rd | 544RIDAHR | NM | Irrigation3 | 06/12/07 | 8:10 | none | |
| Roberts Island Drain along House Rd | 544RIDAHR | NM | Irrigation4 | 07/10/07 | 9:30 | none | |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Roberts Island Drain along House Rd | 544RIDAHR | NM | Irrigation5 | 08/07/07 | 10:20 | none | |
| Roberts Island Drain along House Rd | 544RIDAHR | Sediment | Irrigation5 | 08/09/07 | 9:10 | none | |
| Roberts Island Drain along House Rd | 544RIDAHR | NM | Irrigation6 | 09/04/07 | 8:00 | none | |
| Roberts Island Drain along House Rd | 544RIDAHR | MPM | Irrigation6 | 09/25/07 | 8:10 | none | Management plan monitoring: Cyhalothrin, Lambda |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | NM | Irrigation1 | 04/11/07 | 11:40 | none | |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | NM | Irrigation2 | 05/22/07 | 11:10 | none | |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | NM | Irrigation3 | 06/12/07 | 10:50 | none | |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | MPM | Irrigation3 | 06/20/07 | 13:45 | none | Management plan monitoring: *Ceriodaphnia*, Dieldrin, Chlorpyrifos |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | NM | Irrigation4 | 07/10/07 | 12:10 | none | |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | MPM | Irrigation4 | 07/30/07 | 17:30 | none | Management plan monitoring: Ceriodaphnia |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | NM | Irrigation5 | 08/07/07 | 12:50 | none | |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | Sediment | Irrigation5 | 08/09/07 | 11:20 | none | |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | Sediment | Irrigation5 | 08/31/07 | 16:10 | none | Resampling event due to *Hyalella azteca* toxicity on 08/09/07. |
| Sand Creek @ Hwy 4 Bypass | 544SCAHFB | NM | Irrigation6 | 09/04/07 | 10:20 | none | |
| Storm Drain to Marsh Creek @ Sand Creek Rd | 544SDMCSC | SS | Irrigation6 | 09/12/07 | 14:40 | none | Special Sampling due to fish kill in Marsh Creek on 09/05/07. |
| Storm Drain to Marsh Creek @ Sand Creek Rd | 544SDMCSC | SS | Irrigation6 | 09/12/07 | 15:20 | none | Special Sampling due to fish kill in Marsh Creek on 09/05/07. |
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | NM | Irrigation1 | 04/10/07 | 7:50 | none | |
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | NM | Irrigation2 | 05/22/07 | 7:40 | none | |
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | NM | Irrigation3 | 06/12/07 | 7:50 | none | |

| Station Name | Station Code | Monitoring Event | Season | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | NM | Irrigation4 | 07/10/07 | 7:40 | none | |
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | NM | Irrigation5 | 08/07/07 | 8:10 | none | |
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | Sediment | Irrigation5 | 08/09/07 | 8:40 | none | |
| Terminous Tract Drain @ Hwy 12 | 544XTTHWT | NM | Irrigation6 | 09/04/07 | 7:40 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | NM | Irrigation1 | 04/10/07 | 16:10 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | NM | Irrigation2 | 05/22/07 | 14:20 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | NM | Irrigation3 | 06/12/07 | 14:00 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | NM | Irrigation4 | 07/10/07 | 11:50 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | MPM | Irrigation4 | 07/30/07 | 12:20 | none | Management plan monitoring: Chlorpyrifos |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | NM | Irrigation5 | 08/07/07 | 14:00 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | Sediment | Irrigation5 | 08/09/07 | 12:00 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | Sediment | Irrigation5 | 08/31/07 | 18:20 | none | Resampling event due to *Hyalella azteca* toxicity on 08/09/07. |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | NM | Irrigation6 | 09/04/07 | 12:20 | none | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 531UDLTAJ | MPM | Irrigation6 | 09/25/07 | 9:30 | none | Management plan monitoring: Chlorpyrifos |

## Sampling and Analytical Methods Used

Sampling specifics and instruments used to collect measurements of field parameters and analytical methods are provided below in Table 9- Table 11. All sampling methods were performed as outlined in the Quality Assurance Project Plan (QAPP) Table B-2. That table has been reproduced as Table 9. All analytical methods were performed as described in the QAPP. That table has been reproduced as Table 11. Additional analytical methods were included in Table 11 due to additional monitoring conducted for low dissolved oxygen source identification and as a result of a fish kill in Marsh Creek.

**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 | Store at 4°C; Extract within 7 days | 40 days |
| Organochlorines | Amber Glass | 1 liter | | |
| Organophosphates | Amber Glass | 1 liter | | |
| Pyrethroids | Amber Glass | 1 liter | | |
| Herbicides (general) | Amber Glass | 1 liter | | |
| Herbicides (paraquat) | Polyethylene | 1 liter | | |
| 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 |
| Temperature | YSI Model 556 |
| pH | YSI Model 556 |
| Electrical Conductivity | YSI Model 556 |
| Discharge | Marsh-McBirney Flow Meter |

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

| Analyte | Method | RL | Units |
|---|---|---|---|
| **Physical Parameters** | | | |
| Color | EPA 100.2 | 5.0 | color units |
| Turbidity | EPA 180.1 | 1.0 | NTU |
| Biological Oxygen Demand[1] | EPA 405.1 | 5 | mg/L |
| Dissolved Solids, Total | EPA 160.1 | 10 | mg/L |
| **Drinking Water Parameters** | | | |
| Escherischia coli (*E. coli*) | SM 9223 | 2 | MPN/100 mL |
| Total Organic Carbon | EPA 415.1 | 0.5 | mg/L |
| **Nutrients** | | | |
| Total Kjeldahl Nitrogen | EPA 351.3 | 0.5 | mg/L |
| Nitrate as $NO_3$ | EPA 300.0 | 0.05 | mg/L |
| Nitrite as Nitrogen | EPA 354.1 | 0.05 | mg/L |
| Ammonia | EPA 350.2 | 0.10 | mg/L |
| Hardness | EPA 130.2 | 10 | 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 | 1 | 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 | 0.5 | µg/L |
| Nickel | EPA 200.8 | 1 | µg/L |
| Selenium | EPA 200.8 | 1 | µg/L |
| Zinc | EPA 200.8 | 1 | µg/L |
| **Carbamate Pesticides** | | | |
| Aldicarb | EPA 8321 | 0.5 | µg/L |
| Carbaryl | EPA 8321 | 0.5 | µg/L |
| Carbofuran | EPA 8321 | 0.5 | µg/L |
| Methiocarb | EPA 8321 | 0.5 | µg/L |
| Methomyl | EPA 8321 | 0.5 | µg/L |
| Oxnamyl | EPA 8321 | 0.5 | µg/L |
| **Organochlorine Pesticides** | | | |
| DDD | EPA 8081A | 0.02 | µg/L |
| DDE | EPA 8081A | 0.01 | µg/L |
| DDT | EPA 8081A | 0.01 | µg/L |

| Analyte | Method | RL | Units |
|---|---|---|---|
| Dicofol | EPA 8081A | 0.1 | µg/L |
| Dieldrin | EPA 8081A | 0.01 | µg/L |
| Endrin | EPA 8081A | 0.01 | µg/L |
| Methoxychlor | EPA 8081A | 0.05 | µg/L |
| **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 | 0.2 | µg/L |
| Phosmet | EPA 8141A | 0.2 | µg/L |
| **Pyrethroid Pesticides** | | | |
| Biphenthrin | EPA 8081A | 0.05 | µg/L |
| Cyfluthrin | EPA 8081A | 0.05 | µg/L |
| Cypermethrin | EPA 8081A | 0.05 | µg/L |
| Esfenvalerate | EPA 8081A | 0.05 | µg/L |
| Lambda-Cyhalothrin | EPA 8081A | 0.05 | µg/L |
| Permethrin | EPA 8081A | 0.05 | µg/L |
| **Herbicides** | | | |
| Acrolein[1] | EPA 8260 | 100 | µg/L |
| Atrazine | EPA 619 | 0.5 | µg/L |
| Cyanazine | EPA 619 | 0.5 | µg/L |
| Diuron | EPA 8321 | 0.5 | µg/L |
| Glyphosate | EPA 547 | 5 | µg/L |
| Linuron | EPA 8321 | 0.5 | µg/L |
| Molinate | EPA 8141A | 0.5 | µg/L |
| Paraquat dichloride | EPA 549.1 | 0.5 | µg/L |
| Simazine | EPA 619 | 0.5 | µg/L |
| Thiobencarb | EPA 8141A | 0.5 | µg/L |

[1]Analyzed for special source studies only and not included in the QAPP

## Copy of Chain of Custody Forms

Original chain of custodies (COCs) were scanned into documents and are included as printed pdfs (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 was performed according to the 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.

## Summary of Precision and Accuracy

Normal surface water monitoring occurred six times during the irrigation season of 2007 for 15 sites with the following exceptions due to lack of water:

- Marsh Creek @ Concord Ave (05/22/07, 06/12/07, 07/10/07, 08/07/07, 09/04/07)

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

- Grant Line Canal near Calpack Rd (04/19/07, 07/17/07)
- Kellogg Creek along Hoffman Ln (04/19/07)
- Littlejohns Creek @ Jack Tone Rd (07/17/07)
- Mokelumne River @ Bruella Rd (07/17/07)
- Mormon Slough @ Jack Tone Rd (07/17/07, 09/11/07)
- Roberts Island Drain @ Holt Rd (07/17/07)

Sediment sampling occurred once during the irrigation season during the month of August. The following sites were not sampled due to a lack of water:

- Marsh Creek @ Concord Ave (08/09/07)

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

- French Camp Slough @ Airport Way (08/31/07)
- Kellogg Creek along Hoffman Ln (08/31/07)
- Sand Creek @ Hwy 4 Bypass (08/31/07)
- Unnamed Drain to Lone Tree Creek @ Jack Tone Rd (08/31/07)

During the irrigation season, 16 sites were sampled in addition to normal monitoring for management plan monitoring and special studies (see site subwatershed management plans for details). Management plan and special study sampling occurred 31 times over the 16 sites with the following exceptions due to a lack of water:

- Grant Line Canal @ Clifton Court (07/30/07)

- Marsh Creek @ Concord Ave (06/27/07, 09/25/07)
- Marsh Creek @ Marsh Creek Rd Lower (4/11/07)

### *Chemistry*

Due to the addition of new sites during the irrigation season of 2006, not all sites are sampled for all constituents. For normal monitoring, not including laboratory or field QCs, 87 organic (pesticides), 79 *E. coli*, 85 physical parameter, and 50 nutrient and metal samples were collected and analyzed. There was 100% completeness for environmental samples collected for chemistry analyses except for selenium (36%). Samples were collected for metals analysis including arsenic, boron, cadmium, copper, lead, nickel and selenium, however, due to a COC error during June through September sampling, selenium was not analyzed for 32 of the 50 environmental samples.

For each irrigation event, one field duplicate and field blank were collected for each constituent to meet the field QC requirement of 5%. Since management plan and special study sampling were also conducted during the irrigation season, each constituent varied in the percent of field QCs relative to the overall number of samples collected. Field blanks and duplicates comprised 7% of organic samples, 8% of *E. coli* samples, 7% of physical parameter samples, 11-12% of nutrient samples and 11-12% of metal samples.

For constituents such as color, turbidity, TDS, and metals the values 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 RL is generally increased by multiplying the RL for that analyte by the dilution factor. There are times that the RL is increased higher than this value based on method requirements. 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 in the laboratory comments 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 and posted on the UC Davis Center for Environmental Data Exchange Network (CEDEN) ftp site (ftp://aeal-FTP.ucdavis.edu). 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: One hundred percent of all field blanks and field duplicates met acceptability criteria. Laboratory control spikes and lab blanks were run with each color batch and all met laboratory QC criteria. Lab duplicates were recorded by the laboratory to access precision and 100% had RPDs less than 25.

- Hardness: One hundred percent of field blanks were less than the RL. Eighty-three percent of field duplicates had RPDs less than 25. All laboratory QC met quality criteria. Lab control spikes, matrix spikes, matrix spike duplicates, lab duplicates and lab blanks were run with every batch and all met precision and accuracy requirements.

- Total 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. Laboratory duplicates were analyzed with each batch and met acceptance criteria for 100% of samples. Lab control spikes and matrix spikes cannot be performed for TDS.

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

- Nitrate as N: Eighty-three percent of field duplicates and 92% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL for all samples. Laboratory control spikes and laboratory duplicates were within acceptability criteria for all batches. Matrix spikes and matrix spike duplicates were performed in each batch and 100% of the samples met acceptability requirements for accuracy and precision.

- Ammonia as N: Fifty percent of field duplicates and 100% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Nitrogen, Total Kjeldahl (TKN): One hundred percent of field blanks and 83% of field duplicates met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes and laboratory duplicates were within acceptability criteria for all batches. Matrix spikes were performed in each batch with 97% meeting acceptability requirements. One hundred percent of matrix spike duplicates met acceptability requirements for precision.

- Nitrite as N: One hundred percent of field duplicates and field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Orthophosphate as P: One hundred percent of field duplicates and 92% of field blanks met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes were within acceptability criteria for all batches. Matrix spike samples met acceptability criteria for 93% of the samples analyzed. One hundred percent of matrix spike duplicates were within acceptability criteria for precision.

- Phosphate as P: One hundred percent of field blanks and 83% of field duplicates met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Matrix spike samples met acceptability criteria for 92% of the samples analyzed. One hundred percent of matrix spike duplicates were within acceptability criteria for precision.

- Biological Oxygen Demand (BOD): One hundred percent of field duplicates and blanks collected met acceptance criteria. Lab control spikes and lab duplicates were run each batch and met all acceptance criteria for accuracy and precision.

- Total Organic Carbon (TOC): One hundred percent of field duplicates and field blanks collected met acceptance criteria. Lab blanks were run with every batch and were less than the RL. Lab control spikes and laboratory duplicates were within acceptability criteria for all batches. Lab control spikes, matrix spikes and matrix spike duplicates were within acceptability criteria for all batches meeting requirements of accuracy and precision.

- Total Metals: One hundred percent of field duplicates met field precision criteria except for cadmium (67%) and zinc (83%). All field blanks, except for copper and

zinc, met acceptance criteria. Sixty-seven percent of boron and 83% of zinc field blanks were less than the reporting limit or one fifth of the environmental sample. Due to detections in field blanks during the irrigation and storm season, travel blanks were sent from the lab and traveled with the sampling crew from beginning to end. All travel blanks met acceptability criteria of being less than the RL except for the following metals (percent within acceptability criteria is noted within parenthesis): boron (50%), copper (80%), and zinc (80%). Laboratory blanks were run for each metals batch and 100% of samples met acceptability. Laboratory control spikes were within acceptable recovery limits for 100% of samples run. Matrix spike recovery was within control limits for all samples except for boron. Eighty-nine percent of the boron matrix spikes were within control limits (PR 75-125). All matrix spike duplicates met acceptability criteria.

- *E. coli:* Sterility checks, or laboratory blanks, negative control and positive control samples were run for each batch. One hundred percent of lab blanks performed by the laboratory were less than the RL. One hundred percent of field blanks collected had *E. coli* numbers less than the RL of 1. $R_{log}$s were performed on *E. coli* laboratory 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 Rlogs below the criteria acceptance level. RPDs were also calculated for E. coli laboratory duplicates and 100% were less than 25. 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 field blanks and field duplicates collected met acceptability criteria except for DDT which was detected in one field blank. For the irrigation season pesticides were analyzed in 8 different groups: pyrethroids (EPA 8081A), organochlorines (EPA 8081A), organophosphates (EPA 8141A), carbamates (EPA 8321A), methamidophos (EPA 8141A), paraquat (EPA 549.2), glyphosate (EPA 547), and triazines (EPA 619). Lab blanks were performed for each batch and met acceptability criteria for contamination for all analysis. Matrix spikes and lab control spikes were performed for each batch to assess precision and accuracy as well as possible matrix interference. Either a matrix spike duplicate and/or a lab control spike duplicate were performed per batch to assess precision. Surrogates were run for each analysis except for paraquat and glyphosate. Surrogate recoveries were within specific acceptance criteria for 95% of all samples analyzed. Laboratory control spikes and

laboratory control spike duplicates were within acceptability criteria for 100% for all analytes. Laboratory precision assessed by the RPD of laboratory duplicates, met acceptability criteria in 92% of lab control spike samples for all analytes and 97% of matrix spike duplicates for all samples. Matrix spikes were within acceptability criteria for 91% of samples run. 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.

Hold times for all chemistry analysis were met except for one sample analyzed for nitrate due to a lab 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 management plan samples and resamples due to toxicity during normal monitoring. The overall percentage of field duplicates are as follows: *Ceriodaphnia* 6%, *Pimephales* 6%, *Selenastrum* 6% and *Hyallela* 5%.

- Water Column Toxicity: Field duplicates were collected during each irrigation event and were tested for *Ceriodaphnia, Selenastrum, and Pimephales*. For these three species RPDs for all field duplicates were within acceptability criteria (RPD < 25). All tests met holding time requirements (<36 hrs) except for one sample which was run outside of hold time for *Ceriodaphnia* due to lab error. Water quality requirements and control requirements (as listed in the EPA method guidelines) were met for all samples analyzed.

- Sediment Toxicity: Sediment was collected on August 9, 2007 and resampled on August 31, 2007. One field duplicate was collected and was within acceptability criteria. One hundred percent of the sediment samples had laboratory controls within acceptability criteria. All sediment samples met holding time criteria. The holding temperature for *Hyallela* samples is 4°C. Sediment samples were received at 9°C by the laboratory. The laboratory does not feel that this affected the toxicity testing performed on these samples. Once received the samples were moved into a 4°C refrigerator.

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

Samples were collected during the irrigation season of 2007 and 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 | <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 OCH | DDD(p,p') | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | <RL or < (env sample/5) | 7 | 6 | 85.71 |
| EPA 8081A OCH | Dicofol | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A OCH | Dieldrin | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A OCH | Endrin | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A OCH | Methoxychlor | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A PYR | Cyfluthrin, total | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A PYR | Cypermethrin, total | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 8081A PYR | Permethrin, total | <RL or < (env sample/5) | 7 | 7 | 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 |
| 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 | 6 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| 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 | 6 | 100.00 |
| 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 405.1 | BOD | <RL or < (env sample/5) | 2 | 2 | 100.00 |
| EPA 415.1 | Total Organic Carbon | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| 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 | 4 | 66.67 |
| 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) | 2 | 2 | 100.00 |
| EPA 200.8 | Zinc | <RL or < (env sample/5) | 6 | 5 | 83.33 |
| | | | | | |
| | | **TOTAL** | **365** | **361** | **98.90** |

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

Samples were collected during the irrigation season of 2007 and 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 | 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 OCH | DDD(p,p') | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dicofol | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dieldrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Endrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Methoxychlor | RPD ≤ 25 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyfluthrin, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cypermethrin, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | 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 | 6 | 100.00 |
| 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 |
| 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 | 6 | 100.00 |
| EPA 130.2 | Hardness as CaCO3 | RPD ≤ 25 | 6 | 5 | 83.33 |
| EPA 160.1 | Total Dissolved Solids | RPD ≤ 25 | 6 | 6 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 180.1 | Turbidity | RPD ≤ 25 | 6 | 5 | 83.33 |
| EPA 300.0 | Nitrate as N | RPD ≤ 25 | 6 | 5 | 83.33 |
| EPA 350.2 | Ammonia as N | RPD ≤ 25 | 6 | 3 | 50.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | RPD ≤ 25 | 6 | 5 | 83.33 |
| EPA 354.1 | Nitrite as N | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 365.2 | Phosphate as P | RPD ≤ 25 | 6 | 5 | 83.33 |
| EPA 405.1 | BOD | RPD ≤ 25 | 2 | 2 | 100.00 |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | 6 | 6 | 100.00 |
| SM 9223 | *E. coli* | RPD ≤ 25 | 6 | 6 | 100.00 |
| | | | | | |
| 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 | 4 | 66.67 |
| 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 | 2 | 2 | 100.00 |
| EPA 200.8 | Zinc | RPD ≤ 25 | 6 | 5 | 83.33 |
| | | | | | |
| | | **TOTAL** | **352** | **341** | **96.88** |

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

Samples were analyzed in batches with samples collected during the irrigation season of 2007 and are sorted by method and analyte.

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8260B | Acrolein | <RL | 1 | 1 | 100.00 |
| | | | | | |
| 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 | 11 | 11 | 100.00 |
| EPA 549.2M | Paraquat dichloride | <RL | 9 | 9 | 100.00 |
| | | | | | |
| EPA 8081A OCH | DDD(p,p') | <RL | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | <RL | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | <RL | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dicofol | <RL | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dieldrin | <RL | 7 | 7 | 100.00 |
| EPA 8081A OCH | Endrin | <RL | 6 | 6 | 100.00 |
| EPA 8081A OCH | Methoxychlor | <RL | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | <RL | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyfluthrin, total | <RL | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cypermethrin, total | <RL | 6 | 6 | 100.00 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | <RL | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | <RL | 8 | 8 | 100.00 |
| EPA 8081A PYR | Permethrin, total | <RL | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | <RL | 7 | 7 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | <RL | 10 | 10 | 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 | 7 | 7 | 100.00 |
| EPA 130.2 | Hardness as CaCO3 | <RL | 14 | 14 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | <RL | 10 | 10 | 100.00 |
| EPA 180.1 | Turbidity | <RL | 8 | 8 | 100.00 |
| EPA 300.0 | Nitrate as N | <RL | 11 | 11 | 100.00 |
| EPA 350.2 | Ammonia as N | <RL | 12 | 12 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | <RL | 15 | 15 | 100.00 |
| EPA 354.1 | Nitrite as N | <RL | 7 | 7 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | <RL | 7 | 7 | 100.00 |
| EPA 365.2 | Phosphate as P | <RL | 8 | 8 | 100.00 |
| EPA 405.1 | BOD | <RL | | | NA |
| EPA 415.1 | Total Organic Carbon | <RL | 10 | 10 | 100.00 |
| SM 9223 | *E. coli* | <RL | 7 | 7 | 100.00 |
| | | | | | |
| EPA 200.8 | Arsenic | <RL | 12 | 12 | 100.00 |
| EPA 200.8 | Boron | <RL | 14 | 14 | 100.00 |
| EPA 200.8 | Cadmium | <RL | 12 | 12 | 100.00 |
| EPA 200.8 | Copper | <RL | 16 | 16 | 100.00 |
| EPA 200.8 | Lead | <RL | 12 | 12 | 100.00 |
| EPA 200.8 | Nickel | <RL | 12 | 12 | 100.00 |
| EPA 200.8 | Selenium | <RL | 5 | 5 | 100.00 |
| EPA 200.8 | Zinc | <RL | 13 | 13 | 100.00 |
| | | | | | |
| | | **TOTAL** | **484** | **484** | **100.00** |

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

Laboratory control spikes and laboratory control spike duplicates were analyzed in batches with samples collected during the irrigation season of 2007 and are sorted by method and analyte.

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8260B | Acrolein | PR 52-144 | 2 | 2 | 100.00 |
| | | | | | |
| EPA 8321A CARB | Aldicarb | PR 31-133 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Carbaryl | PR 44-133 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Carbofuran | PR 36-165 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Methiocarb | PR35-142 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Methomyl | PR 23-152 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Oxamyl | PR 10-117 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Diuron | PR 52-136 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Linuron | PR 49-144 | 7 | 7 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | PR 39-156 | 7 | 7 | 100.00 |
| EPA 619 | Cyanazine | PR 22-172 | 7 | 7 | 100.00 |
| EPA 619 | Simazine | PR 21-179 | 7 | 7 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | PR 76-117 | 22 | 22 | 100.00 |
| EPA 549.2M | Paraquat dichloride | PR 50-126 | 18 | 18 | 100.00 |
| | | | | | |
| EPA 8081A OCH | DDD(p,p') | PR 38-135 | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | PR 21-134 | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | PR 18-145 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dicofol | PR 40-135 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dieldrin | PR 18-121 | 7 | 7 | 100.00 |
| EPA 8081A OCH | Endrin | PR 24-143 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Methoxychlor | PR 30-163 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | PR 52-117 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyfluthrin | PR 53-125 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cypermethrin | PR 55-107 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | PR 52-117 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | PR 62-104 | 10 | 10 | 100.00 |
| EPA 8081A PYR | Permethrin, total | PR 24-166 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | PR 36-189 | 7 | 7 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | PR 61-125 | 13 | 13 | 100.00 |
| EPA 8141A OP | Diazinon | PR 57-130 | 7 | 7 | 100.00 |
| EPA 8141A OP | Dimethoate | PR 68-202 | 7 | 7 | 100.00 |
| EPA 8141A OP | Disulfoton | PR 47-117 | 7 | 7 | 100.00 |
| EPA 8141A OP | Malathion | PR 47-125 | 7 | 7 | 100.00 |
| EPA 8141A OP | Methidathion | PR 50-150 | 7 | 7 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | PR 55-164 | 7 | 7 | 100.00 |
| EPA 8141A OP | Phorate | PR 44-117 | 7 | 7 | 100.00 |
| EPA 8141A OP | Phosmet | PR 50-150 | 7 | 7 | 100.00 |
| EPA 8141A OP | Molinate | PR 50-150 | 7 | 7 | 100.00 |
| EPA 8141A OP | Thiobencarb | PR 50-150 | 7 | 7 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | PR 40-135 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 110.2 | Color | PR 80-120 | 5 | 5 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 130.2 | Hardness as CaCO3 | PR 80-120 | 14 | 14 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | PR 80-120 | 10 | 10 | 100.00 |
| EPA 180.1 | Turbidity | PR 80-120 | 6 | 6 | 100.00 |
| EPA 300.0 | Nitrate as N | PR 80-120 | 11 | 11 | 100.00 |
| EPA 350.2 | Ammonia as N | PR 80-120 | 12 | 12 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | PR 80-120 | 15 | 15 | 100.00 |
| EPA 354.1 | Nitrite as N | PR 80-120 | 7 | 7 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | PR 80-120 | 7 | 7 | 100.00 |
| EPA 365.2 | Phosphate as P | PR 80-120 | 8 | 8 | 100.00 |
| EPA 405.1 | BOD | PR 80-120 | 2 | 2 | 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 75-125 | 12 | 12 | 100.00 |
| EPA 200.8 | Boron | PR 75-125 | 14 | 14 | 100.00 |
| EPA 200.8 | Cadmium | PR 75-125 | 12 | 12 | 100.00 |
| EPA 200.8 | Copper | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Lead | PR 75-125 | 12 | 12 | 100.00 |
| EPA 200.8 | Nickel | PR 75-125 | 12 | 12 | 100.00 |
| EPA 200.8 | Selenium | PR 75-125 | 5 | 5 | 100.00 |
| EPA 200.8 | Zinc | PR 75-125 | 13 | 13 | 100.00 |
| | | | | | |
| | | **TOTAL** | **501** | **501** | **100.00** |

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

Laboratory control spikes and laboratory control spike duplicates were analyzed in batches with samples collected during the irrigation season of 2007 and are sorted by method and analyte.

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8260B | Acrolein | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| 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 |
| | | | | | NA |
| EPA 619 | Atrazine | RPD ≤ 25 | | | NA |
| EPA 619 | Cyanazine | RPD ≤ 25 | | | NA |
| EPA 619 | Simazine | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 547M | Glyphosate | RPD ≤ 25 | 11 | 11 | 100.00 |
| EPA 549.2M | Paraquat dichloride | RPD ≤ 25 | 9 | 7 | 77.78 |
| | | | | | |
| EPA 8081A OCH | DDD(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | DDE(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | DDT(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Dicofol | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Dieldrin | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Endrin | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Methoxychlor | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Cyfluthrin | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Cypermethrin | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Cyhalothrin, lambda, total | RPD ≤ 25 | 2 | 2 | 100.00 |
| EPA 8081A PYR | Permethrin, total | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Chlorpyrifos | RPD ≤ 25 | 3 | 3 | 100.00 |
| 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 |
| EPA 8141A OP | Molinate | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Thiobencarb | RPD ≤ 25 | | | NA |

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| | | | | | |
| EPA 8141A OP | Methamidophos | RPD ≤ 25 | | | NA |
| | | | | | |
| 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 405.1 | BOD | 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** | **26** | **24** | **92.31** |

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

Matrix spikes and matrix spike duplicates were collected during the irrigation season of 2007. 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 8260B | Acrolein | PR 52-144 | 2 | 0 | 0.00 |
| | | | | | |
| EPA 8321A CARB | Aldicarb | PR 31-133 | 14 | 14 | 100.00 |
| EPA 8321A CARB | Carbaryl | PR 44-133 | 14 | 14 | 100.00 |
| EPA 8321A CARB | Carbofuran | PR 36-165 | 14 | 14 | 100.00 |
| EPA 8321A CARB | Methiocarb | PR 35-142 | 14 | 14 | 100.00 |
| EPA 8321A CARB | Methomyl | PR 23-152 | 14 | 14 | 100.00 |
| EPA 8321A CARB | Oxamyl | PR 10-117 | 14 | 14 | 100.00 |
| EPA 8321A CARB | Diuron | PR 56-136 | 14 | 12 | 85.71 |
| EPA 8321A CARB | Linuron | PR 49-144 | 14 | 12 | 85.71 |
| | | | | | |
| EPA 619 | Atrazine | PR 39-156 | 14 | 14 | 100.00 |
| EPA 619 | Cyanazine | PR 22-172 | 14 | 14 | 100.00 |
| EPA 619 | Simazine | PR 21-179 | 14 | 12 | 85.71 |
| | | | | | |
| EPA 547M | Glyphosate | PR 76-117 | 22 | 22 | 100.00 |
| EPA 549.2M | Paraquat dichloride | PR 50-126 | 18 | 17 | 94.44 |
| | | | | | |
| EPA 8081A OCH | DDD(p,p') | PR 38-135 | 12 | 12 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | PR 21-134 | 12 | 12 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | PR 18-145 | 12 | 12 | 100.00 |
| EPA 8081A OCH | Dicofol | PR 40-135 | 12 | 12 | 100.00 |
| EPA 8081A OCH | Dieldrin | PR 18-121 | 14 | 14 | 100.00 |
| EPA 8081A OCH | Endrin | PR 24-143 | 12 | 12 | 100.00 |
| EPA 8081A OCH | Methoxychlor | PR 30-163 | 12 | 12 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | PR 52-117 | 12 | 12 | 100.00 |
| EPA 8081A PYR | Cyfluthrin | PR 53-125 | 12 | 10 | 83.33 |
| EPA 8081A PYR | Cypermethrin | PR 55-107 | 12 | 5 | 41.67 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | PR 52-117 | 12 | 6 | 50.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | PR 62-104 | 12 | 4 | 33.33 |
| EPA 8081A PYR | Permethrin, total | PR 24-166 | 12 | 12 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | PR 36-189 | 14 | 14 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | PR 61-125 | 14 | 13 | 92.86 |
| EPA 8141A OP | Diazinon | PR 57-130 | 14 | 14 | 100.00 |
| EPA 8141A OP | Dimethoate | PR 68-202 | 14 | 14 | 100.00 |
| EPA 8141A OP | Disulfoton | PR 47-117 | 14 | 13 | 92.86 |
| EPA 8141A OP | Malathion | PR 47-125 | 14 | 10 | 71.43 |
| EPA 8141A OP | Methidathion | PR 50-150 | 14 | 10 | 71.43 |
| EPA 8141A OP | Parathion, Methyl | PR 55-164 | 14 | 14 | 100.00 |
| EPA 8141A OP | Phorate | PR 44-117 | 14 | 14 | 100.00 |
| EPA 8141A OP | Phosmet | PR 50-150 | 14 | 14 | 100.00 |
| EPA 8141A OP | Molinate | PR 50-150 | 14 | 12 | 85.71 |
| EPA 8141A OP | Thiobencarb | PR 50-150 | 14 | 14 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | PR 40-135 | 12 | 10 | 83.33 |
| | | | | | |
| EPA 110.2 | Color | PR 80-120 | | | NA |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 130.2 | Hardness as CaCO3 | PR 80-120 | 28 | 28 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | PR 80-120 | | | NA |
| EPA 180.1 | Turbidity | PR 80-120 | | | NA |
| EPA 300.0 | Nitrate as N | PR 80-120 | 21 | 21 | 100.00 |
| EPA 350.2 | Ammonia as N | PR 80-120 | 24 | 24 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | PR 80-120 | 29 | 28 | 96.55 |
| EPA 354.1 | Nitrite as N | PR 80-120 | 14 | 14 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | PR 80-120 | 14 | 13 | 92.86 |
| EPA 365.2 | Phosphate as P | PR 80-120 | 16 | 14 | 87.50 |
| EPA 405.1 | BOD | PR 80-120 | | | NA |
| EPA 415.1 | Total Organic Carbon | PR 80-120 | 26 | 24 | 92.31 |
| SM 9223 | *E. coli* | PR 80-120 | | | NA |
| | | | | | |
| EPA 200.8 | Arsenic | PR 75-125 | 22 | 22 | 100.00 |
| EPA 200.8 | Boron | PR 75-125 | 28 | 25 | 89.29 |
| EPA 200.8 | Cadmium | PR 75-125 | 22 | 22 | 100.00 |
| EPA 200.8 | Copper | PR 75-125 | 30 | 30 | 100.00 |
| EPA 200.8 | Lead | PR 75-125 | 22 | 22 | 100.00 |
| EPA 200.8 | Nickel | PR 75-125 | 22 | 22 | 100.00 |
| EPA 200.8 | Selenium | PR 75-125 | 12 | 12 | 100.00 |
| EPA 200.8 | Zinc | PR 75-125 | 24 | 24 | 100.00 |
| | | | | | |
| | | **TOTAL** | **888** | **833** | **93.81** |

**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 2007. 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 8260B | Acrolein | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| EPA 8321A CARB | Aldicarb | RPD ≤ 25 | 7 | 6 | 85.71 |
| EPA 8321A CARB | Carbaryl | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Carbofuran | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Methiocarb | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Methomyl | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Oxamyl | RPD ≤ 25 | 7 | 6 | 85.71 |
| EPA 8321A CARB | Diuron | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8321A CARB | Linuron | RPD ≤ 25 | 7 | 7 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 619 | Cyanazine | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 619 | Simazine | RPD ≤ 25 | 7 | 6 | 85.71 |
| | | | | | |
| EPA 547M | Glyphosate | RPD ≤ 25 | 11 | 11 | 100.00 |
| EPA 549.2M | Paraquat dichloride | RPD ≤ 25 | 9 | 6 | 66.67 |
| | | | | | |
| EPA 8081A OCH | DDD(p,p') | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dicofol | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Dieldrin | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8081A OCH | Endrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A OCH | Methoxychlor | RPD ≤ 25 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyfluthrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cypermethrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A PYR | Permethrin, total | RPD ≤ 25 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Diazinon | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Dimethoate | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Disulfoton | RPD ≤ 25 | 7 | 6 | 85.71 |
| EPA 8141A OP | Malathion | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Methidathion | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Phorate | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Phosmet | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 8141A OP | Molinate | RPD ≤ 25 | 7 | 6 | 85.71 |
| EPA 8141A OP | Thiobencarb | RPD ≤ 25 | 7 | 7 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | RPD ≤ 25 | 6 | 5 | 83.33 |

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| | | | | | |
| EPA 110.2 | Color | RPD ≤ 25 | | | NA |
| EPA 130.2 | Hardness as CaCO3 | RPD ≤ 25 | 14 | 14 | 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 | 10 | 10 | 100.00 |
| EPA 350.2 | Ammonia as N | RPD ≤ 25 | 12 | 12 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | RPD ≤ 25 | 14 | 14 | 100.00 |
| EPA 354.1 | Nitrite as N | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 365.2 | Phosphate as P | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 405.1 | BOD | RPD ≤ 25 | | | NA |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | 13 | 13 | 100.00 |
| SM 9223 | *E. coli* | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 200.8 | Arsenic | RPD ≤ 25 | 11 | 11 | 100.00 |
| EPA 200.8 | Boron | RPD ≤ 25 | 14 | 14 | 100.00 |
| EPA 200.8 | Cadmium | RPD ≤ 25 | 11 | 11 | 100.00 |
| EPA 200.8 | Copper | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 200.8 | Lead | RPD ≤ 25 | 11 | 11 | 100.00 |
| EPA 200.8 | Nickel | RPD ≤ 25 | 11 | 11 | 100.00 |
| EPA 200.8 | Selenium | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 200.8 | Zinc | RPD ≤ 25 | 12 | 12 | 100.00 |
| | | | | | |
| | | **TOTAL** | **443** | **434** | **97.97** |

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

Samples were analyzed in batches with samples collected during the irrigation season of 2007, and also include NONAG matrix spikes included for batch quality assurance purposes, and are sorted by method and analyte.

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8260B | Acrolein | RPD ≤ 25 | | | NA |
| | | | | | |
| 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 OCH | DDD(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | DDE(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | DDT(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Dicofol | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Dieldrin | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Endrin | RPD ≤ 25 | | | NA |
| EPA 8081A OCH | Methoxychlor | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Cyfluthrin, total | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Cypermethrin, total | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | Cyhalothrin, lambda, total | RPD ≤ 25 | | | NA |
| EPA 8081A PYR | 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 |
| 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 | 7 | 7 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 130.2 | Hardness as CaCO3 | RPD ≤ 25 | | | NA |
| EPA 160.1 | Total Dissolved Solids | RPD ≤ 25 | 10 | 10 | 100.00 |
| EPA 180.1 | Turbidity | RPD ≤ 25 | 8 | 8 | 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 405.1 | BOD | RPD ≤ 25 | 3 | 3 | 100.00 |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | | | NA |
| SM 9223 | *E. coli* | RPD ≤ 25 | 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** | **34** | **34** | **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 2007 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 | 196 | 191 | 97.45 |
| EPA 8321A CARB | Tributylphosphate(Surrogate) | RPD ≤ 25; PR 36-140 | 196 | 177 | 90.31 |
| EPA 8321A CARB | Triphenyl phosphate(Surrogate) | RPD ≤ 25; PR 36-140 | | | NA |
| | | | | | |
| EPA 619 | Tributylphosphate(Surrogate) | RPD ≤ 25; PR 36-148 | 196 | 177 | 90.31 |
| EPA 619 | Triphenyl phosphate(Surrogate) | RPD ≤ 25; PR 36-148 | 196 | 196 | 100.00 |
| | | | | | |
| EPA 8081A OCH | Decachlorobiphenyl(Surrogate) | RPD ≤ 25; PR 24-114 | 201 | 201 | 100.00 |
| EPA 8081A OCH | Tetrachloro-m-xylene(Surrogate) | RPD ≤ 25; PR 24-114 | 201 | 196 | 97.51 |
| | | | | | |
| EPA 8081A PYR | Decachlorobiphenyl(Surrogate) | RPD ≤ 25; PR 24-114 | 67 | 67 | 100.00 |
| EPA 8081A PYR | Tetrachloro-m-xylene(Surrogate) | RPD ≤ 25; PR 24-114 | 67 | 67 | 100.00 |
| | | | | | |
| EPA 8141A OP | Tributylphosphate(Surrogate) | RPD ≤ 25; PR 56-150 | 413 | 382 | 92.49 |
| EPA 8141A OP | Triphenyl phosphate(Surrogate) | RPD ≤ 25; PR 56-150 | 413 | 394 | 95.40 |
| | | | | | |
| | | TOTAL | 2146 | 2048 | 95.43 |

**Table 21. SJCDWQC summary of holding time evaluations for environmental, field blank, field duplicate and matrix spike samples collected during the irrigation season of 2007; sorted by method and analyte.**

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8260B | Acrolein | 7 days | 3 | 3 | 100.00 |
| | | | | | |
| EPA 8321A CARB | Aldicarb | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Carbaryl | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Carbofuran | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Methiocarb | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Methomyl | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Oxamyl | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Diuron | 7 days | 106 | 106 | 100.00 |
| EPA 8321A CARB | Linuron | 7 days | 106 | 106 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | 7 days | 106 | 106 | 100.00 |
| EPA 619 | Cyanazine | 7 days | 106 | 106 | 100.00 |
| EPA 619 | Simazine | 7 days | 106 | 106 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | 14 days | 108 | 108 | 100.00 |
| EPA 549.2M | Paraquat dichloride | 7 days | 106 | 106 | 100.00 |
| | | | | | |
| EPA 8081A OCH | DDD(p,p') | 7 days | 104 | 104 | 100.00 |
| EPA 8081A OCH | DDE(p,p') | 7 days | 104 | 104 | 100.00 |
| EPA 8081A OCH | DDT(p,p') | 7 days | 104 | 104 | 100.00 |
| EPA 8081A OCH | Dicofol | 7 days | 104 | 104 | 100.00 |
| EPA 8081A OCH | Dieldrin | 7 days | 107 | 107 | 100.00 |
| EPA 8081A OCH | Endrin | 7 days | 104 | 104 | 100.00 |
| EPA 8081A OCH | Methoxychlor | 7 days | 104 | 104 | 100.00 |
| | | | | | |
| EPA 8081A PYR | Bifenthrin | 7 days | 104 | 104 | 100.00 |
| EPA 8081A PYR | Cyfluthrin | 7 days | 104 | 104 | 100.00 |
| EPA 8081A PYR | Cypermethrin | 7 days | 104 | 104 | 100.00 |
| EPA 8081A PYR | Esfenvalerate/Fenvalerate, total | 7 days | 104 | 104 | 100.00 |
| EPA 8081A PYR | Cyhalothrin, lambda, total | 7 days | 107 | 107 | 100.00 |
| EPA 8081A PYR | Permethrin, total | 7 days | 104 | 104 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | 7 days | 117 | 117 | 100.00 |
| EPA 8141A OP | Diazinon | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Dimethoate | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Disulfoton | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Malathion | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Methidathion | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Phorate | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Phosmet | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Molinate | 7 days | 106 | 106 | 100.00 |
| EPA 8141A OP | Thiobencarb | 7 days | 106 | 106 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | 7 days | 103 | 103 | 100.00 |
| | | | | | |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 110.2 | Color | 48 hours | 97 | 97 | 100.00 |
| EPA 130.2 | Hardness as CaCO3 | 6 months | 81 | 81 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | 48 hours | 98 | 98 | 100.00 |
| EPA 180.1 | Turbidity | 48 hours | 97 | 97 | 100.00 |
| EPA 300.0 | Nitrate as N | 48 hours | 78 | 77 | 98.72 |
| EPA 350.2 | Ammonia as N | Field acidify, 28 days | 75 | 75 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | Field acidify, 28 days | 76 | 76 | 100.00 |
| EPA 354.1 | Nitrite as N | 48 hours | 74 | 74 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | 48 hours | 74 | 74 | 100.00 |
| EPA 365.2 | Phosphate as P | Field acidify, 28 days | 69 | 69 | 100.00 |
| EPA 405.1 | BOD | 48 hours | 33 | 33 | 100.00 |
| EPA 415.1 | Total Organic Carbon | 28 days | 110 | 110 | 100.00 |
| SM 9223 | *E. coli* | 24 hours | 91 | 91 | 100.00 |
| | | | | | |
| EPA 200.8 | Arsenic | Field acidify, 40 days | 73 | 73 | 100.00 |
| EPA 200.8 | Boron | Field acidify, 40 days | 76 | 76 | 100.00 |
| EPA 200.8 | Cadmium | Field acidify, 40 days | 73 | 73 | 100.00 |
| EPA 200.8 | Copper | Field acidify, 40 days | 82 | 82 | 100.00 |
| EPA 200.8 | Lead | Field acidify, 40 days | 73 | 73 | 100.00 |
| EPA 200.8 | Nickel | Field acidify, 40 days | 73 | 73 | 100.00 |
| EPA 200.8 | Selenium | Field acidify, 40 days | 28 | 28 | 100.00 |
| EPA 200.8 | Zinc | Field acidify, 40 days | 74 | 74 | 100.00 |
| | | | | | |
| | | **TOTAL** | **5732** | **5731** | **99.98** |

**Table 22. SJCDWQC summary of toxicity retest evaluations due to failed toxicity criteria for samples collected during the irrigation season of 2007; sorted by method and species.**

| Method | Toxicity Species | Total Environmental Samples | Total Number Retested | Percent Samples Within Acceptable Criteria |
|---|---|---|---|---|
| EPA 821/R-02-012 | *Ceriodaphnia dubia* | 102 | 0 | 100.00 |
| EPA 821/R-02-012 | *Pimephales promelas* | 95 | 0 | 100.00 |
| EPA 821/R-02-013 | *Selenastrum capricornutum* | 101 | 0 | 100.00 |
| EPA 600/R-99-064 | *Hyalella azteca* | 19 | 0 | 100.00 |

**Table 23. SJCDWQC summary of toxicity field duplicate sample evaluations collected during the irrigation season of 2007; sorted by method and species.**

| Method | Toxicity Species | Total Field Duplicate Samples | Data Quality Objective (DQO) | Total Number Sample 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 | 6 | 100.00 |
| EPA 600/R-99-064 | *Hyalella azteca* | 1 | RPD ≤ 25 | 1 | 100.00 |

## Pesticide Use Information

All exceedances for the 2007 irrigation sampling are provided in Table 27 to Table 31 in the following section, Data Interpretation. Pesticide use reports (PURs) for April - September 2007 were requested from all the counties within the Coalition region. These PUR data can be found in Appendix IV. No PUR data for Contra Costa County are available for the irrigation season and therefore are not included in this report. These data will be included as an amendment to this report as soon as we can obtain and process them.

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) was collected for the specific site subwatersheds based on Township-Range-Section (TRS). All pesticide products that contained the chemicals and metals detected are listed by site subwatershed and applications are provided on maps. 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. Where consecutive exceedances are reported and more than one month of data is provided, only pesticide use from the previous monitoring date is provided. The maps show only the additional use.

Dieldrin exceedances are not listed below since there are no registered products with this active ingredient, and nitrate/nitrite/nitrogen 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

A summary of exceedances that occurred during monitoring over the 2007 irrigation season is presented in Table 27 to Table 31. Water quality triggers (WQTs) used to determine exceedances are provided in Table 26.

Discrepancies exist between exceedances reported in this document and those submitted as exceedance reports to the CVRWQCB during the 2007 irrigation monitoring season. The discrepancies are a result of either data entry errors or a change of water quality triggers, and include detections that were either not reported in official exceedance reports or that were reported incorrectly (Table 25).

Field exceedances that were not reported include one pH exceedance at Duck Creek @ Hwy 4 (June 12) and exceedances in DO and EC from the resampling event at Sand Creek @ Hwy 4 Bypass (August 31). There were six exceedances of metals and physical parameter WQTs that were not reported as a result of oversight at the time of data review. These include one lead exceedance experienced in samples collected from French Camp Slough @ Airport Way (June 12), two arsenic exceedances from Grant Line Canal @ Clifton Court Rd and Grant Line Canal near Calpack Rd (September 4), one color exceedance in a field duplicate sample collected from French Camp Slough @ Airport Way, and two TDS exceedances from Grant Line Canal @ Clifton Court Rd and Grant Line Canal near Calpack Rd (April 11). One sample that tested toxic during the resampling event at Grant Line Canal near Calpack Rd (April 19) also went unreported as a result of a miscommunication with the laboratory.

On October 9, 2007 the CVRWQCB provided the Coalition with an updated interim table of WQT limits for agricultural supply. The Coalition is retroactively reporting amended exceedances according to the new limits for constituents for which the limit was reduced. The WQT limit for diuron was reduced from 14 µg/L to 2 µg/L. As a result, samples containing less than 14 µg/L but greater than 2 µg/L of diuron were not reported prior to October 9, 2007. These include two samples collected from Roberts Island Drain @ Holt Rd and Grant Line Canal near Calpack Rd on July 10 and August 7, respectively.

In addition, discrepancies are apparent 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 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. As a result, the percentages reported in the initial exceedance reports may vary slightly from the final exceedances shown below.

**Table 25. Exceedance discrepancies that occurred during the 2007 irrigation season.**

Results are sorted by date.

| Station Name | Sample Date | Oxygen, Dissolved, mg/L | Specific Conductivity, µS/cm | pH, none | DDT (p,p'), µg/L | Diuron, µg/L | Lead, µg/L | Arsenic, µg/L | Color, color units | Total Dissolved Solids, mg/L | *Selenastrum capricornutum* (% control) | Discrepancy Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grant Line Canal near Calpack Rd - FD | 04/11/07 | | | | | | | | | 660 | | Reported incorrectly (1100 mg/L) |
| Grant Line Canal near Calpack Rd | 04/11/07 | | | | | | | | | 610 | | Reported incorrectly (1100 mg/L) |
| Grant Line Canal near Calpack Rd | 04/19/07 | | | | | | | | | | 89 | Not reported, lab mis-communication |
| Duck Creek @ Hwy 4 | 06/12/07 | | | 8.66 | | | | | | | | Not reported |
| French Camp Slough @ Airport Way | 06/12/07 | | | | | | 1.2 | | | | | Not reported |
| French Camp Slough @ Airport Way - FB | 07/10/07 | | | | 0.016 | | | | | | | QC sample contamination; not reported |
| French Camp Slough @ Airport Way - FD | 07/10/07 | | | | | | | | 30 | | | Not reported; corresponding environmental sample was reported |
| Roberts Island Drain @ Holt Rd | 07/10/07 | | | | | 4.8 | | | | | | WQT was 110 ug/L at time of analysis; not reported |
| Grant Line Canal near Calpack Rd | 08/07/07 | | | | | 2.8 | | | | | | Not reported due to WQT change from 110 ug/L to 2 ug/L |
| Sand Creek @ Hwy 4 Bypass | 08/31/07 | 5.77 | 1522 | | | | | | | | | Not reported |
| Grant Line Canal @ Clifton Court Rd | 09/04/07 | | | | | | | 14 | | | | Not reported |
| Grant Line Canal near Calpack Rd | 09/04/07 | | | | | | | 12 | | | | Not reported |

FB = field blank
FD = field duplicate
WQT = water quality trigger

**Table 26. Water Quality Triggers for constituents and parameters measured during Coalition monitoring.**

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit |
|---|---|---|---|---|
| **Field and Physical Parameters** | | | | |
| pH | 6.5 - 8.5 units | Numeric | | Sacramento/San Joaquin Rivers Basin Plan (page III.6.00) |
| Electrical Conductivity (maximum) | 700 umhos/cm | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) |
| 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. |
| | 5 mg/L | | Warm water habitat | Basin Plan Objective, page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan |
| Total Dissolved Solids | 450 mg/L | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) |
| Turbidity | variable | Numeric | Municipal and Domestic Supply | Basin Plan Objective - increase varies based on natural turbidity |
| *E. coli* | 235 MPN/100 ml | | | EPA ambient water quality criteria, single-sample maximum |
| TOC | NA | | | |
| **Pesticides - Carbamates** | | | | |
| Aldicarb | 3 ug/L | Narrative | Municipal and Domestic Supply | Basin Plan Chemical Constituents Objective, USEPA Primary MCL (MUN, human health) |
| Carbaryl | 2.53 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life). Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) |
| Carbofuran | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition, page IV-25.00 (MUN, human health) |
| Methiocarb | 0.5 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates/Resour.Publ.137, Fish Wildl.Serv., U.S.D.I., Washington, D.C :98 p. (OECDG Data File) -(Detect at .5 ug/L - no limit set) |
| Methomyl | 0.52 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life) |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit |
|---|---|---|---|---|
| Oxamyl | 50 ug/L | Numeric | Municipal and Domestic Supply | Basin Plan, page III-3.00, under "Chemical constituents." Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Dept of Health Services. Primary MCL |
| **Pesticides - Organochlorines** | | | | |
| DDD(p,p') | 0.00083 ug/L | Numeric | Municipal and Domestic Supply | Basin Plan (page III-6.00, pesticides, third bullet). CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) |
| 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 | CTR, Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) |
| Endrin | 0.036 ug/L | Numeric | Cold Freshwater Habitat, Spawning | CTR, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average |
| Methoxychlor | 0.03 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective, USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum (aquatic life) |
| **Pesticides - Organophosphates** | | | | |
| Azinphos methyl | 0.01 ug/L | Narrative | Cold Freshwater Habitat, Spawning | National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection (Instantaneous) |
| Chlorpyrifos | 0.015 ug/L | Numeric | Cold Freshwater Habitat, Spawning | Sacramento/San Joaquin Rivers Basin Plan, page III-6.01; San Joaquin River & Delta, pending Sacramento & Feather Rivers (aquatic life); more stringent 4-day average selected over less stringent 1-hour average (Central Valley Regional Water Quality Control Board; recent ammendment for Diazinon and Chlorpyrifos in the Lower San Joaquin River). |
| Diazinon | 0.1 ug/L | Numeric | Cold Freshwater Habitat, Spawning | Sacramento San Joaquin Basin Plan, San Joaquin River & Delta numeric standard pending Sacramento & Feather Rivers numeric standard |
| Dimethoate | 1.0 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective, Notification Level – DHS (MUN, human health). California Notification Levels. (Department of Health Services) |
| Disulfoton | 0.05 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective, USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous |
| Malathion | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00 |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit |
|---|---|---|---|---|
| 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. |
| Methidathion | 0.7 | Narrative | Municipal and Domestic Supply | Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (MUN, human health) |
| Parathion, Methyl | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition, page IV-25.00 |
| Phorate | 0.7 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. |
| Phosmet | 140 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. |
| **Pesticides - Pyrethroids** | | | | |
| Bifenthrin | 110 ug/L | Narrative | | Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (human health) |
| Cypermethrin, total | 0.002 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game)(aquatic life) |
| Cyhalothrin, lambda, total | 35 ug/L | Narrative | | Basin Plan Toxicity Objective, USEPA IRIS Reference Dose (MUN, human health) |
| Permethrin, total | 0.03 ug/L | Narrative | Cold Freshwater Habitat, Spawning | Basin Plan Toxicity Objective, Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life). USEPA National Ambient Water Quality Criteria, CA DFG, 2000 |
| Cyfluthrin, total | NA | | | |
| Esfenvalerate/ Fenvalerate, total | NA | | | |
| **Pesticides - Herbicides** | | | | |
| Atrazine | 1.0 ug/L | Narrative | Municipal and Domestic Supply | Basin Plan, page III-3.00, under "Chemical constituents." California Primary MCL |
| Cyanazine | 1.0 ug/L | Narrative | Municipal and Domestic Supply | Basin Plan Toxicity Objective, USEPA Health Advisory (human health) |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit |
|---|---|---|---|---|
| Diuron | 2 ug/L | Narrative | Municipal and Domestic Supply | 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). Value modified using more recent information in USEPA Office of Pesticide Programs Registration Eligibility Decisions Documents. From Reference 36. (August 2007 Update Edition of the WQG) |
| Glyphosate | 700 ug/L | Numeric | Municipal and Domestic Supply | Basin Plan Chemical Constituents Objective, page III-3.00, California Primary MCL (MUN, human health) |
| Linuron | 1.4 ug/L | Narrative | Municipal and Domestic Supply | USEPA IRIS Reference Dose as a drinking water level* |
| Molinate | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00 |
| Paraquat dichloride | 3.2 ug/L | Narrative | Municipal and Domestic Supply | USEPA IRIS Reference Dose as a drinking water level* |
| Simazine | 4.0 ug/L | Numeric | Municipal and Domestic Supply | Basin Plan Chemical Constituents Objective, California Primary MCL (MUN, human health) |
| Thiobencarb | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition, page IV-25.00 |
| **Metals (c)** | | | | |
| Arsenic | 10 ug/L | Narrative | Municipal and Domestic Supply | Basin Plan Chemical Constituents Objective, USEPA Primary MCL (MUN, human health) |
| Boron | 700 ug/L | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) |
| Cadmium | variable (see charts at conclusion of table) | Numeric | Cold Freshwater Habitat, Spawning | Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness |
| Copper | variable (see charts at conclusion of table) | Numeric | Cold Freshwater Habitat, Spawning | Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness |
| Lead | variable (see charts at conclusion of table) for hardness values 1-70; 2.0 ug/L for hardness values 71 and greater | Numeric | Cold Freshwater Habitat, Spawning / Municipal and Domestic Supply | CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness; CA Public Health Goal |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit |
|---|---|---|---|---|
| Nickel | variable (see charts at conclusion of table) when hardness is 1-18; when hardness is 19 or higher the maximum nickel limit is 12 ug/L regardless of hardness value | Numeric | Cold Freshwater Habitat, Spawning / Municipal and Domestic Supply | Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness; CA Public Health Goal for Drinking Water |
| Selenium | 5 ug/L (4-day average) | Numeric | Cold Freshwater Habitat, Spawning | Table III-1: Trace Element Water Quality Objective. Applicable Water Bodies - San Joaquin River, mouth of the Merced River to Vernalis. Also CTR |
| Zinc | variable (see charts at conclusion of table) | Numeric | Cold Freshwater Habitat, Spawning | Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness |
| **Nutrients** | | | | |
| Nitrate as NO3 | 45,000 ug/L as NO3 | Numeric | Municipal and Domestic Supply | California Primary MCL |
| Nitrite as Nitrogen | 1,000 ug/L as N | Numeric | Municipal and Domestic Supply | California Primary MCL |
| Ammonia | 1.5 mg/L or variable (check page 17 of WQ Goals for pHs above 7.6) | Numeric | Municipal and Domestic Supply / Cold Freshwater Habitat, Spawning | Taste and Odor Threshold; USEPA Freshwater Aquatic Life Criteria, Continuous Concentration |
| Hardness | NA | | | |
| Phosphorus, total | NA | | | |
| Orthophosphate, soluble | NA | | | |
| TKN | NA | | | |

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.**

| Station Name | Sample Date | Sample Time | Oxygen, Dissolved, mg/L | pH, none | Specific Conductivity, µS/cm |
|---|---|---|---|---|---|
| Duck Creek @ Hwy 4 | 06/12/07 | 11:50 | | 8.66 | |
| Duck Creek @ Hwy 4 | 07/10/07 | 9:40 | 6.67 | | |
| Duck Creek @ Hwy 4 | 08/09/07 | 10:50 | 6.54 | | |
| Duck Creek @ Hwy 4 | 09/04/07 | 10:40 | 6.99 | | |
| Duck Creek @ Hwy 4 | 09/25/07 | 9:00 | 5.83 | | |
| Grant Line Canal @ Clifton Court Rd | 04/11/07 | 18:10 | 3.56 | | |
| Grant Line Canal @ Clifton Court Rd | 05/22/07 | 16:00 | 5.77 | | |
| Grant Line Canal @ Clifton Court Rd | 06/12/07 | 17:10 | 4.09 | | |
| Grant Line Canal @ Clifton Court Rd | 06/20/07 | 15:40 | 4 | | 1011 |
| Grant Line Canal @ Clifton Court Rd | 07/10/07 | 14:40 | 0.14 | | |
| Grant Line Canal @ Clifton Court Rd | 08/07/07 | 16:50 | | | 997 |
| Grant Line Canal @ Clifton Court Rd | 08/09/07 | 15:10 | | | 810 |
| Grant Line Canal @ Clifton Court Rd | 09/04/07 | 14:00 | | | 838 |
| Grant Line Canal near Calpack Rd | 04/11/07 | 19:20 | 2.76 | | 972 |
| Grant Line Canal near Calpack Rd | 05/22/07 | 14:30 | 6.24 | | 1222 |
| Grant Line Canal near Calpack Rd | 06/12/07 | 16:00 | 5.48 | | 1209 |
| Grant Line Canal near Calpack Rd | 07/10/07 | 15:50 | 6.2 | | 1289 |
| Grant Line Canal near Calpack Rd | 07/17/07 | 13:20 | 3 | | 1123 |
| Grant Line Canal near Calpack Rd | 07/30/07 | 16:00 | 1.22 | | 998 |
| Grant Line Canal near Calpack Rd | 08/07/07 | 18:40 | 3.42 | | 956 |
| Grant Line Canal near Calpack Rd | 08/09/07 | 14:20 | 4.97 | | 1174 |
| Grant Line Canal near Calpack Rd | 08/28/07 | 9:30 | 2.3 | | 1654 |
| Grant Line Canal near Calpack Rd | 09/04/07 | 13:10 | 1.89 | | 1225 |
| Kellogg Creek along Hoffman Ln | 08/07/07 | 15:10 | | 8.52 | |
| Kellogg Creek along Hoffman Ln | 09/25/07 | 10:10 | 6.87 | 8.75 | |
| Littlejohns Creek @ Jack Tone Rd | 07/10/07 | 11:10 | 6.85 | | |
| Littlejohns Creek @ Jack Tone Rd | 07/17/07 | 12:20 | 6.6 | | |

| Station Name | Sample Date | Sample Time | Oxygen, Dissolved, mg/L | pH, none | Specific Conductivity, µS/cm |
|---|---|---|---|---|---|
| Littlejohns Creek @ Jack Tone Rd | 08/28/07 | 10:10 | 5.85 | | |
| Littlejohns Creek @ Jack Tone Rd | 09/04/07 | 11:40 | 5.72 | | |
| Marsh Creek @ Marsh Creek Rd Upper | 04/11/07 | 15:50 | | | 1447 |
| Mokelumne River @ Bruella Rd | 04/10/07 | 9:50 | | 8.52 | |
| Mormon Slough @ Jack Tone Rd | 06/12/07 | 10:50 | 6.68 | | |
| Mormon Slough @ Jack Tone Rd | 07/10/07 | 9:10 | 6.27 | | |
| Mormon Slough @ Jack Tone Rd | 07/17/07 | 11:10 | 6 | | |
| Roberts Island Drain @ Holt Rd | 04/11/07 | 9:50 | 5.16 | | 950 |
| Roberts Island Drain @ Holt Rd | 05/22/07 | 9:30 | 6.85 | | 1851 |
| Roberts Island Drain @ Holt Rd | 06/12/07 | 9:10 | 3.3 | | 751 |
| Roberts Island Drain @ Holt Rd | 07/10/07 | 10:20 | 3.72 | | 749 |
| Roberts Island Drain @ Holt Rd | 08/07/07 | 11:20 | 2.32 | | 920 |
| Roberts Island Drain @ Holt Rd | 08/09/07 | 10:00 | 0.64 | | 1134 |
| Roberts Island Drain @ Holt Rd | 08/28/07 | 16:10 | 4.83 | | 1436 |
| Roberts Island Drain @ Holt Rd | 09/04/07 | 8:50 | 1.99 | | 966 |
| Roberts Island Drain @ Holt Rd | 09/25/07 | 8:50 | 2.25 | | 1132 |
| Roberts Island Drain along House Rd | 04/11/07 | 8:20 | 4.74 | | 1723 |
| Roberts Island Drain along House Rd | 06/12/07 | 8:10 | 4.7 | | 793 |
| Roberts Island Drain along House Rd | 07/10/07 | 9:30 | 3.3 | | 1148 |
| Roberts Island Drain along House Rd | 08/07/07 | 10:20 | 6.75 | | |
| Roberts Island Drain along House Rd | 08/09/07 | 9:10 | 5.92 | | 759 |
| Roberts Island Drain along House Rd | 09/04/07 | 8:00 | 4.71 | | |
| Roberts Island Drain along House Rd | 09/25/07 | 8:10 | 3.39 | | 1527 |
| Sand Creek @ Hwy 4 Bypass | 04/11/07 | 11:40 | | | 1919 |
| Sand Creek @ Hwy 4 Bypass | 05/22/07 | 11:10 | | | 1946 |
| Sand Creek @ Hwy 4 Bypass | 06/12/07 | 10:50 | 6.35 | | 1848 |
| Sand Creek @ Hwy 4 Bypass | 06/20/07 | 13:45 | | | 1913 |
| Sand Creek @ Hwy 4 Bypass | 07/10/07 | 12:10 | | | 1554 |
| Sand Creek @ Hwy 4 Bypass | 07/30/07 | 17:30 | 5.02 | | 1817 |

| Station Name | Sample Date | Sample Time | Oxygen, Dissolved, mg/L | pH, none | Specific Conductivity, µS/cm |
|---|---|---|---|---|---|
| Sand Creek @ Hwy 4 Bypass | 08/07/07 | 12:50 | 6.82 | | 1762 |
| Sand Creek @ Hwy 4 Bypass | 08/09/07 | 11:20 | 4.9 | | 1723 |
| Sand Creek @ Hwy 4 Bypass | 08/31/07 | 16:10 | 5.77 | | 1522 |
| Sand Creek @ Hwy 4 Bypass | 09/04/07 | 10:20 | 5.27 | | 1608 |
| Storm Drain to Marsh Creek @ Sand Creek Rd | 09/12/07 | 14:40 | | | 1262 |
| Storm Drain to Marsh Creek @ Sand Creek Rd | 09/12/07 | 15:20 | | | 1261 |
| Terminous Tract Drain @ Hwy 12 | 05/22/07 | 7:40 | 6.58 | | |
| Terminous Tract Drain @ Hwy 12 | 06/12/07 | 7:50 | 5.55 | | |
| Terminous Tract Drain @ Hwy 12 | 07/10/07 | 7:40 | 4.58 | | |
| Terminous Tract Drain @ Hwy 12 | 08/07/07 | 8:10 | 5.58 | | |
| Terminous Tract Drain @ Hwy 12 | 08/09/07 | 8:40 | 4.8 | | |
| Terminous Tract Drain @ Hwy 12 | 09/04/07 | 7:40 | 6.7 | | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | 05/22/07 | 14:20 | | | 905 |

**Table 28. Pesticides exceedances in water column.**

| Station Name | Sample Type Code | Sample Date | Sample Time | Carbofuran, µg/L | Chlorpyrifos, µg/L | Cypermethrin, total, µg/L | DDE (p,p'), µg/L | DDT (p,p'), µg/L | Dieldrin, µg/L | Disulfoton, µg/L | Diuron, µg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Duck Creek @ Hwy 4 | E | 07/10/07 | 9:40 | | 0.024 | | | | | | |
| Duck Creek @ Hwy 4 | E | 09/04/07 | 10:40 | | 0.025 | | | | | | |
| Duck Creek @ Hwy 4 | E | 09/25/07 | 9:00 | | 0.029 | | | | | | |
| French Camp Slough @ Airport Way | FB | 07/10/07 | 14:00 | | | | | 0.016 | | | |
| French Camp Slough @ Airport Way | E | 07/10/07 | 14:00 | | | | | | 0.0053 | | |
| Grant Line Canal @ Clifton Court Rd | E | 04/11/07 | 18:10 | 0.09 | | | | | | | |
| Grant Line Canal @ Clifton Court Rd | E | 09/04/07 | 14:00 | | 0.13 | | | | | | |
| Grant Line Canal near Calpack Rd | E | 08/07/07 | 18:40 | | | | | | | 0.083 | 2.8 |
| Kellogg Creek along Hoffman Ln | E | 07/10/07 | 13:20 | | | | 0.022 | 0.018 | | | |
| Littlejohns Creek @ Jack Tone Rd | E | 07/30/07 | 11:50 | | 0.018 | | | | | | |
| Lone Tree Creek @ Jack Tone Rd | E | 07/10/07 | 12:30 | | 0.035 | | | | | | |
| Lone Tree Creek @ Jack Tone Rd | E | 08/07/07 | 15:00 | | | | 0.058 | 0.031 | | | |
| Mormon Slough @ Jack Tone Rd | E | 09/04/07 | 9:50 | | 0.21 | | | | | | |
| Roberts Island Drain @ Holt Rd | E | 07/10/07 | 10:20 | | | | 0.021 | | | | 4.8 |
| Roberts Island Drain along House Rd | E | 09/04/07 | 8:00 | | | 0.077 | | | | | |
| Sand Creek @ Hwy 4 Bypass | E | 07/10/07 | 12:10 | | | | 0.0066 | | | | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 07/10/07 | 11:50 | | 0.034 | | | | | | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 09/25/07 | 9:30 | | 0.017 | | | | | | |

E = Environmental sample
FB = Field Blank

**Table 29. Metals exceedances in water column.**

| Station Name | Sample Type Code | Sample Date | Sample Time | Hardness as CaCO3 mg/L | Copper, µg/L | Lead, µg/L |
|---|---|---|---|---|---|---|
| French Camp Slough @ Airport Way | E | 05/22/07 | 16:50 | 52 | 5.9 | |
| French Camp Slough @ Airport Way | E | 06/12/07 | 16:15 | 44 | 5.9 | 1.2 |
| French Camp Slough @ Airport Way | E | 06/20/07 | 16:30 | 56 | 6.7 | |
| French Camp Slough @ Airport Way | E | 07/10/07 | 14:00 | 52 | 5.4 | |
| French Camp Slough @ Airport Way | E | 07/30/07 | 13:50 | 50 | 6.9 | |
| French Camp Slough @ Airport Way | E | 08/28/07 | 16:40 | 52 | 5.9 | |
| Grant Line Canal @ Clifton Court Rd | FD | 05/22/07 | 16:00 | 310 | 26 | |
| Grant Line Canal @ Clifton Court Rd | E | 05/22/07 | 16:00 | 230 | 24 | |
| Grant Line Canal @ Clifton Court Rd | E | 07/10/07 | 14:40 | 170 | 17 | |
| Kellogg Creek along Hoffman Ln | E | 07/10/07 | 13:20 | 70 | 7 | |
| Littlejohns Creek @ Jack Tone Rd | E | 06/12/07 | 13:10 | 30 | 3.6 | |
| Lone Tree Creek @ Jack Tone Rd | E | 07/10/07 | 12:30 | 52 | 12 | |
| Lone Tree Creek @ Jack Tone Rd | E | 08/07/07 | 15:00 | 38 | 4.6 | |
| Lone Tree Creek @ Jack Tone Rd | FD | 09/04/07 | 13:20 | 34 | 4 | |
| Lone Tree Creek @ Jack Tone Rd | E | 09/04/07 | 13:20 | 28 | 3.5 | |
| Mokelumne River @ Bruella Rd | E | 06/12/07 | 9:30 | 14 | 1.8 | |
| Mokelumne River @ Bruella Rd | E | 07/10/07 | 8:00 | 16 | 4.7 | |
| Mokelumne River @ Bruella Rd | E | 08/07/07 | 8:20 | 16 | 2.4 | |

E = Environmental sample
FD = Field Duplicate

**Table 30. Inorganics/Physical Parameters exceedances in water column.**

| Station Name | Sample Type Code | Sample Date | Sample Time | Arsenic, µg/L | Boron, µg/L | Color, color units | *E. coli*, MPN/100 mL | Total Dissolved Solids, mg/L |
|---|---|---|---|---|---|---|---|---|
| Duck Creek @ Hwy 4 | E | 04/10/07 | 12:50 | | | 30 | 290 | |
| Duck Creek @ Hwy 4 | E | 05/22/07 | 11:40 | | | 30 | | |
| Duck Creek @ Hwy 4 | E | 06/12/07 | 11:50 | | | 80 | | |
| Duck Creek @ Hwy 4 | E | 07/10/07 | 9:40 | | | 50 | | |
| Duck Creek @ Hwy 4 | E | 08/07/07 | 10:30 | | | 25 | | |
| Duck Creek @ Hwy 4 | E | 09/04/07 | 10:40 | | | 25 | | |
| French Camp Slough @ Airport Way | E | 04/10/07 | 18:20 | | | 60 | | |
| French Camp Slough @ Airport Way | E | 05/22/07 | 16:50 | | | 45 | 310 | |
| French Camp Slough @ Airport Way | E | 06/12/07 | 16:15 | | | 40 | | |
| French Camp Slough @ Airport Way | FD | 07/10/07 | 14:00 | | | 30 | | |
| French Camp Slough @ Airport Way | E | 07/10/07 | 14:00 | | | 40 | | |
| French Camp Slough @ Airport Way | E | 08/07/07 | 16:30 | | | 35 | 260 | |
| French Camp Slough @ Airport Way | E | 09/04/07 | 15:20 | | | 45 | 290 | |
| Grant Line Canal @ Clifton Court Rd | E | 04/11/07 | 18:10 | | | 100 | | 480 |
| Grant Line Canal @ Clifton Court Rd | FD | 05/22/07 | 16:00 | 22 | | 350 | | |
| Grant Line Canal @ Clifton Court Rd | E | 05/22/07 | 16:00 | 20 | | 320 | | |
| Grant Line Canal @ Clifton Court Rd | E | 06/12/07 | 17:10 | | | 120 | >2400 | |
| Grant Line Canal @ Clifton Court Rd | E | 07/10/07 | 14:40 | 11 | | 200 | >2400 | |
| Grant Line Canal @ Clifton Court Rd | E | 08/07/07 | 16:50 | 14 | | 250 | >2400 | 590 |
| Grant Line Canal @ Clifton Court Rd | E | 09/04/07 | 14:00 | 14 | | 170 | 1700 | 550 |
| Grant Line Canal near Calpack Rd | FD | 04/11/07 | 19:20 | | | 110 | 490 | 660 |
| Grant Line Canal near Calpack Rd | E | 04/11/07 | 19:20 | | | 130 | 490 | 610 |
| Grant Line Canal near Calpack Rd | E | 05/22/07 | 14:30 | | | 65 | | 750 |
| Grant Line Canal near Calpack Rd | E | 06/12/07 | 16:00 | | | 45 | 980 | 790 |
| Grant Line Canal near Calpack Rd | E | 07/10/07 | 15:50 | | | 80 | 550 | 790 |
| Grant Line Canal near Calpack Rd | E | 08/07/07 | 18:40 | | | 80 | 980 | 630 |
| Grant Line Canal near Calpack Rd | E | 09/04/07 | 13:10 | 12 | | 50 | | 810 |

| Station Name | Sample Type Code | Sample Date | Sample Time | Arsenic, µg/L | Boron, µg/L | Color, color units | *E. coli*, MPN/100 mL | Total Dissolved Solids, mg/L |
|---|---|---|---|---|---|---|---|---|
| Kellogg Creek along Hoffman Ln | E | 04/11/07 | 16:40 | | | 28 | | |
| Kellogg Creek along Hoffman Ln | E | 05/22/07 | 13:00 | | | 24 | | |
| Kellogg Creek along Hoffman Ln | FD | 06/12/07 | 12:50 | | | 27 | | |
| Kellogg Creek along Hoffman Ln | E | 06/12/07 | 12:50 | | | 28 | | |
| Kellogg Creek along Hoffman Ln | E | 07/10/07 | 13:20 | | | 70 | | |
| Kellogg Creek along Hoffman Ln | E | 08/07/07 | 15:10 | | | 20 | | |
| Littlejohns Creek @ Jack Tone Rd | E | 04/10/07 | 14:40 | | | 16 | | |
| Littlejohns Creek @ Jack Tone Rd | E | 05/22/07 | 12:50 | | | 25 | | |
| Littlejohns Creek @ Jack Tone Rd | E | 06/12/07 | 13:10 | | | 16 | | |
| Lone Tree Creek @ Jack Tone Rd | E | 04/10/07 | 17:00 | | | 65 | | |
| Lone Tree Creek @ Jack Tone Rd | E | 05/22/07 | 15:20 | | | 40 | 730 | |
| Lone Tree Creek @ Jack Tone Rd | E | 06/12/07 | 14:50 | | | 56 | 580 | |
| Lone Tree Creek @ Jack Tone Rd | E | 07/10/07 | 12:30 | | | 75 | >2400 | |
| Lone Tree Creek @ Jack Tone Rd | E | 08/07/07 | 15:00 | | | 55 | 1400 | |
| Lone Tree Creek @ Jack Tone Rd | FD | 09/04/07 | 13:20 | | | 40 | | |
| Lone Tree Creek @ Jack Tone Rd | E | 09/04/07 | 13:20 | | | 40 | | |
| Marsh Creek @ Concord Ave | E | 04/11/07 | 13:50 | | | 24 | | |
| Marsh Creek @ Marsh Creek Rd Upper | E | 04/11/07 | 15:50 | | 3200 | | | 900 |
| Mormon Slough @ Jack Tone Rd | E | 09/04/07 | 9:50 | | | 20 | | |
| Roberts Island Drain @ Holt Rd | E | 04/11/07 | 9:50 | | | 50 | | 540 |
| Roberts Island Drain @ Holt Rd | E | 05/22/07 | 9:30 | | | 74 | | 1100 |
| Roberts Island Drain @ Holt Rd | E | 06/12/07 | 9:10 | | | 50 | | |
| Roberts Island Drain @ Holt Rd | E | 07/10/07 | 10:20 | | | 100 | >2400 | 570 |
| Roberts Island Drain @ Holt Rd | E | 08/07/07 | 11:20 | | | 75 | | 560 |
| Roberts Island Drain @ Holt Rd | E | 09/04/07 | 8:50 | | | 90 | | 620 |
| Roberts Island Drain along House Rd | E | 04/11/07 | 8:20 | | | 170 | | 1100 |
| Roberts Island Drain along House Rd | E | 05/22/07 | 8:20 | | | 150 | | |
| Roberts Island Drain along House Rd | E | 06/12/07 | 8:10 | | | 220 | | 500 |
| Roberts Island Drain along House Rd | E | 07/10/07 | 9:30 | | | 380 | | 740 |

| Station Name | Sample Type Code | Sample Date | Sample Time | Arsenic, µg/L | Boron, µg/L | Color, color units | *E. coli*, MPN/100 mL | Total Dissolved Solids, mg/L |
|---|---|---|---|---|---|---|---|---|
| Roberts Island Drain along House Rd | E | 08/07/07 | 10:20 | | | 200 | 1000 | |
| Roberts Island Drain along House Rd | E | 09/04/07 | 8:00 | | | 80 | 460 | |
| Sand Creek @ Hwy 4 Bypass | E | 04/11/07 | 11:40 | | | 36 | | 1400 |
| Sand Creek @ Hwy 4 Bypass | E | 05/22/07 | 11:10 | | | 20 | | 1400 |
| Sand Creek @ Hwy 4 Bypass | E | 06/12/07 | 10:50 | | | 35 | 460 | 1300 |
| Sand Creek @ Hwy 4 Bypass | E | 07/10/07 | 12:10 | | | 40 | 280 | 1000 |
| Sand Creek @ Hwy 4 Bypass | E | 08/07/07 | 12:50 | | | 30 | | 1300 |
| Sand Creek @ Hwy 4 Bypass | E | 09/04/07 | 10:20 | | | 40 | 360 | 1200 |
| Terminous Tract Drain @ Hwy 12 | E | 04/10/07 | 7:50 | | | 50 | | |
| Terminous Tract Drain @ Hwy 12 | E | 05/22/07 | 7:40 | | | 44 | | |
| Terminous Tract Drain @ Hwy 12 | E | 06/12/07 | 7:50 | | | 70 | | |
| Terminous Tract Drain @ Hwy 12 | E | 07/10/07 | 7:40 | | | 90 | | |
| Terminous Tract Drain @ Hwy 12 | E | 08/07/07 | 8:10 | | | 85 | 240 | |
| Terminous Tract Drain @ Hwy 12 | E | 09/04/07 | 7:40 | | | 80 | 330 | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 04/10/07 | 16:10 | | | 85 | | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 05/22/07 | 14:20 | | | | | 620 |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 06/12/07 | 14:00 | | | 60 | | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 07/10/07 | 11:50 | | | 100 | >2400 | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 08/07/07 | 14:00 | | | 100 | 250 | |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 09/04/07 | 12:20 | | | 30 | | |

E = Environmental sample
FD = Field Duplicate

**Table 31. Toxicity exceedances and results of TIE studies.**

| Station Name | Sample Type Code | Sample Date | Sample Time | Toxicity Species Name | Toxicity End Point | Mean | Pct Control | Significance | Summary Comments |
|---|---|---|---|---|---|---|---|---|---|
| French Camp Slough @ Airport Way | E | 08/09/07 | 13:00 | *Hyalella azteca* | Survival (%) | 32 | 34 | SL | Resampled on 08/31/07; toxicity not persistent. |
| Grant Line Canal near Calpack Rd | FD | 04/11/07 | 19:20 | *Selenastrum capricornutum* | Total Cell Count | 243000 | 28 | SL | RPD 43.5 TIE initiated on grab sample. TIE results suggest the presence of an organic compound that has some cationic properties, or that there are two types of contaminants, one organic and one cationic. Resampled on 4/19/07. |
| Grant Line Canal near Calpack Rd | E | 04/11/07 | 19:20 | *Selenastrum capricornutum* | Total Cell Count | 378000 | 44 | SL | TIE run. C8SPE and Chelex treatments each removed the toxicity. TIE results suggest the presence of an organic compound that has some cationic properties, or that there are two types of contaminants, one organic and one cationic. Resampled on 4/19/07. |
| Grant Line Canal near Calpack Rd | RS | 04/19/07 | 10:40 | *Selenastrum capricornutum* | Total Cell Count | 685000 | 89 | SG | Resample due to toxicity on 04/11/07; toxicity was persistent. |
| Grant Line Canal near Calpack Rd | E | 07/10/07 | 15:50 | *Selenastrum capricornutum* | Total Cell Count | 755273 | 79 | SL | Resampled on 07/17/07; toxicity not persistent. |
| Kellogg Creek along Hoffman Ln | E | 04/11/07 | 16:40 | *Ceriodaphnia dubia* | Survival (%) | 45 | 50 | SL | A TIE was initiated but toxicity did not persist to identify its cause. Resampled on 04/19/07. |
| Kellogg Creek along Hoffman Ln | E | 08/09/07 | 12:50 | *Hyalella azteca* | Survival (%) | 0 | 0 | SL | Resampled on 08/31/07; toxicity persistent. |
| Kellogg Creek along Hoffman Ln | RS | 08/31/07 | 16:50 | *Hyalella azteca* | Survival (%) | 0 | 0 | SL | Resample due to toxicity on 08/09/07; toxicity persistent. |
| Littlejohns Creek @ Jack Tone Rd | E | 07/10/07 | 11:10 | *Selenastrum capricornutum* | Total Cell Count | 628270 | 71 | SL | Resampled on 07/17/07; toxicity not persistent. |
| Marsh Creek @ Concord Ave | MPM | 06/20/07 | 14:20 | *Ceriodaphnia dubia* | Survival (%) | 0 | 0 | SL | Management plan sample collected for Ceriodaphnia; 100% mortality on Day 3; TIE initiated on 6/25/07 and it was concluded that non-polar organic chemicals were the cause of toxicity. Resample/retest not performed due to dry sampling site. |
| Mokelumne River @ Bruella Rd | E | 07/10/07 | 8:00 | *Selenastrum capricornutum* | Total Cell Count | 507779 | 57 | SL | Resampled on 07/17/07; toxicity not persistent. |
| Mormon Slough @ Jack Tone Rd | E | 07/10/07 | 9:10 | *Selenastrum capricornutum* | Total Cell Count | 543601 | 61 | SL | Resampled on 07/17/07; toxicity not persistent. |

| Station Name | Sample Type Code | Sample Date | Sample Time | Toxicity Species Name | Toxicity End Point | Mean | Pct Control | Significance | Summary Comments |
|---|---|---|---|---|---|---|---|---|---|
| Mormon Slough @ Jack Tone Rd | E | 09/04/07 | 9:50 | *Ceriodaphnia dubia* | Survival (%) | 0 | 0 | SL | TIE initiated 09/06/07, it was concluded that toxicity was caused by non-polar organic chemicals; A dilution series was conducted and TUa was determined to be 3.2. Resampled on 09/11/07; toxicity not persistent. |
| Roberts Island Drain @ Holt Rd | E | 07/10/07 | 10:20 | *Ceriodaphnia dubia* | Survival (%) | 0 | 0 | SL | 100% mortality on Day 3; TIE initiated on 7/14/07 and it was concluded that non-polar organic chemicals were the cause of toxicity; dilution series conducted and TUa determined to be 1.7. Resampled on 07/17/07; toxicity not persistent. |
| Roberts Island Drain @ Holt Rd | E | 07/10/07 | 10:20 | *Selenastrum capricornutum* | Total Cell Count | 289594 | 40 | SL | Resampled on 07/17/07; toxicity not persistent. |
| Sand Creek @ Hwy 4 Bypass | E | 08/09/07 | 11:20 | *Hyalella azteca* | Survival (%) | 0 | 0 | SL | Resampled on 08/31/07; toxicity persistent. |
| Sand Creek @ Hwy 4 Bypass | RS | 08/31/07 | 16:10 | *Hyalella azteca* | Survival (%) | 0 | 0 | SL | Resample due to toxicity on 08/09/07; toxicity persistent. |
| Unnamed Drain to Lone Tree Creek @ Jack Tone Rd | E | 08/09/07 | 12:00 | *Hyalella azteca* | Survival (%) | 57 | 61 | SL | Resampled on 08/31/07; toxicity not persistent. |

E = Environmental sample; RS = Re-sample; FD = Field Duplicate; MPM = Management Plan Monitoring; SL = statistically different from control and less than 80% threshold; TIE = Toxic Identification Evaluation; TUa = Toxic unit, acute

# Interpretation of Results

Ambient water monitoring is conducted by the Coalition for the purpose of characterizing agricultural discharges in the Coalition area. Over the long term, monitoring data provides insight on the general trends in water quality at each of the sample sites. Results from each event within a monitoring season can help to identify constituents that are found at the monitoring sites, as well as the agricultural lands, crops and/or particular pesticides that contribute to those discharges. A series of actions taken to determine the potential sources of exceedances experienced during each monitoring event include 1) the use of PURs to identify relevant applications that occurred upstream of the sample site and in proximity 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, 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 and 4) additional sampling as listed in site subwatershed management plans. These actions were implemented on a case by case basis over the course of the 2007 irrigation season.

## *Toxicity*

### Water Column Toxicity

Toxicity in the water column can occur as a result of natural or anthropogenic causes, including the discharge, release or re-suspension of metals, pesticides, ammonia or other toxicants in a water body. The three species used in water column toxicity analyses can often be associated with detections of one or more contaminants in the sample water. All sites showing toxicity were resampled to determine if toxicity was persistent. Water column toxicity was experienced in 12 samples collected during the 2007 irrigation monitoring season including one field duplicate (the associated environmental sample was toxic) and a resample to test to toxicity persistence. During the 2007 irrigation season, 4% of the samples were toxic to *Ceriodaphnia* and/or *Selenastrum*. No samples were toxic to *Pimephales*. Four samples were toxic to *Ceriodaphnia* and seven were toxic to *Selenastrum* (including one resample). Water column toxicities occurred during four irrigation season events and at seven Coalition monitoring sites.

Monitoring from the 2006 irrigation season resulted in seven ambient water samples that were toxic to one of the three test species, however the majority of toxicity was to *Ceriodaphnia* (six of seven) and one to *Pimephales*, with no samples resulting in toxicity to *Selenastrum*. It is important to note that during the irrigation sampling conducted in 2006, 12 *Selenastrum* tests had to be re-initiated outside of holding times due to failed controls in the initial test. The percent of samples toxic to one or more species in 2006 was 3% compared to the 4% of samples that experienced toxicity during the 2007 irrigation season.

*Toxicity to Ceriodaphnia dubia*

One of the four samples was toxic to 50% of the *Ceriodaphnia*; the remaining three samples produced complete mortality. The lab conducted a TIE for all four samples and ran a dilution series for the three samples with complete mortality. A TIE report is included in Appendix VII which contains further analysis of the evaluations. *Ceriodaphnia* toxicity occurred at four different monitoring sites during four different months. The four samples represent 4% of the 102 *Ceriodaphnia* samples analyzed during the irrigation monitoring season.

## Kellogg Creek along Hoffman Ln

During the first irrigation season sampling event (April 11, 2007) samples collected from Kellogg Creek along Hoffman Ln were toxic to *Ceriodaphnia*. The sample resulted in 50% mortality relative to the control. The site was resampled on April 14 and toxicity was not persistent. TIE results indicated that the toxicity did not persist in the original sample long enough to determine its cause. The only pesticide detection in the sample water was for diuron (1.3 µg/L) which is too low of a concentration to cause mortality to *Ceriodaphnia*. PUR data is not available yet from the Contra Costa Agricultural Commissioner's office.

## Marsh Creek @ Concord Ave

During management plan sampling conducted on June 20, 2007, Marsh Creek @ Concord Ave was toxic to *Ceriodaphnia*. This was the only time during the irrigation season that water was present at this site and resulted in complete mortality of *Ceriodaphnia.* A resample could not be collected due to a lack of water. The TIE and dilution series performed on this sample indicated that the toxicity was a result of a pyrethroid resulting in 5.6 $TU_a$. Water samples were not collected for chemical analysis since this sample was collected as part of a management plan. After the TIE was concluded, the C18 column was eluted and the eluate sent to the laboratory for analysis

of pyrethroids, but none were detected. PUR data is not available yet from the Contra Costa Agricultural Commissioner's office. The Coalition is currently petitioning to remove Marsh Creek from their monitoring program due to the large amount of recent development within the watershed and the relatively small amount of agriculture. Pyrethroids are applied during early construction of new homes and may be a possible source of this toxicity.

### Mormon Slough @ Jack Tone Rd

Mormon Slough @ Jack Tone Rd was sampled on September 4, 2007. This water resulted in complete mortality to *Ceriodaphnia*. Resampling was conducted on September 6 with toxicity not being persistent. The TIE and dilution series measured 3.2 $TU_a$ of a non-polar organic chemical for which toxicity was removed with the addition of piperonyl butoxide (PBO), a result characteristic of organophosphate toxicity. The pesticide chemical analysis detected 0.21 µg/L of chlorpyrifos, which is 14 times the numerical objective and 3.2 times the standard $LC_{50}$ value for chlorpyrifos (0.065 µg/L). The quantity of chlorpyrifos detected in the sample appears to account for all of the toxicity to *Ceriodaphnia*. Chlorpyrifos was applied on August 5, 6, 14, and 31 within the subwatershed. Other organophosphates applied include dimethoate and malathion although neither were detected in the water sample.

### Roberts Island Drain @ Holt Rd

Samples collected from Roberts Island Drain @ Holt Rd on July 10, 2007were toxic to *Ceriodaphnia*. This sample resulted in complete mortality and was resampled on July 17. The toxicity was not persistent. The TIE and dilution series measured 1.7 $TU_a$ and indicate that a pyrethroid was responsible for the toxicity. Simultaneous chemical analysis found 0.021 µg/L DDE but no pyrethroids. Diuron was detected at a low level which is unlikely to have affected *Ceriodaphnia* survival. Although the Coalition could find no $LC_{50}$ data for DDE for *Ceriodaphnia*, data were available for other invertebrates. $LC_{50}$ values ranged from 123,173 µg/L for brine shrimp (*Artemia salina*) to 1.55 µg/L for *Nitocra spinipes*, a harpaticoid copepod. These results suggest that DDE was not the cause of toxicity in this sample.

*Toxicity to Pimephales promelas*

None of the 95 *Pimephales promelas* toxicity samples collected during the 2007 irrigation season tested toxic to *Pimephales* in the laboratory.

*Toxicity to Selenastrum capricornutum*

Six of the 101 *Selenastrum capricornutum* toxicity samples (5.9%) collected during the irrigation season tested toxic to *Selenastrum* at five sites in two months. Two of the samples experienced less than 50% growth compared to the control; however, due to a lab oversight a TIE was initiated only for one sample. Generally, toxicity to *Selenastrum* is a result of exposure to herbicides and/or metals.

### Grant Line Canal near Calpack Rd

During the first irrigation season event (April 11, 2007) a sample from Grant Line Canal near Calpack Rd experienced less than 50% growth compared to the control in both the environmental sample (44% growth as compared to the control) and the associated field duplicate (28% growth as compared to the control). A TIE concluded that the toxicity was likely due to more than one contaminant, one cationic and one organic. Resampling was conducted on April 19 and toxicity was persistent (89% growth as compared to the control). Chemistry analysis on the initial sample detected trace quantities of the herbicide diuron (0.24 µg/L). This quantity of diuron is unlikely to generate the toxicity measured in the initial test and therefore it is likely that other chemicals contributed to the toxicity of the sample. Chemical analyses detected several metals, including copper (9.5 µg/L) and arsenic (6.8 µg/L). Although neither of these metals were exceedances of WQTs, they may have contributed to the toxicity in this sample. Applied herbicides within this subwatershed include imazamox, bromoxynil, metolachlor, trifluralin, glyphosate, dimethylamine, linuron and diuron. Besides diuron, glyphosate is the only pesticide applied that the Coalition analyzes for and glyphosate was not detected in the sample water. Due to the results of the TIE it is likely that the amount of metals in the water in combination with an organic pesticide not analyzed for by the Coalition contributed to the reduced growth.

During the fourth irrigation season event conducted on July 10, 2007 the Grant Line Canal near Calpack Road sample experienced toxicity to *Selenastrum*. Unlike the sample from the first irrigation season monitoring event the level of toxicity in this sample did not trigger a TIE. Resampling took place within one day of the conclusion of the toxicity test, and a subsequent test with *Selenastrum* found that the toxicity did not persist. Pesticide chemistry analysis detected trace amounts of diuron (0.20 µg/L) and a number of metals, including arsenic and copper. It is possible that metals contributed to the toxicity. The only pesticides applied in this subwatershed occurred in June for matolachlor, imidacloprid, and rimsulfuron of which the Coalition does not analyze.

### Littlejohns Creek @ Jack Tone Rd

The sample collected from Littlejohns Creek @ Jack Tone Rd during the July monitoring event (July 10) was toxic to *Selenastrum* but growth in this sample was not sufficiently

reduced to warrant a TIE (71% growth as compared to the control). Resampling was conducted July 17 and toxicity was not persistent. Chemical analysis of this sample detected no herbicides but did show low concentrations of metals. The concentration of metals did not exceed water quality triggers however they may have acted synergistically with other compounds in the sample water resulting in reduced *Selenastrum* growth. Herbicides applied within this subwatershed included glyphosate, oxyfluorfen, flumioxazin, paraquat, clethodim, copper, clethodim, fluazifop-b-butyl, sethoxydim, diethanolamine, and dimethylamine. Of these, glyphosate and paraquat were non-detects and copper was detected at 2.9 mg/L. It is probable that the toxicity was due to an applied herbicide for which the Coalition does not analyze.

### Mokelumne River @ Bruella Rd

The Mokelumne River @ Bruella Rd site during the fourth irrigation monitoring event was the only site with a sample toxic to *Selenastrum* and a copper detection that exceeded water quality triggers (4.7 µg/L). Combined with the consistently soft water of the Mokelumne River (16 mg/L), the copper and other metals detected (arsenic, boron, lead, nickel, zinc) may have been capable of reducing *Selenastrum* growth. The sample had 57% growth as compared to the control. Resampling took place within one day of the conclusion of the toxicity test, and a subsequent test with *Selenastrum* found that the toxicity did not persist at the sample site. Applied pesticides within this subwatershed included copper, halosulfuron, glyphosate, oxyfluorfen, trifluralin, imidacloprid, paraquat, bromoxynil, and carfentrazone. Of the applied pesticides the Coalition only tests for glyphosate and paraquat- both of which were non-detects.

### Mormon Slough @ Jack Tone Rd

The sample collected from Mormon Slough @ Jack Tone Rd during the fourth irrigation monitoring event exhibited significant toxicity to *Selenastrum* (61% growth as compared to the control). Chlorpyrifos and dimethoate were detected in water collected at the site. Neither of these insecticides is likely to cause algal toxicity. It is more likely that the toxicity was the result of an herbicide for which the Coalition does not analyze for. Resampling took place within one day of the conclusion of the toxicity test, and a subsequent test with *Selenastrum* found that the toxicity did not persist.

### Roberts Island Drain @ Holt Rd

The sample collected during the fourth irrigation monitoring event (July 10) from Roberts Island Drain @ Holt Rd resulted in less than 50% growth relative to the control, but due to a lab oversight a TIE was not initiated. Chemical analysis detected diuron (4.8 µg/L) which may have contributed to the toxicity to *Selenastrum*. Resampling took place within one day of the conclusion of the toxicity test, and a subsequent test with

*Selenastrum* found that the toxicity did not persist at the sample site. Applied herbicides in this subwatershed include fluazifop-p-butyl, trifluralin, glyphosate, carfentrazone, dicamba and halosulfuron-methyl.

**Sediment Toxicity**

Sediment was collected during the fifth irrigation monitoring event (August 9, 2007) to test for toxicity to *Hyalella azteca*. Marsh Creek @ Concord Ave was dry and sediment could not be collected. Sediment from four of the 14 sites showed significantly reduced survival: French Camp Slough @ Airport Way and Unnamed Drain to Lone Tree Creek @ Jack Tone Rd had 32% and 57% survival relative to the control; Kellogg Creek along Hoffman Ln, Sand Creek @ Hwy 4 Bypass both had zero survival. There are currently no standard methods for TIEs and dilution series for sediment toxicity analyses. All four sites were resampled and re-tested. At French Camp Slough and Lone Tree Creek toxicity was not persistent in the sediment. At Kellogg Creek and Sand Creek toxicity persisted and survival was zero.

Sediment sampling during the irrigation season of 2006 resulted in two sample sites (Roberts Island Drain @ Holt Rd and Sand Creek @ Hwy 4 Bypass) that tested toxic to *Hyalella*, both of which experienced toxicity again in the resample. Only Sand Creek experienced sediment toxicity in both the 2006 and 2007 irrigation season.

## *Pesticides*

Over 400 individual analyses for pesticides were conducted during the 2007 irrigation season with a total of 19 exceedances including two of DDT and four of DDE. DDT is a legacy pesticide not currently used by agriculture and DDE is a breakdown product of DDT and therefore 13 of the exceedances experienced are relevant to currently applied pesticides during the 2007 irrigation season. These 13 exceedances occurred at seven sites and in all months except June.

Relative to the 2006 irrigation season, there was a greater number of sampling events (six compared to five) in 2007 and additional monitoring associated with management plans. However there were still fewer pesticide exceedances experienced during the irrigation season of 2007. Monitoring results for chlorpyrifos show a 50% decrease in exceedances (6 in the 2007 irrigation season compared to 12 in the 2006 irrigation season). Of the remaining pesticides, there were 22 exceedances in 2006 and 16 in 2007. Exceedances of DDE, DDT, dieldrin and thiobencarb were experienced in both years.

Chlorpyrifos accounts for the majority of exceedances, with six exceedances at five sites out of a total of 98 organophosphate tests in six months. Three of these exceedances were during the fourth month of irrigation season (July): at Lone Tree Creek @ Jack Tone Rd, Duck Creek @ Hwy 4, and Unknown Drain to Lone Tree Creek @ Jack Tone Rd; and three were during the sixth month of irrigation season (September): Duck Creek @ Hwy 4 again, Mormon Slough @ Jack Tone Rd, and Grant Line Canal @ Clifton Court Rd. The next most frequently detected pesticide was thiobencarb, detected during May at French Camp Slough @ Airport Way and Lone Tree Creek @ Jack Tone Rd. This is the period when rice hericides are applied. These two exceedances were from a total of 87 carbamate tests performed. In the future, the Rice Coalition will be notified of any exceedances of the pesticides used in rice cultivation and the exceedances will not be considered to be the responsibility of the Coalition.

Five additional compounds were detected once each during April, July, August, and September. These compounds are carbofuran and disulfoton at Grant Line Canal near Calpak Rd; dieldrin and bifenthrin at French Camp Slough @ Airport Way, and cypermethrin at Roberts island Drain along House Rd.

Exceedances of DDE and DDT are a result of applications in the past. These pesticides are no longer registered or applied but persist because of their exceptionally high $K_{oc}$ and long half life. It is estimated that the $K_{oc}$ for DDT is between 100,000 and 1,000,000 depending on the source, and the half life in aquatic systems is probably over 150 years (http://www.speclab.com/compound/c50293.htm). These pesticides may be bound to sediment in the channels and mobilized periodically by unknown mechanisms.

Pesticide applications are identifiable to township, range and section (TRS) through the use of PURs. Monitoring results obtained from sampling over the 2007 irrigation season were analyzed against PURs, which were received from the San Joaquin County Agricultural Commissioner's office as soon as they became available. No PURs were available from Contra Costa County. Exceedances or toxicity experienced in samples collected from Coalition monitoring sites were compared to applications that occurred on parcels within the subwatershed upstream of the sample site (the site subwatershed). Pesticides were analyzed based on their active ingredients (AI), and chemicals that could contribute to toxicity were separated by their organic carbon partitioning coefficient ($K_{oc}$). Pesticides with a high $K_{oc}$ value (i.e. those that bind to sediment) are likely to cause sediment toxicity, and those with a low $K_{oc}$ value may contribute to water column toxicity. Specific crops may also correlate with particular exceedances and were also identifiable through PURs. Understanding the potential mechanism by which pesticides are moved to surface waters allowed the Coalition to

target management practices effective in eliminating the exceedances. All PUR data is included in Appendix IV.

## *Metals*

Metals can be divided into two groups: those metals which are currently registered for use by agriculture, and those that are not registered for use or currently applied. During the 2007 irrigation season, exceedances of arsenic, boron, copper and lead were experienced. Among the four metals, only copper is known to be currently used by agriculture within the Coalition region.

A total of 28 exceedances of metals were experienced during the 2007 irrigation season. In 2006 there were 17 exceedances of metals. Exceedances of copper increased from 10 in 2006 to 22 in 2007. Exceedances of other metals decreased from seven in 2006 to six in 2007. The increase in copper exceedances in 2007 may in part be due to the greater number of samples collected and analyzed for copper in 2007.

### Copper

Copper was detected at concentrations above the water quality trigger 18 times at six sites, and these detections occurred in every month except April. Copper is commonly applied throughout the Coalition region and is considered an organic herbicide, fungicide, and algicide. Refer to Appendix IV for PUR data and maps of copper applications in the Coalition region. Copper may have been responsible for the toxicity in at least one *Selenastrum* test and may have contributed to the toxicity of several others.

### Boron

A special study was initiated during the 2006-2007 storm monitoring season to identify the source of boron detected in Marsh Creek. Boron has been frequently detected above water quality trigger levels, but it was unclear whether the source was agricultural. Two new sites were established on Marsh Creek a short distance upstream of the most upstream agricultural input in an attempt to distinguish between boron naturally leached from the soils of the Coast Range and boron originating from agricultural applications. Upstream sampling was conducted during three monitoring events including the first irrigation season monitoring event in April. During that monitoring event the only boron exceedance of the irrigation season occurred at one of the newly established Marsh Creek sites. The upstream sampling concluded that boron

in the Marsh Creek site subwatershed is naturally occurring rather than having agricultural orgins.

**Arsenic**

Arsenic was detected in three separate months at Grant Line Canal @ Clifton Court Rd. As a legacy pesticide that is no longer applied, it is difficult to determine its source. In some locations in the country, particularly areas growing cotton, the extreme use of arsenic pesticides resulted in soils saturated with arsenic. Historically the Delta has never grown cotton. Arsenic has also been identified as a breakdown product of some seaweed-based fertilizers. Arsenic compounds are also used as a wood preservative, however it is doubtful that sufficient quantities of wood would be present to cause the exceedances. At this point it remains unclear what the source of the arsenic is. The Coalition is presently investigating methods for establishing background levels of arsenic in surface waters. The Coalition will determine if it is feasible to obtain the necessary data to establish background levels.

Each time an exceedance of any metal occurred, PUR data for parcels of land upstream of the sample site were reviewed for applications of products containing the particular metal within three months of the sample date. If relevant applications had occurred then it was assumed that these applications may have contributed to the exceedance experienced at the sample site.

There are numerous sources that have the potential to release metals into the environment, and it is important that the Coalition investigate all possible sources to fully understand how exceedances can be addressed.

## *Field Parameters (DO, pH, EC)*

There were 37 exceedances of the DO water quality trigger (7.0 mg/L) including three exceedances during Management Plan sampling. At least one exceedance occurred every month of the irrigation season. Exceedances of DO 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. These processes can be exacerbated by the addition of nutrients which stimulate productivity and eventually release the organic matter 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 focusing on BOD which attempted to determine if

BOD was the cause of the low DO. The results of this study are included in Appendix VIII. Only a few samples contained measurable BOD. The reasons for this could be the long holding time prior to initiation of the test or already depleated dissolved oxygen concentrations in the water column. BOD and TOC were moderately 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.

Only two exceedances of the pH water quality trigger occurred during the 2007 irrigations season, both for elevated pH (above 8.5). Mokelumne River @ Bruella Rd and Kellogg Creek @ Hoffman Ln each had a pH of 8.52; the Mokelumne River in April and Kellogg Creek in August.

There were 29 exceedances of the specific conductance (EC) water quality trigger (700 µS/cm) at 13 sites, including four exceedances during Management Plan sampling. EC exceedances were distributed across the six months of irrigation season monitoring. Further discussion of EC, as it is related to total dissolved solids (TDS), is provided in the next section.

## *Physical Parameters (Color, TDS/EC, TOC)*

Color, TDS and TOC were analyzed 84 times, and the color water quality trigger was exceeded at least once at every site with the exception of the Mokelumne River @ Bruella Rd. Mormon Slough @ Jack Tone Rd, had only a single exceedance, and Littlejohns Creek @ Jack Tone Rd, had three exceedances in the second half of the irrigation season. All other sites chronically exceeded the color water quality trigger throughout the summer. Marsh Creek was dry for all but the first event of the season and is excluded from this summary.

Color is a derived parameter in that it is not delivered to surface waters from any single source, with the possible exception of color derived from suspended sediments. Color is a result of other constituents (e.g. organic carbon) or processes (e.g. photosynthesis, turbulent flow and resuspension of particulate matter). Consequently, management of color is not possible unless the process(es) that contribute to color are understood. Color exceedances at different water bodies may be a result of different factors. As the Coalition conducts the special studies to determine the cause(s) of exceedances of

constituents such as DO and pH, information will become available that will allow us to address color exceedances.

TDS describes all solids (usually mineral salts) that are dissolved in water and were frequently associated with exceedances of EC. Samples from seven sites experienced 25 TDS exceedances distributed throughout all six months of irrigation season monitoring. Three of these sites chronically exceeded the TDS water quality trigger, with two of those sites exceeding the trigger during all six monitoring events (Grant Line Canal near Calpack Rd and Sand Creek @ Hwy 4 Bypass) and the third site exceeding the limit during five of the six events (Roberts Island Drain @ Holt Rd). Both Grant Line Canal @ Clifton Ct Rd and Roberts Island Drain along House Rd exceeded the trigger three times, and Unnamed Drain to Lone Tree Creek @ Jack Tone Rd and Marsh Creek @ Concord Ave exceeded the trigger once.

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

All five sites with chronically elevated levels of both EC and TDS- Sand Creek, both Grant Line Canal sites, and both Roberts Island Drain sites- are located in the Delta where ground water is very shallow. Water with high TDS is used for irrigation and discharged back to the Delta. This process may concentrate salts, but only to a small degree and is not the primary cause of exceedances of the TDS trigger. The CVRWQCB recognizes that EC/TDS is a region-wide problem and must be solved at that level. The Coalition will work with the CVRWQCB to address the problem over the next several years.

## *E. coli*

*E. coli* is an indicator of fecal contamination in surface waters. There were 26 exceedances of the *E. coli* water quality trigger during the 2007 irrigation season at 10 sites in a total of 79 samples tested, with exceedances occurring during all six months of monitoring. Most sites experienced multiple exceedances, with the exception of Duck Creek @ Hwy 4 and Roberts Island Drain @ Holt Rd.

Potential sources of *E. coli* include deposition or runoff from irrigated pasture, dairies, leaky sewer lines, leaky septic systems, application of manure, biosolids and liquid dairy

waste, and a large array of wildlife. A study designed to identify the source of *E. coli* in Coalition water bodies was initiated on August 15, 2006. Obligatory 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* was 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 16 sites (4 baseline and 12 monitoring) within the Coalition region during non-monitoring events. Results indicated that the source of the bacteria in the water samples was a combination of human and bovine fecal matter (as well as a small amount from poultry), depending on the location. The sampling occurred only during late summer low flow conditions and should be repeated during winter storm events. Due to low amounts of rainfall during the winter of 2006-07 no additional study was performed.

## Summary of Management Practices

Management Practices Surveys have been provided to growers throughout the 2007 irrigation season. Surveys were sent by mail on May 17, 2007 and were also handed out at grower meetings that occurred throughout the irrigation season. As of December, 2007, survey results have been received from growers. The percentage of returns varies across site subwatersheds and the results have been compiled into an Access database and summarized in this report. Summaries of survey results, compiled for the entire Coalition region as well as by each site subwatershed are provided in Appedix VI.

# Actions Taken to Address Water Quality Impacts

Ambient water monitoring is conducted by the Coalition for the purpose of characterizing water quality in the Coalition area. Over the long term, monitoring data provides insight on the general trends in water quality at each of the sample sites. Results from each event within a monitoring season can help to identify constituents that are apparent at sample sites, and which agricultural lands, crops and/or particular pesticides need to be addressed to reduce or eliminate input from agriculture. A series of actions taken to determine the potential sources of exceedances experienced during each monitoring event include 1) the use of PURs to identify relevant applications that occurred upstream of the sample site and in proximity 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 via direct-mail from the Coalition, at grower outreach meetings and, in some cases, by personal communication. The Coalition also provided growers with information on best management practices to reduce runoff of irrigation water and sediments into receiving water bodies. Additional relevant management practices were presented via direct mailings and at meetings, such as ground application of pesticides or drip and microspray systems for the purpose of reducing drift.

Reporting was also conducted to inform the Regional Board and stakeholders of Coalition monitoring results and progress. The monitoring and reporting activities are summarized in Table 32 in the next section. Further detail describing all of the actions explained above is provided in this section.

## *Outreach and Education*

Based on the results of the monitoring, the Coalition conducted special studies regarding the condition of water quality that are relevant to agriculture and it 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. Meetings were held in both San Joaquin and Contra Costa Counties. Prior to the onset of the Irrigation monitoring season, the Coalition participated in UC Davis Extension meetings for wine grape, asparagus, and alfalfa growers. In addition, monitoring results, Coalition information, and BMPs were presented at an annual bean grower meeting in Tracy on March 8, a walnut grower meeting in the Lone Tree Creek site subwatershed on May 17 and in the Littlejohns Creek site subwatershed on May 18, a Lodi Chamber of Commerce Leadership class on June 12, and a meeting with growers in the Terminous Tract Drain site subwatershed to address a malathion detection in the waterbody. Outreach was also conducted after the completion of the 2007 irrigation season. Once monitoring results had been received, outreach occurred throughout the Contra Costa and San Joaquin Counties every Tuesday during the month of October. In total, five meetings occurred in Knightsen, Tracy, east Stockton, central Stockton and Lodi. Each of the meetings provided information to growers on general Coalition matters, results from monitoring, a description of management plans and their objectives, updates from the county agricultural commissioner, and relevant best management practices to reduce discharge of irrigation water, pesticides and sediment.

In addition, over time and with each meeting conducted, growers become familiar with each of the Coalition representatives. The meetings described above are often followed with individual discussions of monitoring results and management practices that may help prevent problems. Follow-up discussions such as these have led to management practice implementation by growers, especially in site subwatersheds where exceedances have occurred more than once for a particular pesticide.

The Coalition also hosts a Coalition website: (http://www.ssjid.com/san_joaquin_county_&_delta_water_quality_coalition.htm). This website has served as a clearing house for Coalition activities and outreach on management practices. Information provided on the website has functioned as an important supplement to regular grower contacts and meetings.

## *Pesticide Control Advisors, Agricultural Commissioners, and Registrants*

In order for the Coalition to be most effective in providing recommendations on management practices that will reduce or eliminate discharge collaboration with local

County Agricultural Commissioners, Pesticide Control Advisors (PCA) and pesticide registrants is critical. During the 2007 irrigation season the Coalition worked with each of these entities on a number of occasions; all activities, events and deliverables, including collaborative work, are described in more detail in the next section.

# Activities, Events and Deliverables

Table 32 and Table 33 below provide Coalition activities, events and deliverables that have occurred during the 2007 irrigation monitoring season. Irrigation water and sediment quality monitoring occurred between the months of April and September 2007. Results from these monitoring events were provided through meetings and presentations to growers and interest groups over the course of irrigation season. Outreach to growers was conducted upon the completion of the season in order to provide information on best management practices to address the exceedances experienced. Emphasis was placed on pesticides and constituents that experienced multiple exceedances and that are most relevant to agricultural management practices, such as organophosphate (chlorpyrifos) and pyrethroid pesticides. Alternative products to pesticides that have resulted in exceedances were presented to growers as well as management practices to reduce the runoff of pesticides and sediment. In addition, where pesticide exceedances could be sourced to one (or a few) growers, the Coalition was able to work on an individual basis to determine strategies to reduce pesticide runoff in particular site subwatersheds. In some cases, growers have amended their management practices and/or the type of pesticides used in an effort to eliminate pesticide detections downstream of their fields. These changes have resulted in fewer exceedances experienced in samples collected from those site subwatersheds. Details on these actions are provided in Table 33 below.

**Table 32. Calendar of events and deliverables for the SJCDWQC during the period of March 1 – October 30, 2007.**

Entries include the date in each month in which the activity was performed. Exceedance and Communication Reports are listed as are the general class of constituent(s) (i.e. field parameters, pesticides, *E. coli*/metals/physical parameters, water column toxicity, and sediment toxicity) covered by the reports. Irrigation monitoring events are numbered in chronological order starting with Irrigation 1 which occurred on April 10 and 11, 2007.

| Date | Action Item |
|---|---|
| 10-Apr-07 | Irrigation 1 Regular water sampling event |
| 11-Apr-07 | Irrigation 1 Regular water sampling event |
| 13-Apr-07 | Irrigation 1 Field parameter exceedance report for 10-Apr-07 and 11-Apr-07 sampling |
| 18-Apr-07 | Irrigation 1 Water column toxicity exceedance report for 11-Apr-07 sampling |
| 18-Apr-07 | Irrigation 1 exceedance report for 11-Apr-07 sampling |
| 19-Apr-07 | Irrigation 1 Water resampling event |
| 22-May-07 | Irrigation 2 Regular water sampling event |
| 23-May-07 | Irrigation 2 Field parameter exceedance report for 22-May-07 sampling |

| Date | Action Item |
|---|---|
| 1-Jun-07 | Irrigation 1 Pesticide exceedance report for 11-Apr-07 sampling |
| 12-Jun-07 | Irrigation 3 Regular water sampling event |
| 13-Jun-07 | Irrigation 3 Field parameter exceedance report for 12-Jun-07 sampling |
| 14-Jun-07 | Irrigation 1 *E. coli*/Metals/Physical parameters exceedance report for 10-Apr-07 and 11-Apr-07 sampling |
| 20-Jun-07 | Irrigation 3 Management plan monitoring event |
| 20-Jun-07 | Communication Report for field parameter exceedance on 11-Apr-07 |
| 21-Jun-07 | Irrigation 3 Field parameter exceedance report for 20-Jun-07 management plan monitoring |
| 26-Jun-07 | Irrigation 3 Water column toxicity exceedance report for 20-Jun-07 management plan monitoring |
| 3-Jul-07 | Irrigation 2 Pesticide exceedance report for 22-May-07 sampling |
| 6-Jul-07 | Irrigation 2 *E. coli*/Metals/Physical parameters exceedance report for 22-May-07 sampling |
| 10-Jul-07 | Irrigation 4 Regular water sampling event |
| 11-Jul-07 | Irrigation 4 Field parameter exceedance report for 10-Jul-07 sampling |
| 16-Jul-07 | Irrigation 4 Water column toxicity exceedance report for 10-Jul-07 sampling |
| 17-Jul-07 | Irrigation 4 Water resampling event |
| 18-Jul-07 | Irrigation 4 Field parameter exceedance report for 17-Jul-07 sampling |
| 30-Jul-07 | Irrigation 3 *E. coli*/Metals/Physical parameters exceedance report for 12-Jun-07 sampling, copper exceedance report for 20-Jun-07 management plan monitoring |
| 30-Jul-07 | Irrigation 4 Management plan monitoring event |
| 30-Jul-07 | Communication Report for field parameter exceedance on 22-May-07 |
| 6-Aug-07 | Irrigation 4 Field parameter exceedance report for 30-Jul-07 management plan monitoring |
| 6-Aug-07 | Communication Report for pesticide exceedance on 11-Apr-07 |
| 7-Aug-07 | Irrigation 5 Regular water sampling event |
| 8-Aug-07 | Irrigation 5 Field parameter exceedance report for 7-Aug-07 sampling |
| 9-Aug-07 | Sediment sampling event |
| 10-Aug-07 | Field parameter exceedance report for 9-Aug-07 sediment sampling |
| 13-Aug-07 | Irrigation 4 *E. coli*/Metals/Physical parameters exceedance report for 10-Jul-07 sampling |
| 16-Aug-07 | Irrigation 4 Correction to water column toxicity exceedance report for 10-Jul-07 sampling |
| 16-Aug-07 | Communication Report for field parameter exceedance on 12-Jun-07 |
| 21-Aug-07 | Irrigation 4 Copper exceedance report for 30-Jul-07 management plan monitoring |
| 21-Aug-07 | Irrigation 4 Chlorpyrifos exceedance report for 30-Jul-07 management plan monitoring |
| 28-Aug-07 | Irrigation 5 Management plan monitoring event |
| 29-Aug-07 | Irrigation 5 Field parameter exceedance report for 28-Aug-07 management plan monitoring |
| 30-Aug-07 | Sediment toxicity exceedance report for 9-Aug-07 sediment sampling |
| 31-Aug-07 | Sediment resampling event |
| 4-Sep-07 | Irrigation 4 Pesticide exceedance report for 10-Jul-07 sampling |
| 4-Sep-07 | Irrigation 6 Regular water sampling event |
| 5-Sep-07 | Irrigation 6 Field parameter exceedance report for 4-Sep-07 sampling |
| 10-Sep-07 | Irrigation 6 Water column toxicity exceedance report for 4-Sep-07 sampling |
| 10-Sep-07 | Communication Report for *E. coli*/metals/physical parameters exceedance on 22-May-07 |
| 11-Sep-07 | Irrigation 6 Water resampling event |
| 20-Sep-07 | Irrigation 5 Copper exceedance report for 28-Aug-07 management plan monitoring |

| Date | Action Item |
|---|---|
| 21-Sep-07 | Irrigation 5 Pesticide exceedance report for 7-Aug-07 sampling |
| 24-Sep-07 | Irrigation 5 *E. coli*/Metals/Physical parameters exceedance report for 7-Aug-07 sampling |
| 25-Sep-07 | Irrigation 6 Management plan monitoring event |
| 26-Sep-07 | Irrigation 6 Field parameter exceedance report for 25-Sep-07 management plan monitoring |
| 28-Sep-07 | Irrigation 6 *E. coli*/Metals/Physical parameters exceedance report for 4-Sep-07 sampling |
| 1-Oct-07 | Sediment toxicity exceedance report for 31-Aug-07 sediment resampling |
| 2-Oct-07 | Communication Report for copper exceedance on 12-Jun-07 |
| 16-Oct-07 | Irrigation 6 Pesticide exceedance report for 4-Sep-07 sampling |
| 18-Oct-07 | Communication Report for water column toxicity exceedance on 10-Jul-07 |
| 22-Oct-07 | Irrigation 6 Chlorpyrifos exceedance report for 26-Sep-07 management plan monitoring |
| 5-Nov-07 | Communication Report for sediment toxicity exceedance on 9-Aug-07 |
| 7-Nov-07 | Communication Report for pesticide exceedance on 10-Jul-07 |
| 14-Nov-07 | Communication Report for toxicity on 4-Sep-07 |
| 28-Nov-07 | Communication Report for pesticide exceedance on 7-Aug-07 |
| 20-Dec-07 | Communication Report for pesticide exceedance on 4-Sep-07 |

**Table 33. Table of SJCDWQC actions and deliverables dealing with exceedances and management practices relevant to the 2007 irrigation monitoring season.**

| Date | County or Site Subwatershed | Activity | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| May 17, 2007 | All | Grower notification | Mailing to growers including Coalition bill, summary of exceedances, and a Coalition newsletter. | All exceedances | John Meek, Mike Wackman |
| November - December, 2007 | All | Grower notification | Exceedance notification flyers provided to growers at all Agricultural Commissioners Annual Meetings. | All exceedances | John Meek |
| May, 2007 | All | BMP Outreach and Education | Coalition website built to provide useful information to growers such as BMPs, Coalition information, Coalition meetings and outreach schedules, etc. (http://sjdeltawatershed.org/) | Pesticides | Mike Wackman |
| May 18, 2007 | Littlejohns Creek | BMP Outreach and Education | Outreach to Walnut growers in Littlejohns Creek site subwatershed, exceedances and relevant BMPs presented, alternative materials (to chlorpyrifos) and BMPs for the upcoming irrigation season discussed among growers. | Pesticides (chlorpyrifos and other OP) | Terry Prichard |
| May 16, 2007 | Lone Tree Creek | BMP Outreach and Education | Outreach to Walnut growers in the Lone Tree Creek site subwatershed, exceedances and relevant BMPs presented, alternative materials (to chlorpyrifos) and BMPs for the upcoming irrigation season discussed among growers. | Pesticides (chlorpyrifos and other OP) | Terry Prichard |
| June 12, 2007 | San Joaquin County | BMP Outreach and Education | Outreach to Lodi Chamber of Commerce Leadership Lodi Class regarding the Coalition and the Irrigated Lands Program | All exceedances | John Meek |
| June 18, 2007 | Terminous Tract Drain | BMP Outreach and Education | Grower Meeting - Terminous Tract Drain, to discuss all exceedances including malathion hit | Malathion (and all other | John Meek, MLJ-LLC |

| Date | County or Site Subwatershed | Activity | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| | | | in the site subwatershed and BMPs | exceedances) | |
| July 24, 2007 | Grant Line Canal | BMP Outreach and Education | Meet with landowner/operators, Pesticide Control Advisors of other operators, and UC Extension water and alfalfa specialists regarding the Grant Line Canal site subwatershed at the UC Extension office in Stockton to review the upcoming worm and aphid control applications. Reviewed Management Practice options for material used, applications and buffer zones. | OP Pesticides | John Meek, MLJ-LLC |
| August 8, 2007 | San Joaquin County | BMP Outreach and Education | Attended irrigation workshop by UC Extension gave presentation regarding the Irrigated Lands Program and the Coalition to growers | All exceedances | John Meek |
| August 24, 2007 | Mokelumne River | BMP Outreach and Education | Met with producer and landowner regarding irrigation runoff, set up date to inspect site (Mokelumne River) | Sediment runoff | John Meek |
| August 30, 2007 | All | BMP Outreach and Education | California Alfalfa & Forage Assn. conference call with Parry Klassen regarding pesticide application and runoff practices | Chlorpyrifos | John Meek |
| October 9, 2007 | Contra Costa County | BMP Outreach and Education | Coalition outreach to growers in the Contra Costa County held in Knightsen. Presentations included general Coalition information, monitoring results and program objectives, description of management plans, and information on management practices to decrease runoff of irrigation water, pesticides and sediment. | All exceedances (OP and pyrethroid pesticide BMPs) | John Meek, Mike Wackman, MLJ-LLC, CURES, UC Extension |

| Date | County or Site Subwatershed | Activity | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| October 16, 2007 | San Joaquin | BMP Outreach and Education | Coalition outreach to growers in the San Joaquin County held in Tracy. Presentations included general Coalition information, monitoring results and program objectives, description of management plans, and information on management practices to decrease runoff of irrigation water, pesticides and sediment. | All exceedances (OP and pyrethroid pesticide BMPs) | John Meek, Mike Wackman, MLJ-LLC, CURES, UC Extension |
| October 23, 2007 | San Joaquin County | BMP Outreach and Education | Coalition outreach to growers in the San Joaquin County held in east Stockton. Presentations included general Coalition information, monitoring results and program objectives, description of management plans, and information on management practices to decrease runoff of irrigation water, pesticides and sediment. | All exceedances (OP and pyrethroid pesticide BMPs) | John Meek, Mike Wackman, MLJ-LLC, CURES, UC Extension |
| October 30, 2007 | San Joaquin County | BMP Outreach and Education | Coalition outreach to growers in the San Joaquin County held in central Stockton and Lodi. Presentations included general Coalition information, monitoring results and program objectives, description of management plans, and information on management practices to decrease runoff of irrigation water, pesticides and sediment. | All exceedances (OP and pyrethroid pesticide BMPs) | John Meek, Mike Wackman, MLJ-LLC, CURES, UC Extension |
| May 17, 2007 | All | Management Practices Surveys | BMP Survey was included in mailing that went out to all growers in the Coalition region. | NA | John Meek |
| December 31, 2007 | All | Management Practices Surveys | BMP surveys compiled and summarized | NA | John Meek, MLJ-LLC |

| Date | County or Site Subwatershed | Activity | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| May 1, 2007 | Grant Line Canal | Management Practices Implementation | Ferguson Farms converts to alternative pesticides to chlorpyrifos (and also uses an additional buffer) which has resulted in no pesticide exceedances yet this year. Communicated change to Coalition in May but will use alternative material when needed year round. | Chlorpyrifos | Ferguson Farms |
| May 29, 2007 | Marsh Creek | Other | Communication with Barry Margesson of the Contra Costa Parks and Recreation Dept. regarding water quality in the Marsh Creek site subwatershed, to be followed up with contact to growers. | Pesticide exceedances | MLJ-LLC, John Meek |
| May 15, 2007 | Sand Creek | Other | Meeting with grower regarding management practices and drainage in the Sand Creek site subwatershed. | Pesticide exceedances | John Meek |
| July 24, 2007 | San Joaquin County | Other | Test studies to determine most effective alternative material to chlorpyrifos - results provided to growers | OP Pesticides | UC Ag Extension |
| August 8-9, 2007 | All | Other | Working with Dow Agro Sciences on chlorpyrifos issues | Chlorpyrifos | John Meek, MLJ-LLC |
| September 12, 2007 | Marsh Creek | Other | Special monitoring for pesticides and toxicity as a result of fish kill in Marsh Creek | Acrolein | MLJ-LLC, John Meek |
| September 25, 2007 | San Joaquin County | Other | Meet with landowners, PCA's and Languard representatives to discuss OP pesticide concerns and viability of Languard. | OP Pesticides | John Meek, MLJ-LLC |

| Date | County or Site Subwatershed | Activity | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| September 25, 2007 | Mokelumne River | Other | Meeting with Don Lucchessi, his landlord Jim Moffatt, Chris Jimmersen, Mike Johnson and John Meek regarding sediment runoff in Mokelumne River. Landowner has applied for an EQIP grant though NRCS to install a tailwater return system. | Sediment runoff | John Meek, MLJ-LLC |
| October 19, 2007 | Mormon Slough | Other | Meeting with grower regarding complaint of wastewater discharge. Operation and drainage of facility investigated and results reported to CVRWQCB. | General discharge | John Meek |
| November 27, 2007 | San Joaquin County | Other | Meeting with Dave Simpson regarding SJ County Ag Show booth to distribute Ag Waiver information to growers | All exceedances | John Meek |

# Exceedance, Communication, and Evaluation Reports

## *Exceedance and Communication Reports*

Exceedance reports were submitted for all exceedances experienced during the 2007 irrigation season monitoring events. Communication Reports have also been submitted for all exceedances that occurred for the first time at a site. A copy of these reports is provided in Appendix V.

## *Evaluation Reports*

Evaluation Reports were not required for exceedances experienced during the 2007 irrigation season events. Management Plans have superceded Evaluation Reports and have been submitted for each site subwatershed where two or more exceedances of a specific constituent were experienced during Coalition monitoring. Table 34 summarizes the schedule of Management Plans submitted for each site subwatershed. Management Plans 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 address the entire Coalition region is scheduled to be submitted by April 1, 2007.

**Table 34. Schedule of Management Plans that have been submitted for each site subwatershed.**

| Sample Site | Management Plan due date |
|---|---|
| Grant Line Canal near Calpack Rd* | 3/23/2007 |
| Grant Line Canal @ Clifton Court Rd* | |
| Littlejohns Creek @ Jack Tone Rd* | 3/23/2007 |
| Lone Tree Creek @ Jack Tone Rd* | 3/23/2007 |
| Lone Tree Creek @ Bernnan Rd | |
| Unnamed Drain to Lone Tree Creek at Jack* | |
| Sand Creek at Highway 4 Bypass* | 3/23/2007 |
| Marsh Creek @ Balfour Ave | 3/23/2007 |
| Marsh Creek @ Concord Ave* | |
| French Camp Slough @ Airport Way* | 4/13/2007 |
| Morman Slough @ Jack Tone* | NA |
| Duck Creek at Highway 4* | 4/13/2007 |

| Sample Site | Management Plan due date |
|---|---|
| Kellogg Creek @ Hwy 4 | 5/4/2007 |
| Kellogg Creek along Hoffman Ln* | |
| Potato Slough @ Hwy 12 | 5/4/2007 |
| Mokelumne River @ Bruella Rd* | 5/4/2007 |
| Terminous Tract Drain @ Hwy 12* | 5/4/2007 |
| Delta Drain- Terminous Tract off Glascock Rd | |
| Delta Drain- Terminous Tract off Guard Rd | |
| Roberts Island Drain along House Road* | 5/18/2007 |
| Roberts Island Drain at Holt Road* | 5/18/2007 |

*current sampling site

# Conclusions and Recommendations

Over the 2007 Irrigation season, the Coalition was able to meet its monitoring program objectives to the following degree:

- Determine the concentration and load of waste in discharges to surface waters.
  - Due to an oversight, Se was not included in the list of analytes from June through September and only 36% of the analyses were completed
  - With the exception of selenium, the completeness of the remaining 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.
  - 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.
  - 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.
  - For those constituents that could not be readily assigned a potential source, the Coalition is undertook three special studies (boron, BOD, *E. coli*) to determine the ultimate cause of the exceedance of water quality triggers.
- Assess the impact of waste discharges from irrigated agriculture to surface water.
  - Comparisons of monitoring data with water quality triggers allowed an evaluation of whether the water body was impacted by irrigated agriculture.
  - The level of impairment is difficult to determine solely from the data collected as ecosystem function is assumed to be impaired, but the mechanism of impairment is difficult to assess.

- 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 has provided surveys to growers and and received responses.
  - Survey results are being compiled to determine the management practices used in the site subwatersheds in which exceedances of water quality triggers occur.
  - The Coalition will continue to assess the degree of implementation of management practices over time.
- Determine the effectiveness of management practices and strategies to reduce discharges of wastes that impact water quality.
  - Determining effectiveness remains an elusive task.
  - Variability in climatic conditions and pest control needs may result in improvement or degradation water quality despite the management practices implemented.
  - The Coalition is receiving information from organizations such as the University of California, Davis and the Coalition for Urban/Rural Environmental Stewardship on the effectiveness of various new management options.
  - At this time, the Coalition does not have a adequate data to evaluate the effectiveness of management practices implemented in the Coalition region.
  - At this time, the Coalition does not have sufficient information returned from growers to characterize the management practices implemented throughout a site subwatershed with regard to specific exceedances.

The monitoring and reporting program was a success in that:

- All planned sample events were captured and samples were collected from all sites that had water
- 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 Coalition contracted with a new toxicity testing laboratory and was able to obtain information on exceedances and causes in a timely manner

The monitoring and reporting program will improve in the following areas:

- The Coalition will try to obtain the Pesticide Use Reports more quickly so the source identification analyses can be performed

The monitoring program provided the following technical conclusions:

- In many site subwatersheds, large amounts of pesticides are applied emphasizing the importance of managing water quality from a watershed perspective
  - Multiple applications of pesticides in a site subwatershed make source identification difficult
  - Common pesticides are often applied across the entire site subwatershed on multiple parcels
- The most common exceedances were dissolved oxygen, *E. coli*, TDS/EC, pesticides, and toxicity

At this point, it is difficult to determine if water quality measured during the irrigation season of 2007 is improved over the irrigation season of 2006. The winter of 2007 was very dry compared to 2006 and irrigation was initiated a month earlier in 2007 compared to 2006. Overall there were fewer exceedances in 2007 compared to 2006 even though there was an increased monitoring effort. Much of the improvement can be attributed to grower contacts made by Coalition representatives. Conversations took place with individual growers in the Sand Creek and Grant Line Canal @ Calpack Rd site subwatersheds. These are small watersheds that experienced a large number of exceedances in the past. Growers made significant efforts to prevent discharges and these efforts appeared to be successful. No exceedances were experienced this irrigation season for the specific constituents of concern in those site subwatersheds. Given the lack of exceedances detected at these sites to date, the process of monitoring, obtaining PURs, and contacting growers appears to be successful in eliminating water quality problems.

The success in these two areas was the result of the small size of the subwatersheds, the relatively few growers operating in the area, and the willingness of the growers to discuss the problem and modify their operations. Not all subwatersheds have those conditions and consequently, it will not be as easy to affect change in water quality throughout the Coalition region. The Coalition will make substantial efforts to target problem areas and contact growers.

In addition, many of the site subwatersheds are under Management Plans and specific monitoring efforts will be developed for those locations.