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March 1, 2010

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Irrigated Lands Conditional Waiver Program
Central Valley Regional Water Quality Control Board
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Dear Dania,

The East San Joaquin Water Quality Coalition (ESJWQC) is submitting the 2010 Annual Monitoring Report (AMR) and Quarterly Monitoring Data Report (fourth quarter) for review by the Central Valley Regional Water Quality Control Board (CVRWQCB) as required by the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Resolution Order No. R5-2006-0053, Monitoring and Reporting Program Order No. R5-2008-0005 (MRP).

The attached documents report on the Coalition's monitoring program for the period of October 1, 2008 to December 31, 2009 and covers monitoring, reporting, outreach and education activities that occurred during this time. The Quarterly Monitoring Data Report is specific to the data collected from October 1, 2009 and December 31, 2009 (fourth quarter).

In every aspect, the Coalition seeks the best quality in its monitoring program by using the most scientifically reliable field and laboratory protocols, ensuring complete quality control and quality assurance of the data received from laboratories, and reporting on that data accurately and punctually to both the CVRWQCB and to the members of the Coalition. The Coalition and its technical staff process and review an immense quantity of data and provide a large number of reports in a timely manner to the CVRWQCB.

The Coalition's monitoring program met MRP requirements as described in the attached AMR. Sampling occurred during all fifteen months (including one storm event and two sediment events) and all data generated are an accurate reflection of conditions in the Coalition region. Overall, there was compliance with completeness, accuracy, and precision requirements for data collected from October 2008 through December 2009. Each of the five MRP programmatic questions is addressed in the Conclusions and Recommendations section of the AMR.

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

This letter will be mailed to the CVRWQCB with an original signature.

Submitted respectfully,

Parry Klassen
Executive Director
East San Joaquin Water Quality Coalition

East San Joaquin
WATER QUALITY COALITION

# Annual Monitoring Report

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## AMR Requirements – Section Key

| Required Section - MRP | Section Name/Location - AMR |
|---|---|
| 1. Signed Transmittal Letter; | Cover Letter |
| 2. Title page; | San Joaquin County & Delta Water Quality Coalition AMR |
| 3. Table of contents; | Table of Contents,<br>List of Tables,<br>List of Figures |
| 4. Executive Summary; | Executive Summary |
| 5. Description of the Coalition Group geographical area; | Geographical Area |
| 6. Monitoring objectives and design; | Monitoring Objectives and Design |
| 7. Sampling site descriptions and rainfall records for the time period covered under the AMR; | Sampling Site Descriptions and Rainfall Record |
| 8. Location map(s) of sampling sites, crops and land uses; | Sampling Site Descriptions and Rainfall Record,<br>Appendix VIII (Land Use Maps and 2009 Annual Site Photos) |
| 9. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible (example table is included in (MRP Order Attachment C); | Appendix II (Monitoring Results) |
| 10. Discussion of data to clearly illustrate compliance with the Coalition Group Conditional Waiver, water quality standards, and trigger limits; | Discussion of Results,<br>Conclusions and Recommendations |
| 11. Electronic data submitted in a SWAMP comparable format; | SWAMP Comparability Access Database (attached CD) |
| 12. Sampling and analytical methods used; | Sampling and Analytical Methods |
| 13. Copy of chain-of-custody forms; | Appendix I (Chain of Custody Forms) |
| 14. Field data sheets, signed laboratory reports, laboratory raw data (as identified in Attachment C); | Appendix IX (Field Sheets),<br>Quarterly Data Submittal (attached CD, attached printed hard copies),<br>Appendix VI (Toxicity Identification Evaluation Report) |
| 15. Associated laboratory and field quality control samples results; | Appendix III (Lab and Field QC Results) |

| Required Section - MRP | Section Name/Location - AMR |
|---|---|
| 16. Summary of Quality Assurance Evaluation results (as identified in Attachment C for Precision, Accuracy and Completeness) ; | Precision, Accuracy and Completeness |
| 17. Specify the method used to obtain flow at each monitoring site during each monitoring event; | Sampling and Analytical Methods |
| 18. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date. | Appendix VIII (Land Use Maps and 2009 Annual Site Photos) |
| 19. Summary of Exceedance Reports submitted during the reporting period and related pesticide use information; | Discussion of Results,<br>Appendix IV (Pesticide Use Reports),<br>Appendix V (Exceedance Reports)<br>PUR Access Database (attached CD) |
| 20. Actions taken to address water quality exceedances that have occurred, including but not limited to, revised or additional management practices implemented; | Actions Taken To Address Water Quality Exceedances,<br>Appendix VII (Meetings, Agendas and Handouts) |
| 21. Status update on preparation and implementation of all Management Plans and other special projects; and | Management Plan Status and Special Projects |
| 22. Conclusions and recommendations. | Conclusions and Recommendations |

## List of Acronyms

| | |
|---|---|
| A | Assessment |
| AG | Agriculture |
| AMR | Annual Monitoring Report |
| AWEP | Agricultural Water Enhancement Program |
| BMP | Best Management Practice |
| BU | Beneficial Use |
| C | Core |
| CDEC | California Data Exchange Center |
| CEDEN | California Environmental Data Exchange Network |
| COC | Chain of Custody |
| CURES | Coalition for Urban and Rural Environmental Stewardship |
| CVRWQCB | Central Valley Regional Water Quality Control Board |
| DDD | Dichlorodiphenyldichloroethane |
| DDE | Dichlorodiphenyldichloroethylene |
| DDT | Dichlorodiphenyltrichloroethane |
| DO | Dissolved Oxygen |
| DQO | Data Quality Objective |
| DWR | (California) Department of Water Resources |
| $EC_{50}$ | Effective Concentration of 50% of the measured endpoint |
| EPA | Environmental Protection Agency |
| ESJWQC | East San Joaquin Water Quality Coalition |
| FB | Field Blank |
| FD | Field Duplicate |
| HCH | Hexachlorocyclohexane |
| ID | Identification |
| ILRP | Irrigated Land and Regulatory Program |
| $K_{oc}$ | Organic Carbon Partitioning Coefficient |
| LABQA | Laboratory Quality Assurance |
| $LC_{50}$ | Lethal Concentration at 50% mortality |
| LCS | Laboratory Control Spike |
| LCSD | Laboratory Control Spike Duplicate |
| MCL | Maximum Contaminant Level |
| MDL | Maximum Daily Load |
| MLJ-LLC | Michael L. Johnson, LLC |
| MPM | Management Plan Monitoring |

| | |
|---|---|
| MPN | Most Probable Number |
| MRP | Monitoring and Reporting Program Order No. R5-2008-0005 |
| MRPP | Monitoring and Reporting Program Plan |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| MUN | Municipal and Domestic Supply (beneficial use) |
| NA | Not Applicable |
| ND | Not Detected |
| NM | Normal Monitoring |
| OP | Organophosphate pesticides |
| PCA | Pesticide Control Advisor |
| pH | Power of Hydrogen |
| PR | Percent Recovery |
| PTFE | Polytetraflouroethylene (Teflon™) |
| PUR | Pesticide Use Report |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RfD | Reference Dose |
| RL | Reporting Limit |
| RPD | Relative Percent Difference |
| RSD | Relative Standard Deviation |
| SC | Specific Conductance |
| SG | Statistically significantly different from control; Greater than 80% threshold |
| SL | Statistically significantly different from control; Less than 80% threshold |
| SOP | Standard operating procedure |
| SWAMP | Surface Water Ambient Monitoring Program |
| TDS | Total Dissolved Solids |
| TIE | Toxicity Identification Evaluation |
| TKN | Total Kjeldahl Nitrogen |
| TMDL | Total Maximum Daily Load |
| TOC | Total Organic Carbon |
| TRS | Township, Range, Section |
| TSS | Total Suspended Solids |
| UC | University of California |
| UCD RDC | University of California, Davis Regional Data Center |
| US EPA | United States Environmental Protection Agency |
| VOA | Volatile Organic Analyte |
| WQTL | Water Quality Trigger Limit |

| | |
|---|---|
| YSI | Yellow Springs Instruments |

## List of Units

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

## List of Terms

**Agricultural Commissioner** – County Agriculture Commissioner

**ArcGIS** – Geographic Information Systems mapping software

**Central Valley or Valley** – California Central Valley

**Coalition** –East San Joaquin Water Quality Coalition

**Coalition/ESJWQC region** – The region within the Central Valley that is monitored by the East San Joaquin Water Quality Coalition.

**Drainage** –water that moves horizontally across the surface or vertically into the subsurface from land

**Landowners** – one or more persons responsible for the management of the irrigated land

**Non project 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; also includes TMDL monitoring.

**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. R5-2008-0005 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 East San Joaquin Water Quality Coalition (ESJWQC) region includes the counties of Stanislaus, Merced, Madera, Tuolumne, and Mariposa and the portion of Calaveras County that drains into the Stanislaus River. Apart from the San Joaquin River which forms the south and east boundary of the Coalition, there are five major rivers in the watershed: the Fresno River, Chowchilla River, Merced River, Tuolumne River and Stanislaus River. In addition, the Eastside Bypass is considered a major water body. These east side tributaries of the San Joaquin River drain the Sierra Nevada range from east to west. Irrigated agriculture is the predominant land use in the Coalition area although the growing urban areas in the Central Valley are also a significant land use. Other non-irrigated land uses include dairies with minor acreage in feedlots.

The Coalition area was divided into six zones based on hydrology, crop types, land use, soil types, and rainfall. The zone names are: 1) Dry Creek @ Wellsford Zone, 2) Prairie Flower Drain @ Crows Landing Zone, 3) Highline Canal @ Hwy 99 Zone, 4) Merced River @ Santa Fe Zone, 5) Duck Slough @ Gurr Rd Zone, and 6) Cottonwood Creek @ Rd 20 Zone. Descriptions of zone-specific climate, water drainage and flow, soil characteristics and land use are included in the Coalition's Monitoring and Reporting Plan (submitted August 25, 2008).

### *MONITORING PROGRAM OBJECTIVES*

Water quality monitoring was conducted during every month from October 2008 through December 2009. The primary objectives of the monitoring program were to characterize discharge from agriculture and to determine if implementation of management practices was effective in reducing or eliminating discharge. The ESJWQC monitored water quality at 20 sites in the Coalition region between October 2008 and December 2009. In addition, eleven sites were monitored under management plans as outlined in the ESJWQC Management Plan (submitted September 30, 2008 and updated annually on April 1 of each year). Of the sites monitored for management plan constituents, three sites (Dry Creek @ Wellsford Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd) were also monitored monthly for normal monitoring constituents. The Coalition sampled for numerous water quality parameters and constituents including 45 pesticides, *E. coli*, physical parameters (total dissolved solids, total suspended solids and turbidity), nine metals, total organic carbon, five nutrients, field parameters (dissolved oxygen, pH, specific conductivity), water column toxicity to three test species (*Ceriodaphnia dubia*, *Pimephales promelas* and *Selenastrum capricornutum*) and sediment toxicity to *Hyalella azteca*. In May 2009 the Coalition omitted the following constituents from its monitoring program: metals not applied by agriculture (arsenic, cadmium, lead and molybdenum), sediment bound pesticides (glyphosate, paraquat dichloride), organochlorine pesticides no longer applied by agriculture (including Group A

pesticides) along with a subset of nutrients (Total Kjeldahl Nitrogen and orthophosphate) (ESJWQC MRPP amended on May 15, 2009). These constituents will be sampled once a year during events with high total suspended solids except for Total Kjeldahl Nitrogen and orthophosphate (OP) which were omitted completely starting April 2009 due to redundancy in monitoring data. Monitoring constituents are established by the Irrigated Lands Regulatory Program (ILRP) Monitoring and Reporting Program (MRP) (Order No. R5-2008-0005).

The monitoring program from October 2008 through December 2009 under the new ILRP MRP was substantially different relative to previous years of monitoring. Within each zone, a Core Monitoring site and an Assessment Monitoring site were established. Core sites are meant to establish trends in water quality over a longer period of time and will be monitored continuously over several years. There are fewer constituents monitored at core sites, primarily physical parameters and nutrients. Assessment monitoring sites are meant to characterize discharge in the zone in which they are located. Assessment Monitoring includes the full suite of constituents. Assessment sites are rotated every third year to a new site. Core sites receive assessment monitoring every third year as well.

## *MONITORING PROGRAM COMPLIANCE*

For the period of October 2008 to December 2009, the Coalition was able to meet its monitoring program objectives by determining the concentration and load of waste in discharges to surface waters, evaluating compliance with existing narrative and numeric water quality limit triggers to determine if implementation of additional management practices is necessary to improve and/or protect water quality and assessing the impact of storm water discharges from irrigated agriculture to surface water. The Coalition used the results from surveys of management practices to determine the implementation of management practices to reduce discharge of specific wastes that impact water quality in receiving waters of the Coalition region.

Coalition monitoring between October 1, 2008 and December 31, 2009 resulted in exceedances of Water Quality Trigger Limits (WQTLs) for dissolved oxygen (DO), power of hydrogen (pH), specific conductance (SC), *E. coli*, total dissolved solids (TDS), ammonia, nitrate, arsenic, copper, chlorpyrifos, diuron, dichlorodiphenyldichloroethylene (DDE), and hexachlorocyclohexane (HCH). Water column toxicity to *Ceriodaphnia dubia, Pimephales promelas, Selenastrum capricornutum,* and sediment toxicity to *Hyalella azteca* occurred between October 2008 and December 2009.

The most common exceedances were for DO (39 exceedances - 23%), TDS (22 exceedances - 18%), SC (28 exceedances - 17%), pH (17 exceedances - 10%), and *E. coli* (56 exceedances - 41%). Exceedances of the nitrate WQTL were common (20 exceedances - 17%) and of the metals analyzed; only copper and arsenic exceeded WQTLs. All arsenic exceedances were at a

single location, Deadman Creek @ Gurr Rd. Among the metals, only copper is currently used by agriculture within the Coalition region. Sources are distinguishable using stable isotopes but the cost of the analyses is substantial and the Coalition does not anticipate using this technique to identify the source(s). There were eleven pesticide exceedances; the most common pesticide exceedance was for the chlorpyrifos WQTL (0.9% of all samples collected, includes Management Plan Monitoring exceedances). Overall, exceedances of physical parameters and *E. coli* were more common than exceedances of pesticides or metals (16.7%, 40.7%, 0.6% and 1.5% respectively).

From the 11 toxic water column samples, five of those samples had end points less than 50% compared to the control and therefore Toxicity Identification Evaluations (TIEs) were performed. Three TIEs indicated that ammonia was the cause of the toxicity; one TIE indicated the toxicity resulted from a combination of ammonia and a cationic metal, and the remaining TIE indicated pyrethroids were the cause.

The series of actions taken to determine the potential sources of exceedances include: 1) the use of Pesticide Use Reports (PURs) to identify relevant applications that occurred upstream of the sample site and within a specified time period prior to the sampling event, 2) an analysis of monitoring data and toxicity results to better understand the potential sources and toxicity of detected constituents, 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.

Grower notification, management practice outreach and education, and management practice tracking and implementation are additional actions taken by the Coalition to ensure that growers are aware of downstream water and sediment quality issues as well as the importance of implementing various management practices within their farm operations. The Coalition provides growers with information on management practices to reduce storm water runoff, discharge of irrigation water, and mobilization of sediments into receiving waters.

The Coalition has developed a strategy to prioritize subwatersheds in order to conduct focused outreach with individual members. The purpose of the outreach is to review current farm management practices, determine if additional management practices are applicable, and document implementation of any new practices. From 2008 to 2010 the Coalition has conducted focused outreach in: Dry Creek @ Wellsford Rd, Prairie Flower Drain @ Crows Landing Rd and Duck Slough @ Hwy 99. Growers were contacted during the spring and summer of 2009, a review of management practices was conducted and documented including any recommended practices. Follow up with growers will be conducted in spring of 2010 to document implementation of new practices.

## *CONCLUSIONS*

The results of the monitoring program from October 2008 through December 2009 indicate that although there has been substantial improvement in water quality in many areas, water quality is still not protective of beneficial uses across most of the Coalition region. The most common exceedances of WQTLs involve physical parameters such as DO, TDS, and SC which resulted in impaired Agricultural and Aquatic Life Beneficial Uses. Other parameters such as *E. coli* and TDS also experienced numerous exceedances which resulted in impaired Recreational and Aquatic Life Beneficial Uses. The most common causes of impairment of the Municipal Beneficial Use were elevated concentrations of arsenic. Discharges from irrigated lands are but one of many possible sources of impairments to beneficial uses.

For many parameters, it is not clear to what extent WQTL exceedances are the results of current agricultural activities. Source identification is difficult especially for non-conserved constituents. There are numerous non-conserved constituents that cannot be traced upstream, e.g. dissolved oxygen. Many pesticides are the result of agricultural applications and enter surface waters as a result of drift or runoff in either storm water or irrigation return flows. The Coalition is continuing to identify sources of WQTL exceedances through PUR, assessment of water quality data and evaluation of current management practices. The Coalition's sourcing strategy is further described in the Coalition's Management Plan.

The Coalition's outreach program is focused on general meetings for growers across the entire Coalition region. Information on management practices is provided by the Coalition in several forums that range from meetings with one or two growers to large annual meetings sponsored by the Coalition.

The conclusions from these data are that 1) individual grower visits are an effective method of communicating with members, and 2) implementation of management practices is improving water quality in the Coalition region.

## ESJWQC Geographical Area

The ESJWQC area includes Stanislaus, Merced, Madera, Tuolumne, and Mariposa Counties and the portion of Calaveras County that drains into the Stanislaus River. The region that drains into the Coalition area is bordered by the crest of the Sierra Nevada on the east and the San Joaquin River on the west, the Stanislaus River on the north to the San Joaquin River on the south. The southern portion of the Coalition area has been expanded since the inception of the Coalition and now includes the area that was formerly the Root Creek Coalition area. Landholdings in the vicinity of the Lone Willow Slough drainage area (west of the Eastside Bypass) have joined the Westside Coalition.

### Irrigated Land

Overall the Coalition is comprised of approximately 5,500,314 acres of which 17% are irrigated. Although exact acreage is difficult to estimate due to rapidly changing land use, the Coalition area contains approximately 919,730 acres that are considered irrigated agriculture (Table 1). For Madera, Tuolumne and Mariposa Counties, the Coalition used the Department of Water Resources (DWR) land use estimates for irrigated agriculture to determine total acreage. Acreage included in Table 1 for Stanislaus, Merced and Calaveras Counties were obtained from land use survey from the DWR since the Coalition boundary does not accurately represent the county boundary (Table 1).

***Table 1. Acreage of irrigated land in ESJWQC counties and available DWR data.***

| County | Irrigated Land Area (acres) | Data Source Year (Agricultural Land and Water Use) | Data Source Year (Land Use Survey) |
|---|---|---|---|
| Calaveras | 880 | 2000 – Not Used | 2000 |
| Madera | 295,000 | 2001 | 2001 |
| Mariposa | 1,300 | 2001 | 1998 |
| Merced | 342,200 | 2002 – Not Used | 2002 |
| Stanislaus | 279,050 | 2004 – Not Used | 2004 |
| Tuolumne | 1,300 | 2001 | 1997 |
| **Total** | **919,730** | | |

DWR Agricultural Land Use: http://www.water.ca.gov/landwateruse/anaglwu.cfm
DWR Land Use Survey: http://www.water.ca.gov/landwateruse/lusrvymain.cfm

## Geographical Characteristics and Land Use

The Coalition area has been divided into six zones to create a comprehensive monitoring program (Figure 1). These zones were designated based on hydrology, crop types, land use, soil types, and rainfall (Table 2). The zone names are based on the Core Monitoring location within that area and are: 1) Dry Creek @ Wellsford Zone, 2) Prairie Flower Drain @ Crows Landing Zone, 3) Highline Canal @ Hwy 99 Zone, 4) Merced River @ Santa Fe Zone, 5) Duck Slough @ Gurr Rd Zone, and 6) Cottonwood Creek @ Rd 20 Zone. Descriptions of zone-specific climate, water drainage and flow, soil characteristics and land use are included in the Coalition's MRPP (submitted August 25, 2008). Land use maps for each zone are Figures 2 -7.

*Figure 1. Zone boundaries (1-6) within the ESJWQC.*

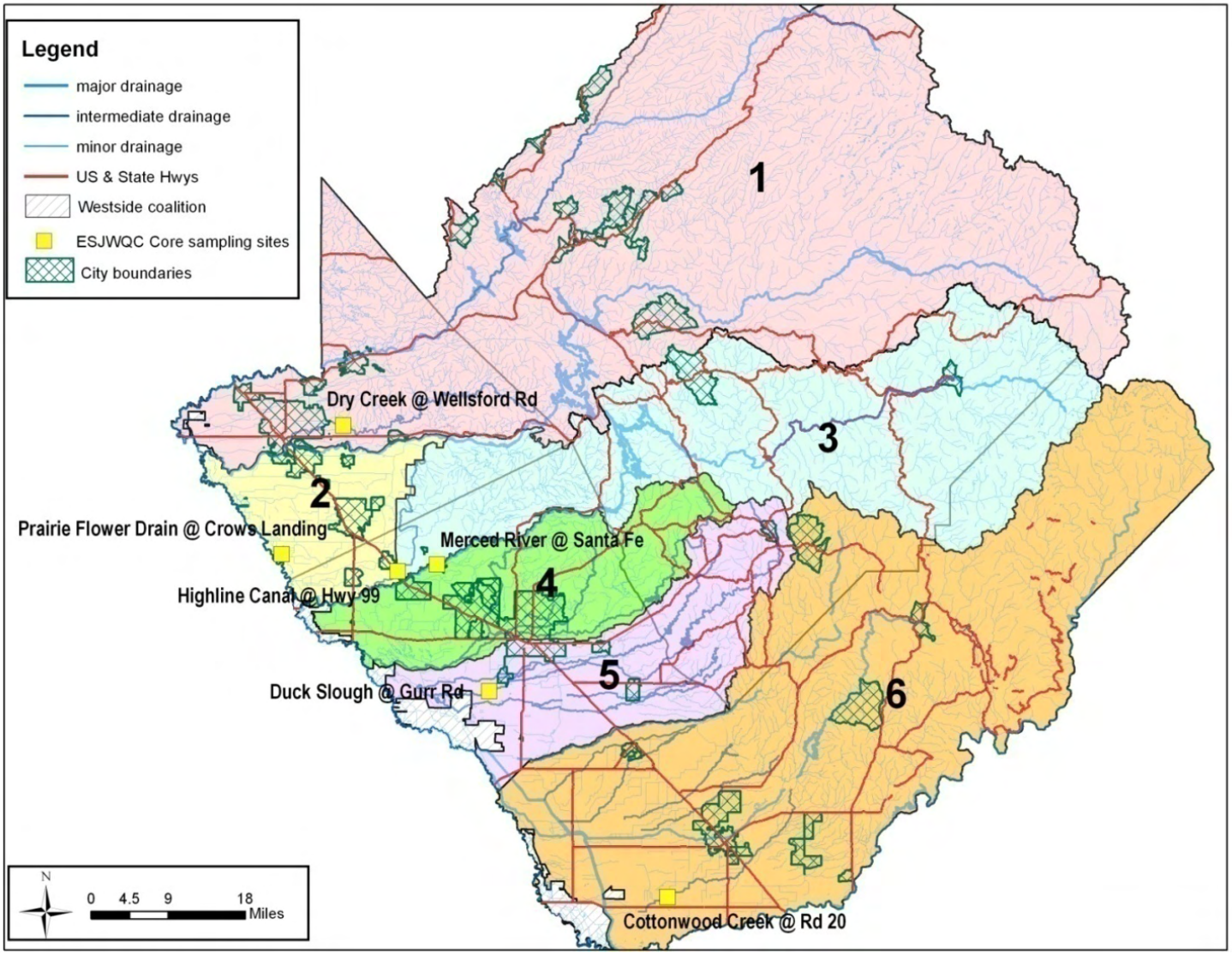


*Table 2. Land use and soil percentages for ESJWQC zones.*

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 |
|---|---|---|---|---|---|---|
| | Dry Creek @ Waterford/ Wellsford Zone | Prairie Flower Drain @ Crows Landing Zone | Highline Canal @ Hwy 99 Zone | Merced River @ Santa Fe Zone | Duck Slough @ Gurr Rd Zone | Cottonwood Creek @ Rd 20 Zone |
| Total Acres | 2,739,267.53 | 757,501.78 | 1,213,340.09 | 608,351.75 | 637,819.21 | 1,268,513.09 |
| Irrigated Acres | 134,306.48 | 164,632.91 | 88,616.45 | 121,746.40 | 142,686.29 | 335,069.21 |
| Soil (average %): | | | | | | |
| Sand | 56.26 | 71.42 | 62.03 | 58.77 | 39.56 | 63.66 |
| Silt | 25.34 | 18.83 | 23.45 | 25.39 | 36.05 | 22.26 |
| Clay | 18.40 | 9.75 | 14.52 | 15.83 | 24.38 | 14.08 |
| Land Use (% of irrigated acres): | | | | | | |
| Deciduous Fruits/Nuts | 39.21 | 37.83 | 60.73 | 37.55 | 18.82 | 31.63 |
| Field Crops | 16.27 | 22.73 | 15.84 | 22.25 | 32.85 | 15.29 |
| Grains/Hay | 0.89 | 0.81 | 1.57 | 3.87 | 5.54 | 4.28 |
| Pasture | 35.04 | 30.88 | 11.13 | 19.58 | 31.42 | 13.17 |
| Vineyard | 3.76 | 3.27 | 8.63 | 5.69 | 1.69 | 31.37 |
| Dairies/Feedlots: | | | | | | |
| % of total acres | 0.34 | 1.59 | 0.20 | 0.80 | 0.66 | 0.53 |
| Number of operations | 1,903 | 2,302 | 273 | 473 | 460 | 1,725 |
| Urban (% of total acres) | 2.70 | 5.77 | 0.93 | 3.84 | 2.01 | 3.02 |
| Depth to groundwater: | | | | | | |
| Weighted average | 49.18 | 30.12 | 138.17 | 46.43 | 68.52 | 119.98 |
| % area of groundwater | 5.7 | 71.9 | 7.1 | 39 | 43.3 | 25.1 |

*Figure 2. Land use for Dry Creek @ Wellsford Rd Zone (Zone 1). See Figure 8 for a land use legend.*

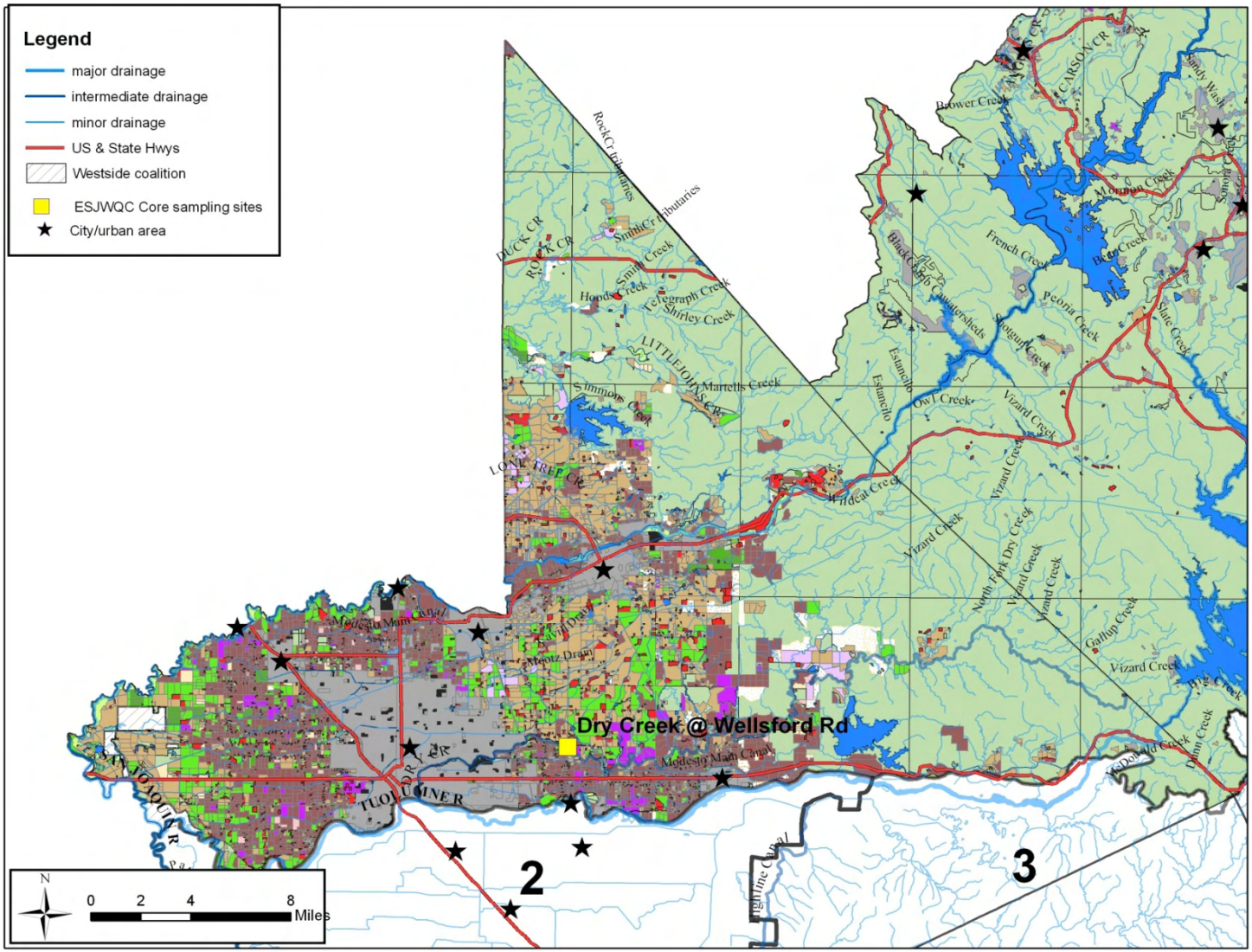


*Figure 3. Land use for Prairie Flower Drain @ Crows Landing Zone (Zone 2). See Figure 8 for a land use legend.*

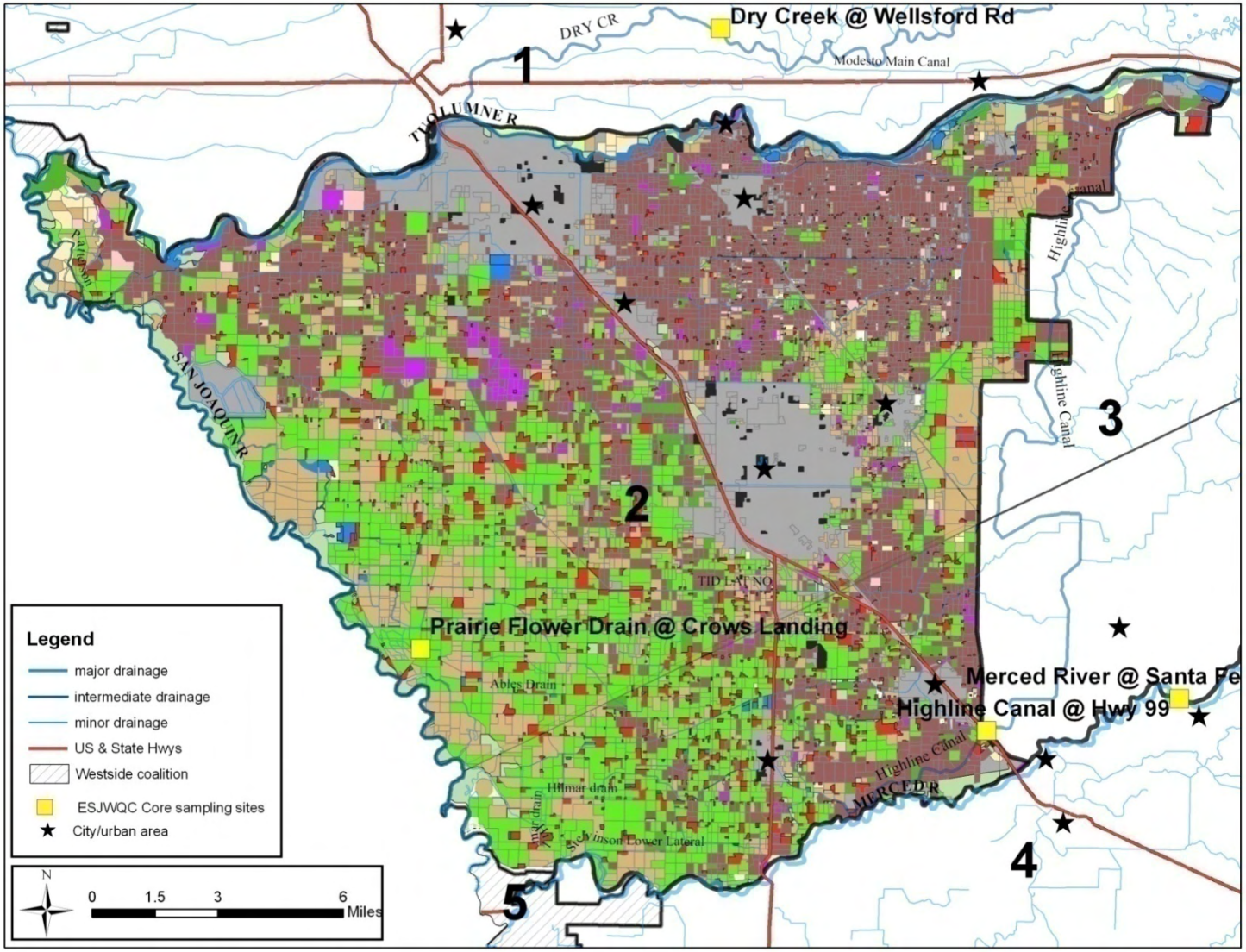


*Figure 4. Land use for Highline Canal @ Hwy 99 Zone (Zone 3). See Figure 8 for a land use legend.*

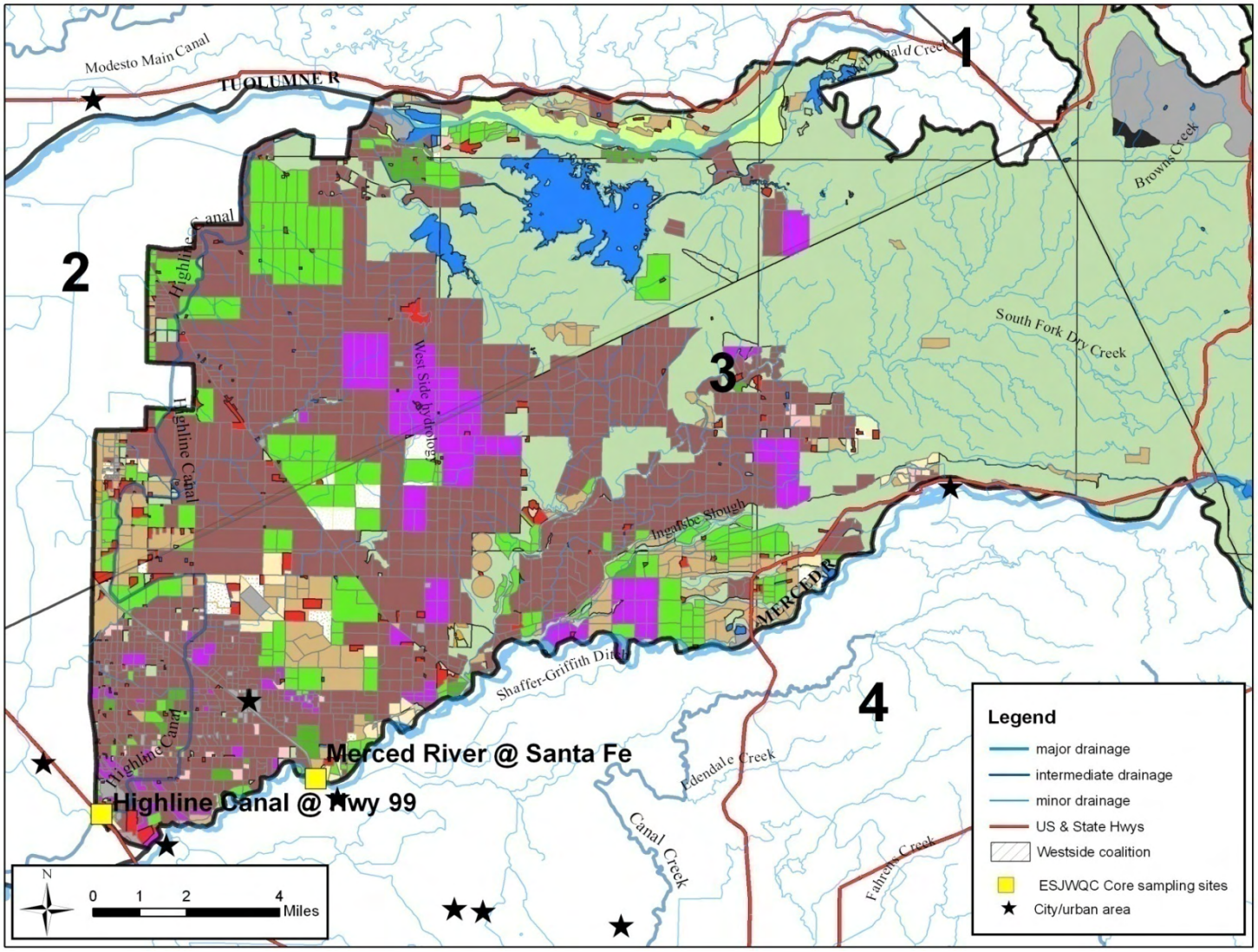


*Figure 5. Land use for Merced River @ Santa Fe Zone (Zone 4). See Figure 8 for a land use legend.*

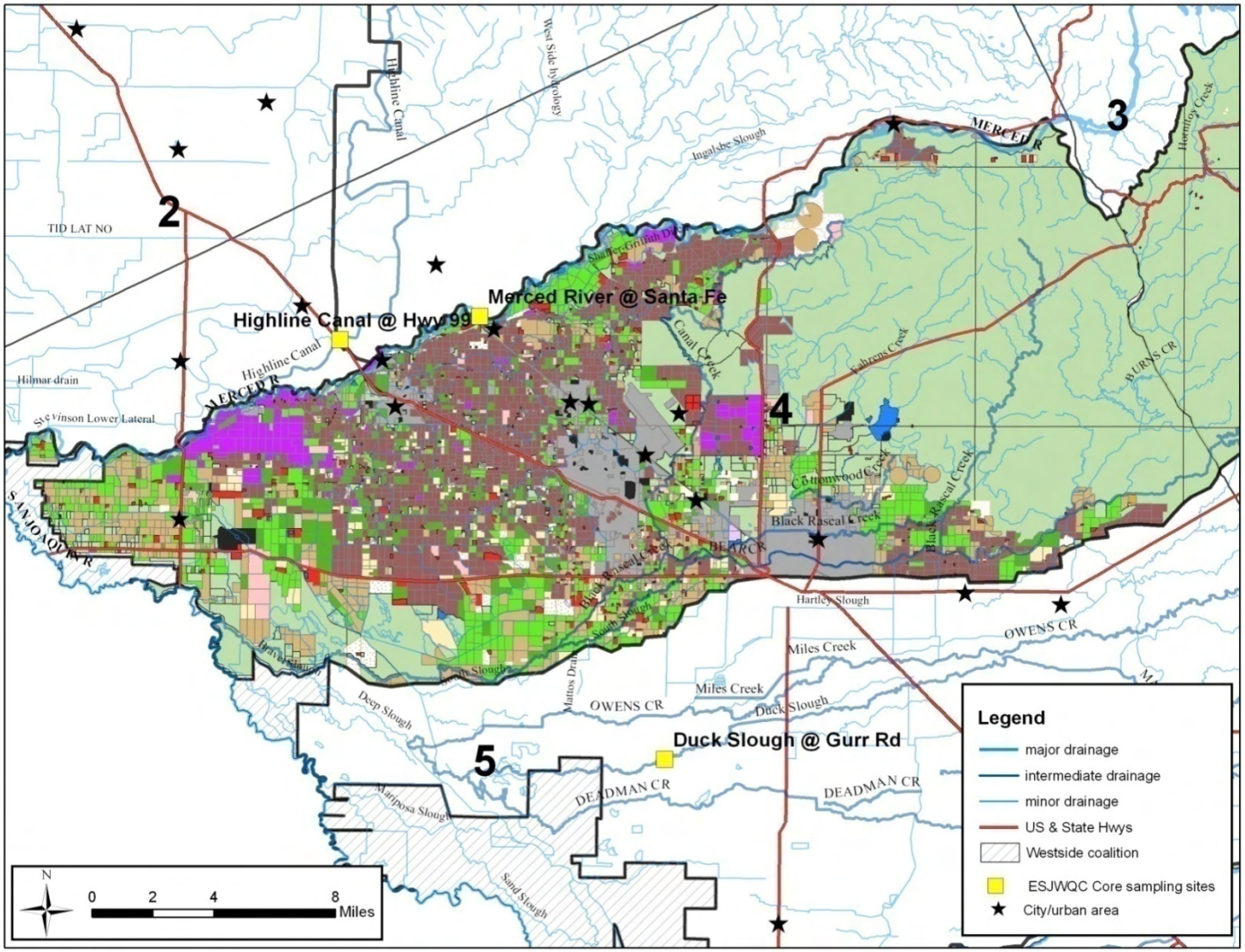


*Figure 6. Land use for Duck Slough @ Gurr Rd Zone (Zone 5). See Figure 8 for a land use legend.*

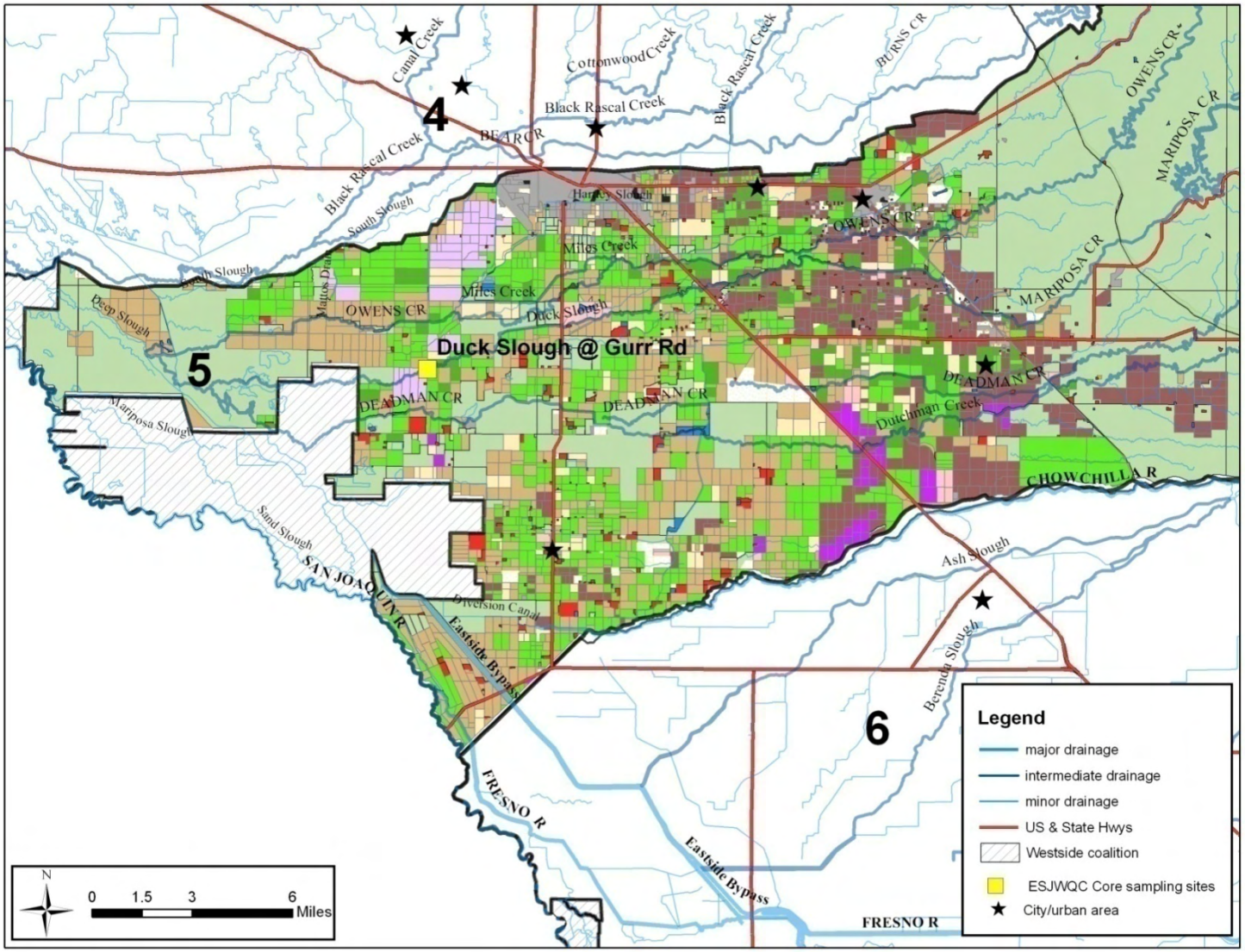


*Figure 7. Land use for Cottonwood Creek @ Rd 20 Zone (Zone 6). See Figure 8 for a land use legend.*

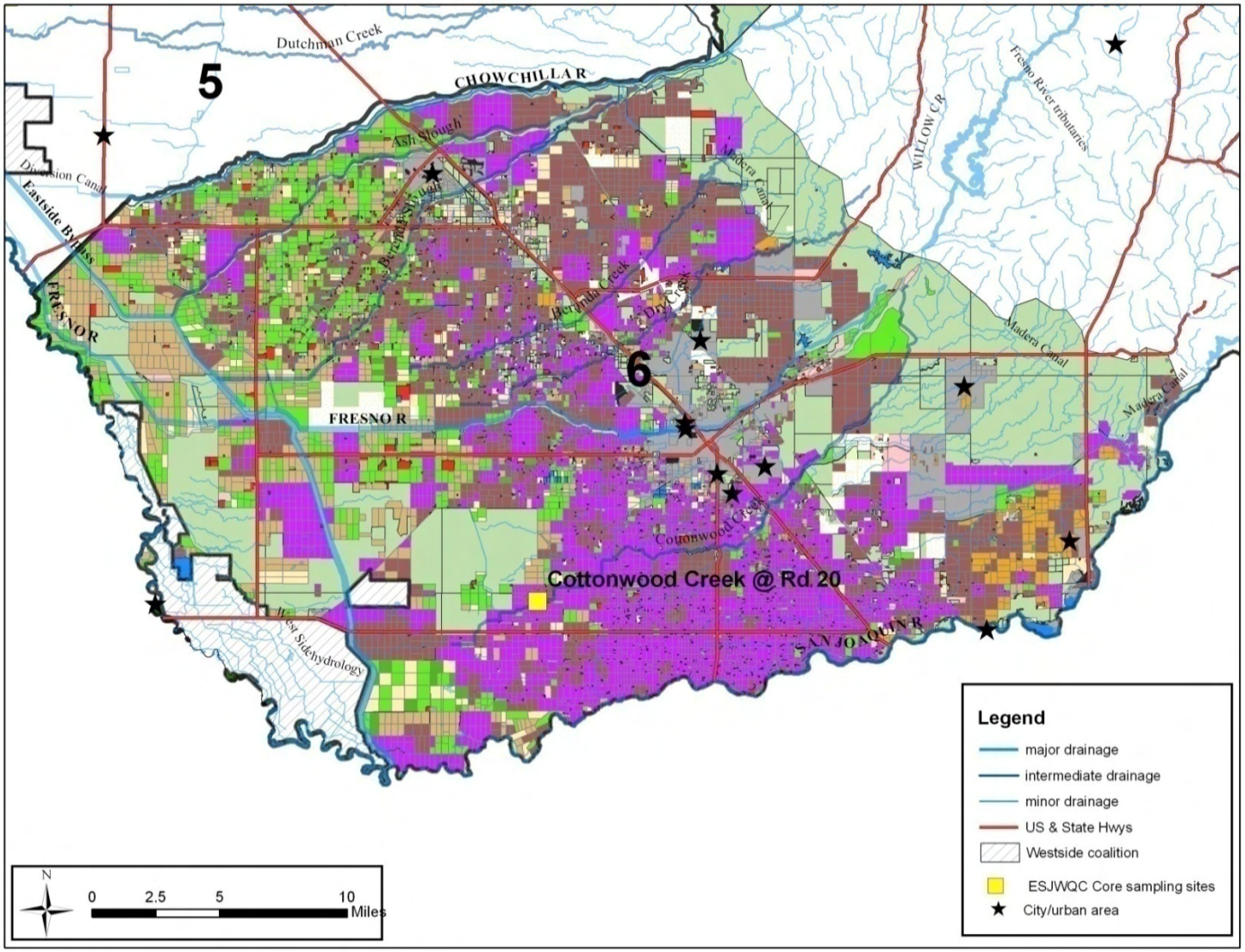


*Figure 8. Land use legend for ESJWQC.*

# Monitoring Objectives and Design

## Monitoring October 2008 – December 2009

From October 2008 to December 2009 the Coalition conducted both normal monitoring and Management Plan Monitoring based on the approved Management and Reporting Program Plan (MRPP) submitted on August 25, 2008 and Management Plan submitted on September 30, 2008.

As part of normal monitoring during the 2009 monitoring year, the Coalition sampled both Core and Assessment Monitoring locations once a month including at least one storm event and two sediment events. The following section briefly describes the objectives of normal monitoring (including Core, Assessment and sediment monitoring) and Management Plan Monitoring (MPM) as well as the overall Coalition sampling design including sampling seasons and storm triggers.

## Monitoring Objectives

The objectives of the ESJWQC monitoring program are to:

1. Determine the concentration and load of waste in discharges to surface waters
2. Evaluate compliance with existing narrative and numeric water quality objectives to determine if implementation of additional management practices is necessary to improve and/or protect water quality
3. Assess the impact of waste discharges from irrigated agriculture to surface water
4. Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality in watersheds within the coalition region
5. 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 ESJWQC monitored water quality at 20 sites in the Coalition region between October 2008 and December 2009. In addition, eleven sites were monitored for MPM as outlined in the ESJWQC Management Plan. Of the sites monitored for management plan constituents, three sites (Dry Creek @ Wellsford Rd, Highline Canal @ Hwy 99, and Prairie Flower Drain @ Crows Landing Rd) were also monitored monthly for normal monitoring constituents. The Coalition sampled for numerous water quality parameters and constituents including 45 pesticides, *E. coli*, physical parameters (total dissolved solids, total suspended solids and turbidity), nine metals, total organic carbon, five nutrients, field parameters (dissolved oxygen, pH, specific conductivity), water column toxicity to three test species (*Ceriodaphnia dubia*, *Pimephales promelas* and *Selenastrum capricornutum*) and sediment toxicity to *Hyalella azteca* (Table 3). In May 2009 the Coalition omitted the following constituents from its monitoring program: metals not applied by agriculture (arsenic, cadmium,

lead and molybdenum), sediment bound pesticides (glyphosate, paraquat dichloride), organochlorine pesticides no longer applied by agriculture (including Group A pesticides) along with a subset of nutrients (Total Kjeldahl Nitrogen and orthophosphate) (ESJWQC MRPP amended on May 15, 2009). These constituents will be sampled once a year during events with high total suspended solids. Monitoring constituents are established by the Monitoring and Reporting Program (MRP) (Order No. R5-2008-0005) and are discussed in more detail at the end of this section.

*Table 3. Monitoring Parameters.*

| Constituents, Parameters, and Tests | Monitoring Type |
|---|---|
| **TMDL/CWA 303(d) listed*** | |
| Aldrin | As needed to characterize 303d listed waterbodies |
| Chlordane | As needed to characterize 303d listed waterbodies |
| Heptachlor | As needed to characterize 303d listed waterbodies |
| Heptachlor epoxide | As needed to characterize 303d listed waterbodies |
| Hexachlorocyclohexane (including Lindane) (gamma-HCH) | As needed to characterize 303d listed waterbodies |
| Hexachlorocyclohexane (alpha-HCH) | As needed to characterize 303d listed waterbodies |
| Hexachlorocyclohexane (beta-HCH) | As needed to characterize 303d listed waterbodies |
| Hexachlorocyclohexane (delta-HCH) | As needed to characterize 303d listed waterbodies |
| Endosulfan I | As needed to characterize 303d listed waterbodies |
| Endosulfan II | As needed to characterize 303d listed waterbodies |
| Toxaphene | As needed to characterize 303d listed waterbodies |
| **Photo Monitoring** | |
| Photograph of monitoring location | With every monitoring event |
| **WATER COLUMN SAMPLING** | |
| **Physical Parameters and General Chemistry** | |
| Flow (field measure) | Assessment and Core |
| pH (field measure) | Assessment and Core |
| Electrical Conductivity (field measure) | Assessment and Core |
| Dissolved Oxygen (field measure) | Assessment and Core |
| Temperature (field measure) | Assessment and Core |
| Turbidity | Assessment and Core |
| Total Dissolved Solids | Assessment and Core |
| Total Suspended Solids | Assessment and Core |
| Hardness | Assessment and Core |
| Total Organic Carbon (TOC) | Assessment and Core |
| **Pathogens** | |
| *E. coli* | Assessment and Core |
| **Water Column Toxicity Test** | |
| Algae -*Selenastrum capricornutum* | Assessment |
| Water Flea – *Ceriodaphnia dubia* | Assessment |
| Fathead Minnow - *Pimephales promelas* | Assessment |
| Toxicity Identification Evaluation** | As needed based on criteria described in MRP Part II.E |
| **Pesticides** | |
| **Carbamates** | |
| Aldicarb | Assessment |

| Constituents, Parameters, and Tests | Monitoring Type |
|---|---|
| Carbaryl | Assessment |
| Carbofuran | Assessment |
| Methiocarb | Assessment |
| Methomyl | Assessment |
| Oxamyl | Assessment |
| **Organochlorines*** | |
| Dichlorodiphenyldichloroethane (DDD) | Assessment |
| Dichlorodiphenyldichloroethylene (DDE) | Assessment |
| Dichlorodiphenyltrichloroethane (DDT) | Assessment |
| Dicofol | Assessment |
| Dieldrin | Assessment |
| Endrin | Assessment |
| Methoxychlor | Assessment |
| **Organophosphates** | |
| Azinphos-methyl | Assessment |
| Chlorpyrifos | Assessment |
| Diazinon | Assessment |
| Dichlorvos | Assessment |
| Dimethoate | Assessment |
| Dimeton-s | Assessment |
| Disulfoton (Disyton) | Assessment |
| Malathion | Assessment |
| Methamidophos | Assessment |
| Methidathion | Assessment |
| Parathion-methyl | Assessment |
| Phorate | Assessment |
| Phosmet | Assessment |
| **Herbicides** | |
| Atrazine | Assessment |
| Cyanazine | Assessment |
| Diuron | Assessment |
| Glyphosate* | Assessment |
| Linuron | Assessment |
| Paraquat dichloride* | Assessment |
| Simazine | Assessment |

| Constituents, Parameters, and Tests | Monitoring Type |
|---|---|
| Trifluralin | Assessment |
| **Metals** | |
| Arsenic (total)* | Assessment |
| Boron (total) | Assessment |
| Cadmium (total and dissolved)* | Assessment |
| Copper (total and dissolved) | Assessment |
| Lead (total and dissolved)* | Assessment |
| Nickel (total and dissolved) | Assessment |
| Molybdenum (total)* | Assessment |
| Selenium (total) | Assessment |
| Zinc (total and dissolved) | Assessment |
| **Nutrients** | |
| Total Kjeldahl Nitrogen† | Assessment and Core |
| Nitrate plus Nitrite as Nitrogen | Assessment and Core |
| Total Ammonia | Assessment and Core |
| Unionized Ammonia (calculated value) | Assessment and Core |
| Total Phosphorous (as P) | Assessment and Core |
| Soluble Orthophosphate† | Assessment and Core |
| **SEDIMENT SAMPLING** | |
| **Sediment Toxicity** | |
| Hyalella azteca | Assessment |
| **Pesticides (as needed based on criteria described in MRP Part II.E.2)** | |
| Bifenthrin | As needed based on criteria described in MRP Part II.E |
| Cyfluthrin | As needed based on criteria described in MRP Part II.E |
| Cypermethrin | As needed based on criteria described in MRP Part II.E |
| Esfenvalerate | As needed based on criteria described in MRP Part II.E |
| Lambda-Cyhalothrin | As needed based on criteria described in MRP Part II.E |
| Permethrin | As needed based on criteria described in MRP Part II.E |
| Fenpropathrin | As needed based on criteria described in MRP Part II.E |
| Chlorpyrifos | As needed based on criteria described in MRP Part II.E |
| **Other sediment parameters** | |
| Total Organic Carbon | Assessment |
| Grain Size | Assessment |

*Starting May 2009, the Coalition will only monitor for these constituents during a single high Total Suspended Solids (TSS) event.

†Constituents were omitted from the ESJWQC MRPP on May 15, 2009.

** Specific TIE manipulations utilized in each test will be reported.

*Table 4. Normal Monitoring schedule for October 2008 – December 2009 including site name, ID, zone and constituent groups.*

| Zone | Monitoring Type | Monitoring Location | Group A Pesticides ** | Physical Parameters | Nutrients* | Pathogens | Carbamates | Organo-phosphates | Herbicides** | Metals (total and dissolved)** | Water Column Toxicity | Sediment Toxicity/ Chemistry |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | C | Dry Creek @ Wellsford Rd | | x | x | x | | | | | | |
| 1 | A | Mootz Drain @ Langworth Rd | x | x | x | x | x | x | x | x | x | x |
| 1 | A | Mootz Drain downstream of Langworth Pond | | x | x | x | x | x | x | x | x | x |
| 2 | C | Prairie Flower Drain @ Crows Landing | | x | x | x | | | | | | |
| 2 | A | Lateral 2 1/2 near Keyes Rd | x | x | x | x | x | x | x | x | x | x |
| 3 | C | Highline Canal @ Hwy 99 | | x | x | x | | | | | | |
| 3 | A | Mustang Creek @ East Ave | | x | x | x | x | x | x | x | x | x |
| 4 | C | Merced River @ Santa Fe Rd | x | x | x | x | | **x** | | **x** | | |
| 4 | A | Howard Lateral @ Hwy 140 | | x | x | x | x | x | x | x | x | x |
| 5 | C | Duck Slough @ Gurr Rd | | x | x | x | | **x** | | **x** | | |
| 5 | A | Deadman Creek @ Gurr Rd | | x | x | x | x | x | x | x | x | x |
| 6 | C | Cottonwood Creek @ Rd 20 | | x | x | x | | | | | **x**† | **x** |
| 6 | A | Ash Slough @ Ave 21 | | x | x | x | x | x | x | x | x | x |

*Total Kjeldahl Nitrogen and orthophosphate were dropped on May 15, 2009.

**Glyphosate, paraquat, arsenic, cadmium, lead, molybdenum and Group A pesticides were dropped on May 15, 2009 except for sampling during a single high TSS event.

†*Pimephales promelas* and *Selenastrum capricornutum* only.

**Bolded Xs** are for additional constituents at Core Monitoring locations due to one exceedance during previous monitoring (see Table 21 for specifics).

## Monitoring Design

### Normal Monitoring

Starting October 2008 the Coalition initiated monitoring under a new MRPP (submitted August 25, 2008 and approved on August 18, 2008) that includes a schedule of Core and Assessment Monitoring locations to be monitored on a monthly basis. Previous to the August 2008 MRPP the Coalition monitored only during the irrigation season (April – September) and twice during the storm season (December – March) as determined by a 24 hour rainfall trigger of 0.25 inches. The Coalition monitored from October to December (fall season) for the first time in 2008. For reference, Table 5 illustrates the locations and seasons that the Coalition has monitored from 2004 - 2009.

Sampling occurred at six Core and six Assessment sites once per month per site throughout each of the monitoring seasons. In the case of a storm event, monthly monitoring occurred within three days following a rainfall that exceeded 0.25 inches within 24 hours. Storm samples were collected on December 16, 2008, February 7, 2009 and December 15, 2009.

#### *Core Monitoring*

Core Monitoring is designed to track water and sediment quality trends over extended periods of time. Core Monitoring is not limited to largest volume water bodies, but includes a diversity of water body size and flows. Data generated from the Core Monitoring sites is used to establish trend information about the effectiveness of the Coalition's efforts to reduce or eliminate the impact of irrigated agriculture on surface waters.

#### *Assessment Monitoring*

Assessment Monitoring includes a diversity of monitoring sites that are representative of individual zones. Assessment Monitoring sites are selected in order to adequately characterize water quality for all waters of the State within individual zones. In conjunction with Core Monitoring for trends and Special Projects focused on specific problems, Assessment Monitoring demonstrates the effectiveness of management practices and identifies locations for implementation of new management practices, as needed.

#### *Sediment Monitoring*

Sediment samples are collected bi-yearly. Storm season sediment samples are collected after the major rainfall events and before the height of the irrigation season when water flows and levels are low (between March 1 and April 30). Irrigation season sediment samples are collected at the end of the irrigation season, when water levels are low and safe enough to sample sediment (between August 15 and October 15). Storm season sediment samples were collected on April 21, 2009 and irrigation season sediment samples were collected on August 18, 2009.

*Table 5. Sample sites and years monitored.*

| Station Name | 2004 | 2005 | | 2006 | | 2007 | | 2008 | | | 2009 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Irrigation | Storm | Irrigation | Storm | Irrigation | Storm | Irrigation | Storm | Irrigation | Fall | Winter | Storm | Irrigation | Fall |
| Ash Slough @ Ave 21 | | | x | x | x | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry | Dry |
| August Road Drain upstream of Crows Landing Bridge (Hogin Rd) | x | | | | | | | | | | | | | |
| Bear Creek @ Kibby Rd | | x | x | x | x | x | x | x | x | | | | | |
| Bear Creek @ North Alpine Rd | | | | | | | | x | | x | x | | | |
| Berenda Slough along Ave 18 1/2 | | | | | x | Dry | x | x | Dry | | | | | |
| Black Rascal Creek @ Yosemite Rd | | | | | x | x | x | x | x | | | | | |
| Cottonwood Creek @ Rd 20 | | x | x | x | x | Dry | x | x | x | Dry | Dry | x | Dry | x |
| Cottonwood Creek @ Hwy 145[1] | | | | | | | | | x | | | | | |
| Deadman Creek @ Hwy 59 | | | | | x | x | x | x | x | | | | Dry | |
| Deadman Creek (Dutchman) @ Gurr Rd | x | | | | x | x | x | x | x | x | x | x | x | x |
| Dry Creek @ Rd 18 | | | x | Dry | x | x | x | x | x | | | | | |
| Dry Creek @ Rd 22[1] | | | | | | | | | x | | | | | |
| Dry Creek @ Rd 28½[1] | | | | | | | | | x | | | | | |
| Dry Creek @ Oakdale Rd | | | | | | | | | | | | Dry | | Dry |
| Dry Creek @ Waterford Rd[1] | | | | | | | | | x | | | | x | |
| Dry Creek @ Wellsford Rd | | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Duck Slough @ Gurr Rd | x | x | x | x | x | x | x | x | x | Dry | x | x | x | x |
| Duck Slough @ Hwy 59[1] | | | | | | | | | x | | | | | |
| Duck Slough @ Hwy 99 | | x | x | x | x | x | x | x | x | | | | x | |
| Duck Slough @ Whealan Rd[1] | | | | | | | | | x | | | | | |
| Hatch Drain @ Tuolumne Rd | | | | | | | x | x | x | | | | | |
| Highline Canal @ Hwy 99 | | | x | x | x | x | x | x | x | Dry | Dry | x | x | x |
| Highline Canal @ Lombardy Ave | | x | x | x | x | x | x | x | x | | | | x | |
| Hilmar Drain @ Central Ave | | x | x | x | x | x | x | x | x | | | | x | |
| Hilmar Drain @ Mitchell Rd[1] | | | | | | | | | x | | | | | |
| Howard Lateral @ Hwy 140 | | | | | | | | | | x | Dry | Dry | x | x |
| Jones Drain @ Oakdale Rd | | x | x | x | x | x | x | | | | | | | |
| Lateral 2 ½ near Keyes Rd | | | | | | | | | | x | Dry | Dry | x | x |
| Livingston Drain @ Robin Ave | | | | | | | x | x | x | | | | | |

| Station Name | 2004 | 2005 | | 2006 | | 2007 | | 2008 | | | 2009 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Irrigation | Storm | Irrigation | Storm | Irrigation | Storm | Irrigation | Storm | Irrigation | Fall | Winter | Storm | Irrigation | Fall |
| Lone Willow Slough @ Madera Ave | | x | x | | | | | | | | | | | |
| Merced River @ Santa Fe | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Miles Creek @ Reilly Rd | | | | | | | x | x | x | | | | x | |
| Mootz Drain @ Langworth Rd | | | | | | | | | | x | x | x | x | x |
| Mootz Drain downstream of Langworth Pond | | | | | | | | | | | | x | | |
| Mustang Creek @ East Ave | | | | | x | x | x | x | Dry | Dry | x | x | Dry | x |
| North Slough @ Hwy 59[1] | | | | | | | | | Dry | | | | | |
| Prairie Flower Drain @ Crows Landing Rd | | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Prairie Flower Drain @ Morgan Rd[1] | | | | | | | | | x | | | | | |
| Reclamation Drain @ Williams Ave[1] | | | | | | | | | x | | | | | |
| Silva Drain @ Meadow Dr | | | | | x | x | x | x | x | | | | | |
| South Slough @ Quinley Rd | | | | | x | Dry | x | x | x | | | | | |
| Westport Drain @ Vivian Rd | | | | | | | x | x | x | | | | | |

A blank cell indicates that no sampling occurred at that site during the specified season.

"Dry" indicates that the site was dry during one or more events during the specified monitoring season.

[1]Upstream sampling of normal monitoring locations conducted for source identification.

## Management Plan Monitoring

Management Plan Monitoring occurred at eleven sites during 2009: Deadman Creek @ Hwy 59, Dry Creek @ Oakdale Rd, Dry Creek @ Waterford Rd, Dry Creek @ Wellsford Rd, Duck Slough @ Hwy 99, Highline Canal @ Hwy 99, Highline Canal @ Lombardy Rd, Hilmar Drain @ Central Ave, Merced River @ Santa Fe, Miles Creek @ Reilly Rd, and Prairie Flower Drain @ Crows Landing Rd. The Coalition conducted the additional monitoring as part of the ESJWQC Management Plan's strategy to identify contaminant sources and evaluate effectiveness of newly implemented management practices at sites where exceedances had previously occurred more than once. This additional monitoring included toxicity analysis for *Ceriodaphnia* and *Selenastrum,* as well as chemistry analysis for copper and chlorpyrifos (Table 6). Details on the process and the schedule of Management Plan Monitoring are available in the ESJWQC Management Plan Update Report submitted April 1, 2009 to the Regional Board.

*Table 6. 2009 Management Plan Monitoring sites and constituents.*

| Site Name | Year | Month | *Ceriodaphnia dubia* | *Selenastrum capricornutum* | Copper | Chlorpyrifos |
|---|---|---|---|---|---|---|
| Deadman Creek @ Hwy 59 | 2009 | April | | X | | |
| Duck Slough @ Hwy 99 | 2009 | April | | X | | |
| Highline Canal @ Hwy 99 | 2009 | April | | X | | |
| Hilmar Drain @ Central Ave | 2009 | April | | X | | |
| Miles Creek @ Reilly Rd | 2009 | April | | X | | |
| Prairie Flower Drain @ Crows Landing Rd | 2009 | April | | X | | |
| Duck Slough @ Hwy 99 | 2009 | May | | | | X |
| Highline Canal @ Hwy 99 | 2009 | May | | X | | |
| Highline Canal @ Lombardy Rd | 2009 | May | | X | | |
| Prairie Flower Drain @ Crows Landing Rd | 2009 | May | | X | | |
| Duck Slough @ Hwy 99 | 2009 | June | | | X | |
| Dry Creek @ Waterford Rd | 2009 | July | | | | X |
| Dry Creek @ Wellsford Rd | 2009 | July | | | | X |
| Duck Slough @ Hwy 99 | 2009 | July | | | X | X |
| Highline Canal @ Hwy 99 | 2009 | July | | | | X |
| Highline Canal @ Lombardy Rd | 2009 | July | X | | | X |
| Miles Creek @ Reilly Rd | 2009 | July | | | X | X |
| Deadman Creek @ Hwy 59 | 2009 | August | | | | X |
| Dry Creek @ Waterford Rd | 2009 | August | | | | X |
| Dry Creek @ Wellsford Rd | 2009 | August | | | | X |
| Duck Slough @ Hwy 99 | 2009 | August | | | X | |
| Highline Canal @ Lombardy Rd | 2009 | August | X | | X | X |
| Miles Creek @ Reilly Rd | 2009 | August | | | X | X |
| Prairie Flower Drain @ Crows Landing Rd | 2009 | August | | | | X |
| Deadman Creek @ Hwy 59 | 2009 | September | | | | X |
| Duck Slough @ Hwy 99 | 2009 | September | | | X | X |
| Hilmar Drain @ Central Ave | 2009 | September | | X | | |
| Miles Creek @ Reilly Rd | 2009 | September | | | | X |
| Dry Creek @ Oakdale Rd | 2009 | November | | | | X |

| Site Name | Year | Month | *Ceriodaphnia dubia* | *Selenastrum capricornutum* | Copper | Chlorpyrifos |
|---|---|---|---|---|---|---|
| Merced River @ Santa Fe | 2009 | November | | | | X |
| Dry Creek @ Oakdale Rd | 2009 | December | | | | X |
| Merced River @ Santa Fe | 2009 | December | | | | X |

## Monitoring Seasons

The Coalition organizes its monitoring by "seasons": fall, winter, irrigation and storm (Table 7). Fall monitoring occurs after irrigation is finished and generally before dormant sprays (October – December). Winter monitoring occurs between January and March when dormant sprays and significant rainfalls are expected. Irrigation season sampling is scheduled to characterize the discharge from irrigated agriculture and irrigation return flows (April – September). A storm event can occur at anytime of the year but is expected to occur during the winter season. Additional details regarding storm sampling events and their rainfall trigger are included in the section "Sample Site Descriptions and Rainfall Records".

***Table 7. Description of Monitoring Seasons.***

| Season | Month Range | Description |
|---|---|---|
| Fall | October-December | No irrigation. |
| Winter | January-March | No irrigation, possible dormant spray runoff. |
| Storm | Anytime | Storm is triggered by > 0.25 inches within 24 hours; may occur during any month but generally occurs between January and March. |
| Irrigation | April-September | Summer months with possible irrigation. |

## Monitoring Constituents

All monitoring constituents are listed in Table 3. The following section describes agricultural sources of the constituent groups analyzed for by the coalition.

### *Pesticides and Toxicity*

Pesticides can be found in the water column or sediment as a result of applications to fields that are subsequently irrigated or drift from fields to surface waters during spraying. Irrigation return flows from fields or storm water runoff can move sediment and chemicals to surface waters. The concentrations can be compared to numeric and narrative water quality triggers to determine if exceedances are occurring. 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 results of toxicity testing along with water chemistry analysis to assess the impact of discharges from irrigated agriculture and determine the cause of any adverse impact.

The ESJWQC omitted sediment bound pesticides (glyphosate and paraquat dichloride) and pesticides no longer applied by agriculture (organochlorines and Group A pesticides) from their sampling schedule in May 2009. These constituents are to be sampled once a year during an event with high total suspended solids (TSS). The above pesticides have an extremely high

affinity for binding to sediments and organic material and therefore are rarely detected in the water column except for times when sediment runoff is a concern (i.e. a high TSS event).

### *Nutrients and Physical Parameters*

Excessive nutrients can cause eutrophication of surface waters resulting in low dissolved oxygen and an inability to support normal aquatic communities. 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. However, sources of nutrients, organic carbon, and low dissolved oxygen are difficult to identify. If current monitoring data are not sufficient, the Coalition may conduct further investigations to identify sources. Such investigations may include special studies if they are determined to be cost effective. By understanding the sources of nutrients responsible for the exceedances, the Coalition can properly recommend management practices to address exceedances of nutrients and physical parameters.

### *Field Parameters*

Much like physical parameters, exceedances of water quality objectives for pH, dissolved oxygen (DO), and specific conductance (SC) are difficult to track to sources. All of these parameters are non-conserved meaning that they can increase or decrease as water moves downstream. These parameters are the result of 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 if they are cost effective. 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, companion animals such as dogs and cats, cows, 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.

As a result of *E. coli* detections in samples collected for Coalition monitoring, a special study was conducted in 2006 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. A full report of the *E. coli* special study was submitted to the Central Valley Regional Water Quality Control Board (CVRWQCB) on September 9, 2007.

*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 is the result of runoff from irrigated pasture or manure applications for fertilizer.

### Metals

Nine metals were included in Coalition monitoring until May 2009: arsenic, boron, cadmium, copper, lead, molybdenum, nickel, selenium and zinc. Five of these metals are analyzed for both dissolved and total concentrations, and three metals are analyzed only for total recoverable metal. Dissolved metals were added to the Coalition monitoring plan in 2008 as a result of a new provision in MRP Order R5-2008-0005. The Environmental Protection Agency (EPA) recommends "the use of dissolved metal to set and measure compliance with aquatic life water quality standards." The EPA states that dissolved metal "more closely approximates the bioavailable fraction of the metal in the water column than total recoverable metal." In order to assess compliance with water quality standards the Coalition analyzes for dissolved fractions of cadmium, copper, lead, nickel and zinc. The remaining metals are analyzed for total concentrations only. The ESJWQC omitted sampling for metals that are not currently applied by agriculture including arsenic, cadmium, lead and molybdenum except for a single event of high total suspended solids; this went into effect in May 2009 (ESJWQC MRPP amended on May 15, 2009).

Of the nine metals there are four general classes: 1) those that are naturally present because of underlying geologic materials but generally not applied by agriculture (boron, selenium, 2) those that are naturally present because of underlying geologic materials but 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 applied by agriculture, exceedances would be expected to primarily be a result of natural weathering of soils.

Natural weathering of geologic materials can release to surface waters metals and metalloid elements such as selenium, arsenic, and boron. Selenium salts are naturally elevated in the southwest portion of the San Joaquin Valley and are transported to surface waters during storm runoff. These salts are so problematic that there is a prohibition of discharge of irrigation tail water in some locations in the Valley. Arsenic appears to be naturally elevated in several locations in the San Joaquin 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 metals can be applied during agricultural operations 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 magnitude 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 declining 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. Lead-based paint was routinely used until the latter parts of the last century but is still present in many old buildings and structures. 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 fertilizer mixes are not reported, there is no way the Coalition can distinguish between natural and anthropogenic sources with normal 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.

## Sample Site Descriptions and Rainfall Records

The site names, codes and locations of the 18 sites sampled from October 2008 through December 2009 are provided in Table 8.

A narrative description of each site subwatershed with respect to hydrology and agricultural production is included in the section "Site Subwatershed Descriptions". Location maps of sampling sites, crops and land uses are provided in the Land Use Maps and 2009 Annual Site Photos Appendix VIII.

ESJWQC region rainfall data for the months October 2008 through December 2009 are described in the section "Record of Rainfall".

*Table 8. ESJWQC October 2008 – December 2009 sampling locations.*

| Zone | Type | Site Name | Station Code | Latitude | Longitude |
|---|---|---|---|---|---|
| 1 | C* | Dry Creek @ Wellsford Rd | 535XDCAWR | 37.6602 | -120.8743 |
| 1 | A | Mootz Drain @ Langworth Rd* | 535XMDALR | 37.70582 | -120.89303 |
| 1 | A | Mootz Drain downstream of Langworth Pond* | 535XMDDLP | 37.70551 | -120.89438 |
| 2 | C* | Prairie Flower Drain @ Crows Landing | 535XPFDCL | 37.4422 | -121.0024 |
| 2 | A | Lateral 2 1/2 near Keyes Rd | 535LTHNKR | 37.54780 | -121.09274 |
| 3 | C* | Highline Canal @ Hwy 99 | 535XHCHNN | 37.41530 | -120.75570 |
| 3 | A | Mustang Creek @ East Ave | 535XMCAEA | 37.49180 | -120.68390 |
| 4 | C* | Merced River @ Santa Fe Rd | 535XMRSFD | 37.4271 | -120.6721 |
| 4 | A | Howard Lateral @ Hwy 140 | 535XHLAHO | 37.30790 | -120.78200 |
| 5 | C | Duck Slough @ Gurr Rd | 535XDSAGR | 37.2142 | -120.5596 |
| 5 | A | Deadman Creek @ Gurr Rd | 535XDCAGR | 37.19360 | -120.56120 |
| 6 | C | Cottonwood Creek @ Rd 20 | 545XCCART | 36.8686 | -120.1818 |
| 6 | A | Ash Slough @ Ave 21 | 545XASAAT | 37.05450 | -120.41580 |
| 1 | MPM | Dry Creek @ Waterford Rd | 535XDCWF | 37.65876 | -120.77887 |
| 1 | MPM* | Dry Creek @ Wellsford Rd | 535XDCAWR | 37.6602 | -120.8743 |
| 2 | MPM | Hilmar Drain @ Central Ave | 535XHDACA | 37.39060 | -120.95820 |
| 2 | MPM* | Prairie Flower Drain @ Crows Landing | 535XPFDCL | 37.4422 | -121.0024 |
| 3 | MPM | Dry Creek @ Oakdale Rd | 535DCAORD | 37.46047 | -120.61530 |
| 3 | MPM* | Highline Canal @ Hwy 99 | 535XHCHNN | 37.41530 | -120.75570 |
| 3 | MPM | Highline Canal @ Lombardy Ave | 535XHCALR | 37.45560 | -120.72070 |
| 4 | MPM* | Merced River @ Santa Fe Rd | 535XMRSFD | 37.4271 | -120.6721 |
| 5 | MPM | Deadman Creek @ Hwy 59 | 535DMCAHF | 37.19810 | -120.48690 |
| 5 | MPM | Duck Slough @ Hwy 99 | 535XDSAHN | 37.25010 | -120.41000 |
| 5 | MPM | Miles Creek @ Reilly Rd | 535XMCARR | 37.25820 | -120.47550 |

C – Core Monitoring site
A – Assessment Monitoring site
MPM – Management Plan Monitoring site
*Core site also sampled as MPM.
*Mootz Drain @ Langworth was approved to be moved downstream to Mootz Drain downstream of Langworth Pond on November 30, 2009. Sampling in the new location began December 8, 2009.

## Site Subwatershed Descriptions

The Coalition sampled a total of 20 site subwatersheds as part of normal monitoring and Management Plan monitoring between October 2008 and December 2009. Not all sites had water during that time and some sites were not sampled during the entire period. Descriptions of the site subwatersheds for all sample sites are provided below alphabetically.

- Ash Slough @ Avenue 21 (29,613 irrigated acres) – Agriculture upstream includes vineyards, field crops, and deciduous nuts. Ash Slough flows just north of Chowchilla but there appears to be a buffer of agricultural land between Ash Slough and Chowchilla. Dairies are located upstream.

- Cottonwood Creek @ Road 20 (37,360 irrigated acres) – This site subwatershed is at the very southern edge of the Coalition region in Madera County and drains into the Eastside Bypass. The immediate upstream agriculture is vineyards, and there are deciduous nuts farther to the east. There are only a few dairies in the Cottonwood Creek site subwatershed.

- Deadman Creek @ Gurr Rd (39,789 irrigated acres) - This site subwatershed is a downstream site from Deadman Creek @ Hwy 59. The primary agriculture in the site subwatershed is orchards and row crops with some upstream irrigated pasture.

- Deadman Creek @ Highway 59 (36,543 irrigated acres) – Deadman Creek flows out of the Sierra foothills and confluences with Dutchman's Creek in the vicinity of Highway 59. The primary agriculture in the site subwatershed is orchards and row crops with some upstream irrigated pasture.

- Dry Creek @ Oakdale Ave (13,564 irrigated acres) – Dry Creek flows into Merced River at Oakdale Ave. The agriculture draining into Dry Creek consists primarily of deciduous trees.

- Dry Creek @ Waterford Rd (15,175 irrigated acres) – This site is upstream of Dry Creek @ Wellsford and collects runoff from approximately 62% of the irrigated agriculture in the subwatershed. The agriculture drained is of the same composition as Dry Creek @ Wellsford Rd and includes a combination of field crops, deciduous nuts, and vineyards.

- Dry Creek @ Wellsford Road (23,331 irrigated acres) – This site subwatershed is in the northern part of the Coalition region and drains a combination of field crops, deciduous nuts, and vineyards. Dry Creek originates to the east of Modesto and drains into the Tuolumne River. This site subwatershed samples Dry Creek at the furthest downstream location that collects agricultural drainage prior to flowing through the urban areas of Modesto. Dairies are located upstream of this site and the town of Waterford may contribute an urban signal.

- Duck Slough @ Gurr Road (21,082 irrigated acres) – This site subwatershed is a monitoring location downstream from Duck Slough @ Hwy 99. Located to the south

and west of Merced, this site drains field crops immediately upstream and deciduous nuts further upstream as well as some irrigated pasture. The city of Merced delivers treated water to Duck Slough a few miles upstream of the Gurr Road site. Duck Slough flows west eventually becoming Deadman Creek in the western portion of the Coalition region. The slough eventually flows into the San Joaquin River via Deadman Creek and Deep Slough.

- Duck Slough @ Hwy 99 (10,695 irrigated acres) – This site subwatershed is located upstream of the Duck Slough @ Gurr Road site and was selected to determine relative contribution of water quality impairments in the upstream portion of the Duck Slough subwatershed. Duck Slough originates in the Sierra foothills and flows west eventually joining with Deadman Creek in the western portion of the coalition region. The monitoring site is located just east of Highway 99, south of Planada and Merced. Irrigated agriculture in this site subwatershed is primarily deciduous nuts, with truck crops and irrigated pasture the next most common land uses.

- Highline Canal @ Highway 99 (35,220 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District (TID) and carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. This site was selected as a downstream companion site to the Highline Canal @ Lombardy Road site. This site subwatershed is monitored to determine the relative contribution of the upstream and downstream site subwatersheds to water quality impairments. The sampling site is located just south of Delhi as the canal crosses the highway. The irrigated agriculture is primarily deciduous nuts, and these are located at the lower end of the site subwatershed. A small number of vineyards are also present.

- Highline Canal @ Lombardy Road (30,154 irrigated acres) – The Highline Canal is a conveyance of the Turlock Irrigation District and carries both clean irrigation water and irrigation return flow during the summer, and storm water runoff during the winter. The main upstream tributary of the Highline Canal is Mustang Creek. The Highline Canal flows west and eventually drains into the Merced River. Dairies are present upstream and Mustang Creek (described below), a major tributary during the dormant season, passes immediately to the southeast of the Turlock Airport. The main agricultural crop upstream is deciduous nuts.

- Hilmar Drain @ Central Ave (1,898 irrigated acres) – This site subwatershed is located toward the western edge of the Coalition region near the San Joaquin River. This is a small site subwatershed containing primarily field crops and a large number of dairies with irrigated pasture. Hilmar Drain originates at Williams Ave and Washington Road and eventually drains into the San Joaquin River. At this location TID refers to the water body as “Reclamation Drain.”

  Howard Lateral @ Hwy 140 (3,876 irrigated acres) – The lateral is located just south and west of Livingston Drain, in the central portion of the Coalition region in Merced County. Agricultural land use is predominantly truck/nursery/berry crops and deciduous fruit, but also includes field crops, pasture, grains/hay, vineyard and dairy.

- Lateral 2 1/2 near Keyes Rd (32,740 Irrigated acres) – This site subwatershed is located in the western portion of the Coalition region just south of the Tuolumne River and East of the San Joaquin River. The site subwatershed extends east past the City of Modesto to Turlock Lake. The primary agriculture in this site subwatershed is deciduous fruits and nuts but also includes almost all other crops types and land use found in the Coalition Region.

- Merced River @ Santa Fe Drive (33,421 irrigated acres) – This water body is designated as a major water body and is 303d listed. It was selected as an integrator site for several of the drains and tributaries in the vicinity. The Merced River originates in the high Sierra encountering several dams and impoundments as it flows west. The Merced River eventually drains into the San Joaquin River near Hatfield State Park. Upstream agriculture includes some field crops in the immediate vicinity of the river and deciduous nuts, primarily almonds.

- Miles Creek @ Reilly Rd. (9,840 irrigated acres) – Miles Creek is located just north of Duck Slough and drains into Owen's Creek. The primary agriculture includes field crops, deciduous nuts and fruit, pasture and truck/nursery/berry. Within the subwatershed are also urban drainages, dairies and hay, and pasture lands.

- Mootz Drain @ Langworth Rd (2,829 irrigated acres) – This site subwatershed is located in the northern part of the Coalition region. The drain originates to the east of Modesto and drains through Lateral 6 into the Stanislaus River. Land use upstream of the site is predominantly pastures and dairies. A small portion of land is allocated as field crops. The sample for this site is located upstream of the retention pond.

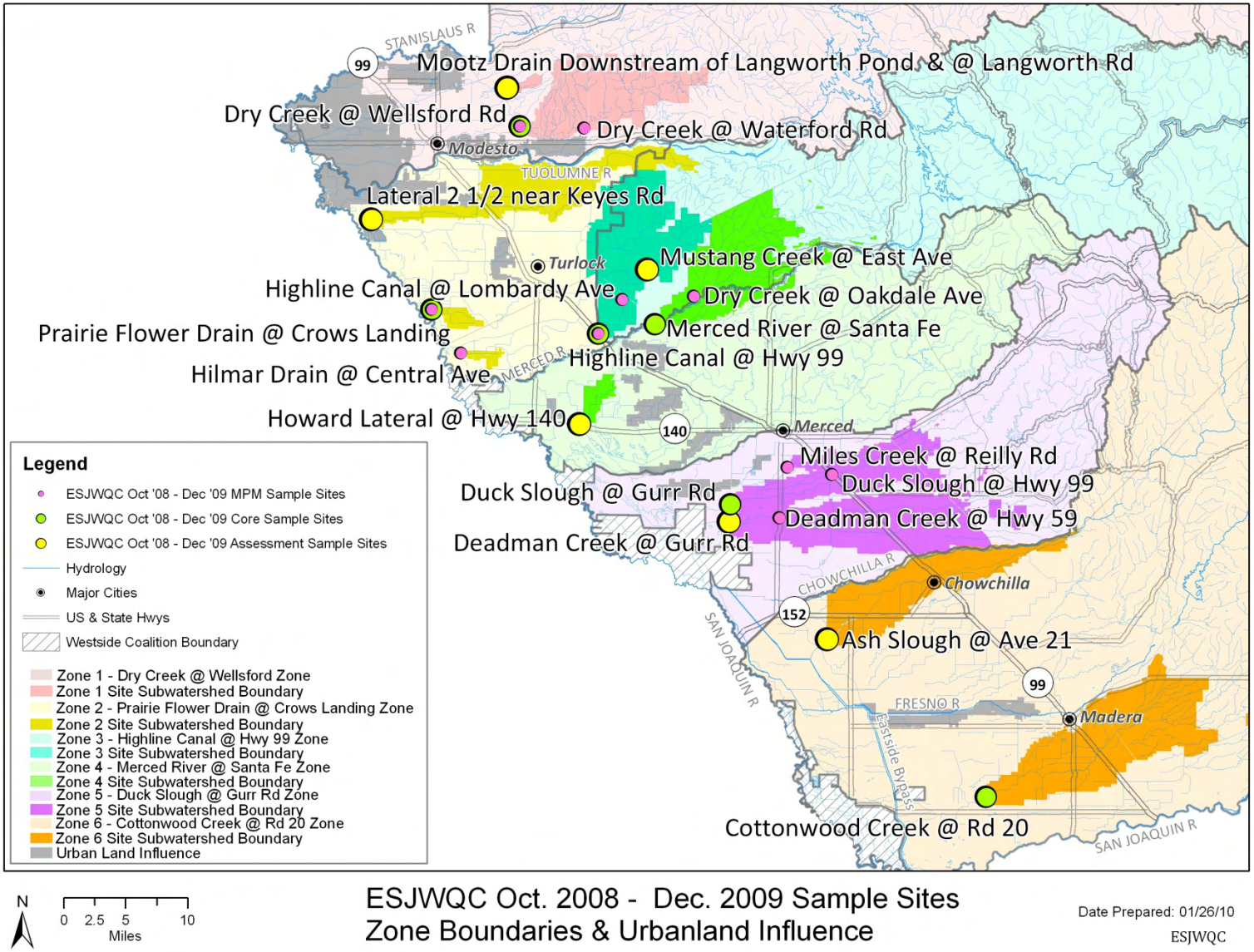
- Mootz Drain downstream of Langworth Pond (2,829 irrigated acres) – This site subwatershed is just downstream of Mootz Drain @ Langworth and represents the same acreage upstream but the sample is taken downstream of the retention pond rather than upstream.

- Mustang Creek @ East Ave (9,643 irrigated acres) – Mustang Creek originates in the foothills of the Sierra Nevada and flows into the upper portion of the Highline Canal. Mustang Creek is ephemeral with flow found primarily during winter runoff events. Summer flows are intermittent as the upstream orchards utilize microspray irrigation. Citrus and deciduous nut crops are the main agriculture with smaller amounts of field crops and grains and hay.

- Prairie Flower Drain @ Crows Landing Road (3,611 irrigated acres) – Relative to other drains in the western portion of the Coalition region, Prairie Flower Drain is longer and appears to drain mostly irrigated agriculture. Dairies and feedlots are ubiquitous in this part of the Coalition region and this drain may receive runoff from several dairies immediately upstream. Upstream agriculture is field crops.

## Sample Site Locations

***Figure 9. Site subwatershed locations relative to zone boundaries.***



## Rainfall Records

The ESJWQC considers a sampling event a "storm sampling event" when there has been at least 0.25 inches of rain within a 24 hour period. Monthly sampling is pre-scheduled and, if a storm is forecasted within a week before a scheduled sampling event or within two days after the scheduled sampling event, the Coalition moves its sampling date to capture the storm. The Coalition sampled three storms between October 2008 and December 2009. Below is a description of all the storms that occurred during that time period, including whether or not they were sampled.

Daily rainfall records are graphed for the three major cities in the Coalition region Modesto, Merced and Madera in Figure 10 (October – December 2008), Figure 11 (January – March 2009), Figure 12 (April – June 2009), Figure 13 (July – September 2009) and Figure 14 (October – December 2009).

### October 2008 – December 2009

The period between October and December is not generally when large storm events occur. The area requires a few storm events to saturate the soils before rainfall will result in subsequent discharge in local streams and rivers. Because of this, the ESJWQC did not sample rain events in October and November 2009.

There was a storm in the ESJWQC region that lasted from October 30 through November 4, 2008, resulting in 0.74 inches of precipitation in Merced, 0.35 inches in the Modesto area, and 0.58 inches in Madera. The next sizable storm occurred on November 26, 2008 resulting in 0.41 inches of rain in Merced, 0.35 inches in Modesto, and 0.58 inches in Madera.

The first ESJWQC storm sampling event took place on December 16, 2008. This storm was accompanied by gusty winds and deposited 0.48 inches of rain on the Merced area in five days with 0.37 inches falling on December 14 (Figure 10). The last significant rain event of 2008 occurred between December 21- 25, 2008. This storm brought rainfall totals of 0.66 inches in Merced, 0.65 inches in Madera, and 1.06 inches in Modesto. Sampling did not occur since this rain event occurred less than two weeks after the December 16, 2008 storm event. After December, the Merced area of California reported seasonal rainfall of approximately 72% of the historical average (historical average from California Data Exchange Center (CDEC) for Merced in December is 2.00 inches).

### January 2009 – March 2009

On January 2, 2009 one small rain event brought 0.08 inches of precipitation to Modesto and 0.07 inches to Merced. A few scattered showers on January 5, 2009 resulted in 0.03 inches in Modesto, and 0.02 inches in Merced and Madera. On January 21- 25, 2009, a sizeable storm came across the state that brought heavy rain to the region. Within 24 hours on January 23, Merced recorded 1.19 inches of precipitation, making the total amount of rain for the five days

equivalent to 1.73 inches. Modesto received 0.50 inches and Madera received 1.37 inches. The Coalition did not sample this event since sampling already occurred on January 20 as scheduled. This storm had been unanticipated and was not expected to result in the rainfall that occurred.

The first storm sampling event of 2009 took place on February 7, 2009, preceded by a strong two-day storm February 5- 6, 2009, that deposited 0.65 inches of rain in Madera; only 0.21 inches of rain in was recorded in Modesto and 0.20 inches in Merced (Figure 11). Due to the January rain events which saturated the soils in most of the Central Valley, the amount of rain that occurred by February 7 was considered sufficient to result in discharge throughout most of the Coalition region. On February 8, 2009, the day after storm sampling, rainfall continued in parts of the Coalition area resulting in 0.41 inches in Merced and 0.01 inches in Madera; there was no additional rain in Modesto.

The next system brought rainfall to the San Joaquin Valley shortly after the previous storm and remained in the area from February 11-18, 2009. This system showed measureable precipitation everyday with February 13 being the wettest day with totals of 0.40 to 0.49 inches in all three cities. The total precipitation for all eight days was 1.17 inches in Merced, 1.07 inches for Modesto, and 1.39 inches in Madera. There was a short break with no rain before the next system crossed the San Joaquin Valley. This system lasted six day, spanning February 21-26, 2009. Totals from this storm were less than the preceding rain event, but still significant with precipitation totals of 0.38 inches in Merced, slightly less at 0.21 inches in Modesto, and 0.33 inches in Madera. Due to saturated soils and continuous rains, it was not anticipated that dormant spray applications occurred during the rest of February.

During the first part of March, a good sized weather system lasted four days from March 1-4, 2009. The Merced area reported 0.63 inches of precipitation, Modesto 0.34 inches, and Modesto only had 0.09 inches. A small storm swept across the south Coalition region on March 21-22, 2009, and only resulted in 0.16 inches of precipitation in Modesto on March 21 and 0.03 inches on March 22, 2009. Merced received 0.10 inches and Madera recorded 0.42 inches on March 22. Following this storm, the Merced area had reported rainfall of approximately 58% of historical averages (historical average from CDEC for Merced in March is 1.75 inches).

### April 2009 – September 2009

Merced received 0.47 inches of precipitation between April 6–9, 2009, and 0.31 inches of precipitation was recorded in Modesto. This system stayed to the north part of the San Joaquin Valley, therefore Madera only received 0.01 inches during this same time. The next small summer rain event occurred over May 1 and 2, producing 0.55 inches of precipitation in Merced, 0.20 inches in Modesto, and 0.11 inches in Madera (Figure 12). A small system swept quickly across the state on June 5, 2009 and lasted one day. Merced and Madera reported 0.24 inches and 0.54 inches of precipitation, respectively, while Modesto only received 0.04 inches.

The area was relatively dry with little to no measureable precipitation the rest of June through August.

On September 14, 2009, a small cell moved across Merced and amounted to less than a quarter inch of precipitation (Figure 13).

### October 2009 – December 2009

One heavy cell passed over the state on October 13, 2009 reporting as much as 1.57 inches in Modesto, 1.39 inches in Merced, and 0.81 inches in Madera (Figure 14). This event was early in the season and it was predicted that few, if any, dormant sprays would have been applied yet. No storm sampling took place to catch runoff from this event and normal monitoring occurred on October 20, 2009 as scheduled. No major rain events occurred during the remaining days of October. In November, the Merced area recorded only 0.24 inches of precipitation for the month, with less recorded in Modesto and Madera.

On December 7, 2009, a short but heavy system swept across the region bringing rain to the Coalition area. This system dropped 0.51 inches of precipitation in Merced, 0.41 inches in Modesto, and 0.30 inches in Madera. Due to sampling conflicts and the fact that another storm was predicted for the next week, sample collection was postponed until the next storm. The second storm sampling event of 2009 took place on December 15, 2009 following a three day storm system that deposited 1.60 inches of rain in Merced, 0.92 inches in Madera, and 0.49 inches in Modesto (Figure 14). This system was predicted in advance and appropriate arrangements were made for the Coalition to prepare for storm sampling. The rain stopped by the time sampling occurred on December 14, and a majority of the water bodies had slightly increased flows when compared to October flows except for Duck Slough @ Gurr Rd. The flows in Duck Slough were unsafe to measure as the depth of water increased from 0.5 inches in November to over eight feet in December.

A small system came through on December 21, 2009 resulting in 0.22 inches of precipitation in Merced, 0.11 inches in Modesto, and 0.46 inches in Madera. Subsequently, on December 26-30, 2009, a system brought precipitation totals of 0.30 inches to Merced, 0.31 inches to Modesto and 0.30 inches to Madera. Storm sampling did not occur during either of these events since storm sampling was already conducted less than two weeks earlier on December 15, 2009.

***Figure 10. Local weather conditions between October 12, 2008 and December 31, 2008.***
Storm sampling occurred on December 16, 2008. All data recorded in Merced, CA and reported on weatherunderground.com.

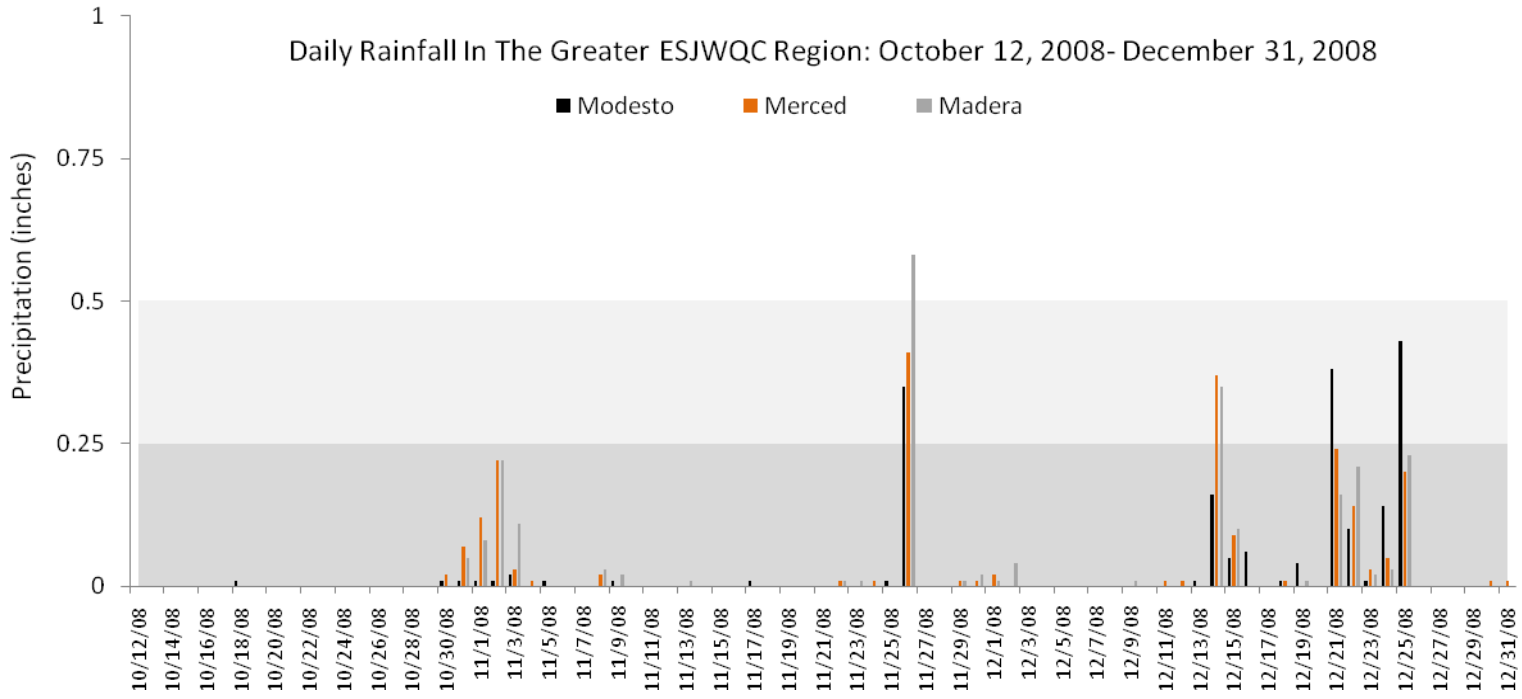


***Figure 11. Local weather conditions between January 1 and March 31, 2009.***
Storm sampling occurred on February 7, 2009. All data recorded in Merced, CA and reported on weatherunderground.com.

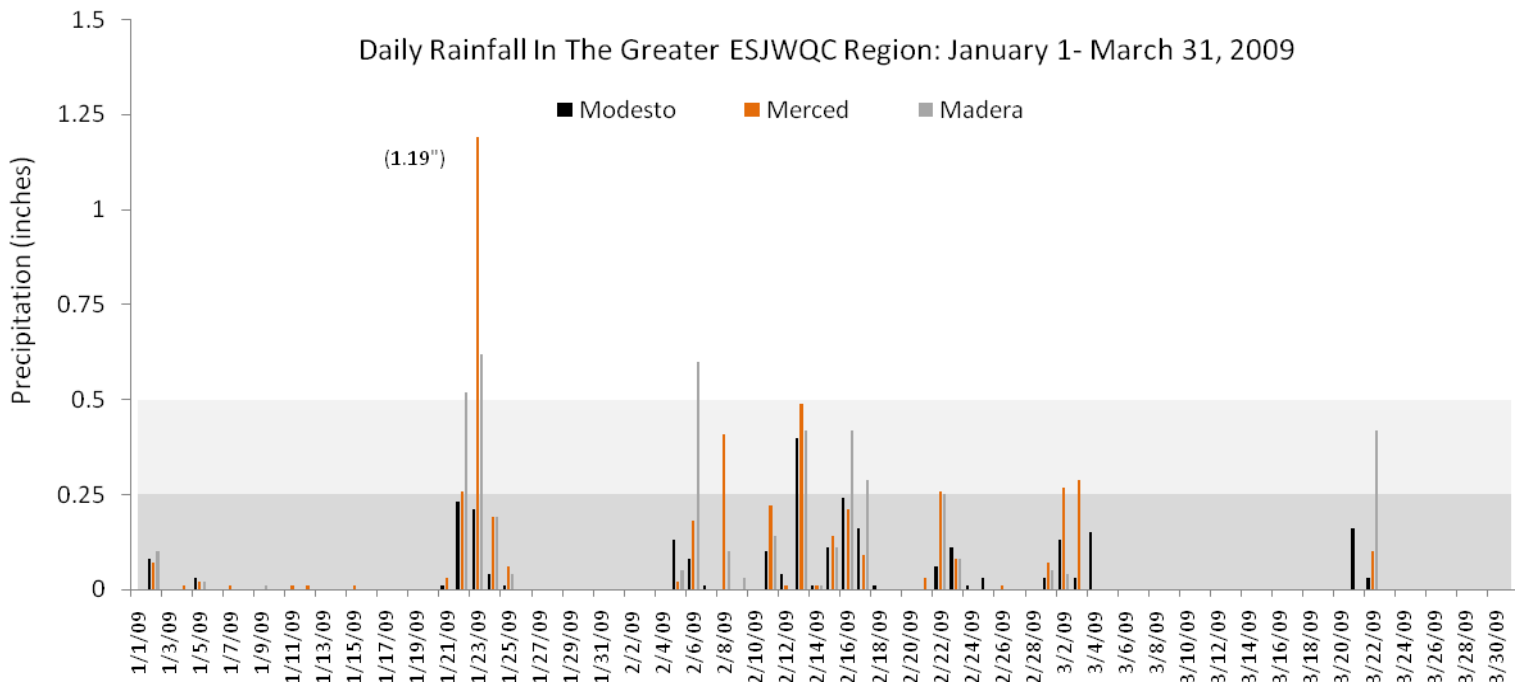


***Figure 12. Local weather conditions between April 1 - June 30, 2009.***
Storm sampling occurred on February 7, 2009. All data recorded in Merced, CA and reported on weatherunderground.com.

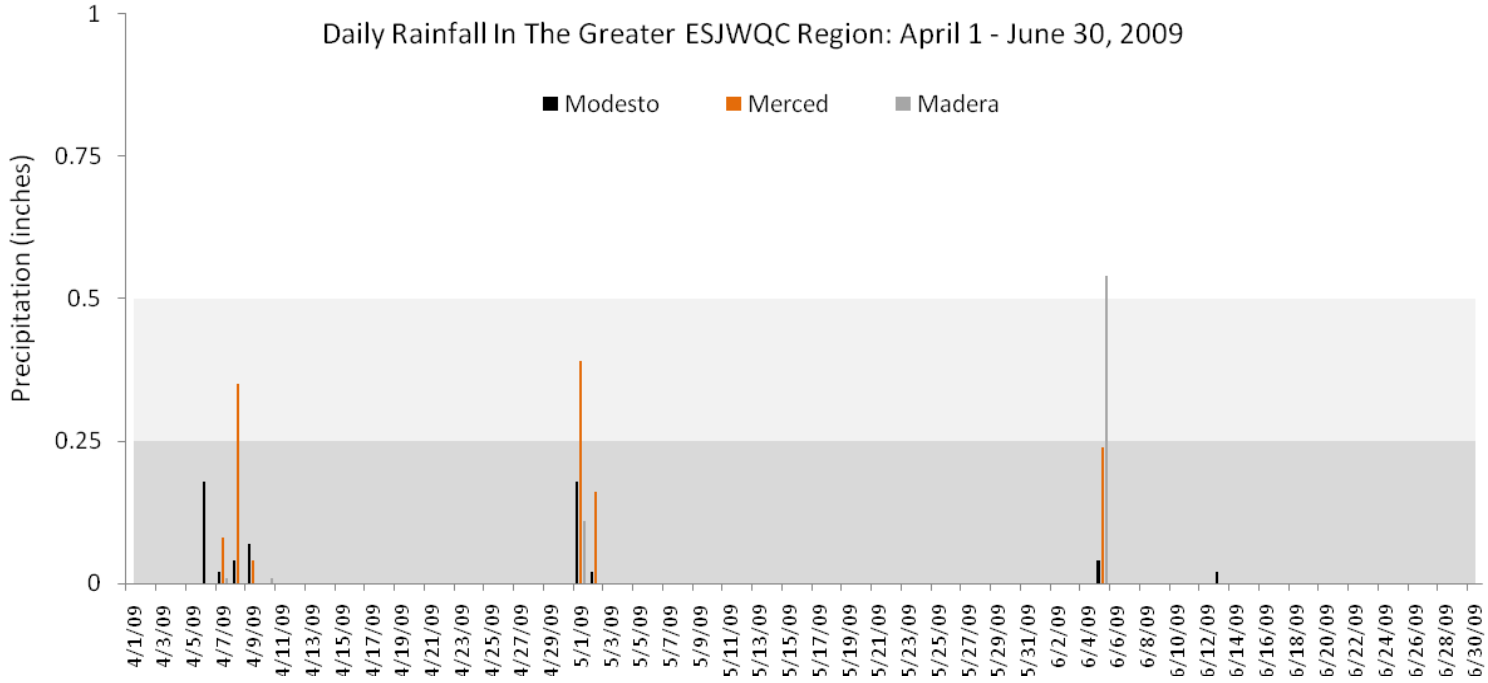


***Figure 13. Local weather conditions between July 1- September 30, 2009.***
Storm sampling occurred on February 7, 2009. All data recorded in Merced, CA and reported on weatherunderground.com.

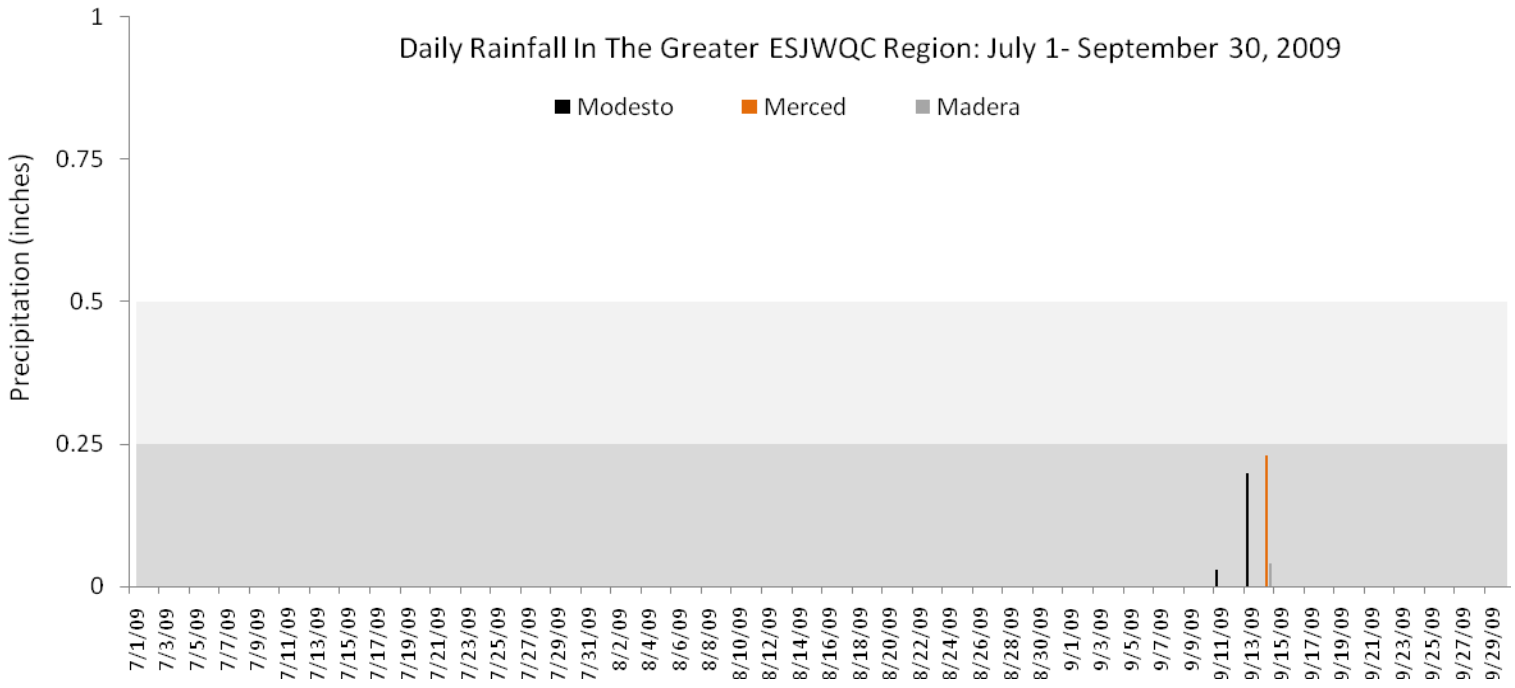
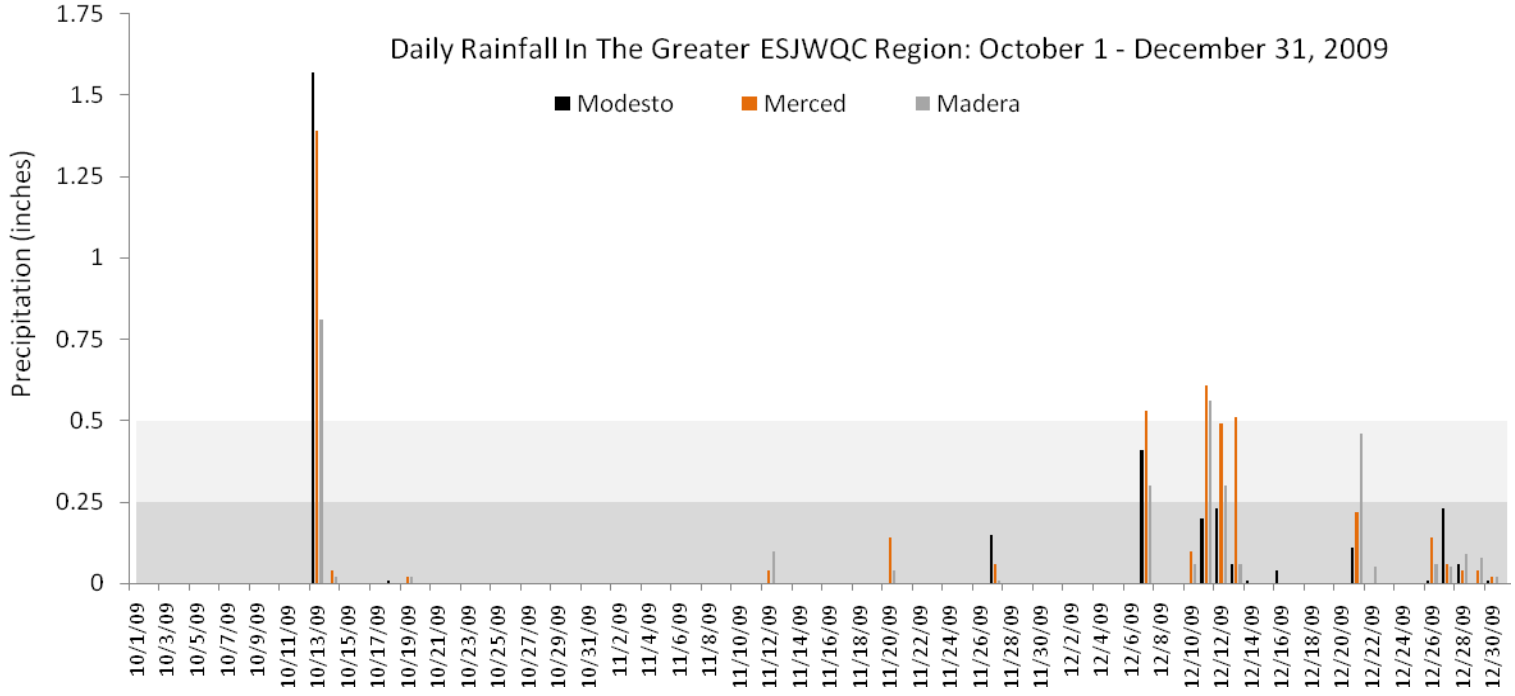


***Figure 14. Local weather conditions between October 1- December 31, 2009.***
*Storm sampling occurred on February 7, 2009. All data recorded in Merced, CA and reported on weatherunderground.com.*



# Monitoring Results

## Sample Details

Original Chain of Custody (COC) forms were scanned and converted to pdf. Pdf copies of the COCs are provided in Appendix I. 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 ESJWQC QAPP. 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 can be found in Appendix I.

Complete monitoring results from sampling that occurred from October 2008 through December 2009 are included in Appendix II and III. The results include field parameters, organic (pesticides), inorganics including metals and *E. coli*, toxicity (water and sediment), sediment chemistry, and loads for any detectable analyte with corresponding site flow. Loads have been calculated for all detections (Appendix II, Table II-8) according to the following formula:

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

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

Monitoring data include results from samples taken for normal monitoring, Management Plan Monitoring and sediment monitoring events. Each sampling location, sampling date, sampling time and type of monitoring is listed in Table 9.

All field data sheets can be found in Appendix IX. Laboratory reports for the last quarter of 2009 will be submitted along with this report on March 1, 2010 and previous quarters' reports have already been submitted with the Coalition's Quarterly Data Submittals.

*Table 9. Sample details for samples collected from October 2008 through December 2009 (sorted by station name, sample date and monitoring event).*

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Ash Slough @ Ave 21 | 545XASAAT | NM | Fall1 | 10/21/2008 | 10:05 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Fall2 | 11/11/2008 | 09:56 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Storm3 | 12/16/2008 | 10:28 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Winter1 | 1/20/2009 | 10:43 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Storm1 | 2/7/2009 | 10:23 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Winter2 | 3/17/2009 | 09:52 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM, SED | Irrigation1 | 4/21/2009 | 09:55 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Irrigation2, Non Contiguous | 5/19/2009 | 11:30 | None | Non contiguous water body, water was flowing upstream of the bridge but disappeared in the sand beneath the bridge. |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Irrigation3 | 6/16/2009 | 11:00 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Irrigation4 | 7/21/2009 | 11:30 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM, SED | Irrigation5 | 8/18/2009 | 12:00 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Irrigation6 | 9/22/2009 | 11:25 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Fall1 | 10/20/2009 | 10:40 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Fall2 | 11/17/2009 | 10:33 | Dry | |
| Ash Slough @ Ave 21 | 545XASAAT | NM | Storm2 | 12/15/2009 | 11:07 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Fall1 | 10/21/2008 | 09:17 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Fall2 | 11/11/2008 | 09:16 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Storm3 | 12/16/2008 | 09:33 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Winter1 | 1/20/2009 | 10:00 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Storm1, Non Contiguous | 2/7/2009 | 09:30 | None | Non contiguous water body, discharge recorded as zero. |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Winter2 | 3/17/2009 | 09:05 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM, SED | Irrigation1 | 4/21/2009 | 09:10 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Irrigation2 | 5/19/2009 | 09:10 | None | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Irrigation3 | 6/16/2009 | 10:20 | None | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Irrigation4 | 7/21/2009 | 10:50 | Dry | |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Cottonwood Creek @ Rd 20 | 545XCCART | NM, SED | Irrigation5 | 8/18/2009 | 10:40 | None | Creek was shallow and sediment was stirred up during sample collection. |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Irrigation6 | 9/22/2009 | 10:25 | Dry | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Fall1 | 10/20/2009 | 09:30 | None | Too shallow to measure discharge. |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Fall2 | 11/17/2009 | 09:40 | None | |
| Cottonwood Creek @ Rd 20 | 545XCCART | NM | Storm2 | 12/15/2009 | 10:00 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Fall1 | 10/21/2008 | 10:50 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Fall2 | 11/11/2008 | 10:40 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Storm3 | 12/16/2008 | 12:00 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Winter1 | 1/20/2009 | 12:00 | None | Discharge recorded as zero due to no measurable flow. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Storm1 | 2/7/2009 | 11:00 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Winter2 | 3/17/2009 | 10:30 | None | Discharge recorded as zero due to no measurable flow. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM, SED | Irrigation1 | 4/21/2009 | 12:00 | None | Sediment chemistry analyzed for toxic samples only. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Irrigation2 | 5/19/2009 | 12:50 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Irrigation3 | 6/16/2009 | 11:50 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Irrigation4 | 7/21/2009 | 12:30 | None | Discharge recorded as zero due to flow moving in upstream direction, from west to east. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM, SED | Irrigation5 | 8/18/2009 | 14:20 | None | Sediment chemistry analyzed for toxic samples only; Discharge recorded as zero due to flow moving in upstream direction, from west to east. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Irrigation6 | 9/22/2009 | 13:40 | None | |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Fall1 | 10/20/2009 | 11:30 | None | Discharge recorded as zero due to no measurable flow. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Fall2, Non Contiguous | 11/17/2009 | 11:20 | None | Non contiguous water body; Discharge recorded as zero due to flow moving in upstream direction, from west to east. |
| Deadman Creek (Dutchman) @ Gurr Rd | 535XDCAGR | NM | Storm2, Non Contiguous | 12/15/2009 | 12:30 | None | Non contiguous water body, discharge recorded as zero. |
| Deadman Creek @ Hwy 59 | 535DMCAHF | MPM | Irrigation1, Management Plan Monitoring | 4/21/2009 | 11:28 | Dry | April MPM for *Selenastrum* toxicity. |
| Deadman Creek @ Hwy 59 | 535DMCAHF | MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 13:49 | Dry | August MPM for chlorpyrifos. |
| Deadman Creek @ Hwy 59 | 535DMCAHF | MPM | Irrigation6, Management Plan Monitoring | 9/22/2009 | 11:55 | Dry | September MPM for chlorpyrifos. |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Dry Creek @ Oakdale Rd | 535DCAORD | MPM | Fall2, Management Plan Monitoring | 11/17/2009 | 13:54 | Dry | November MPM for chlorpyrifos. |
| Dry Creek @ Oakdale Rd | 535DCAORD | MPM | Storm2, Management Plan Monitoring | 12/15/2009 | 13:55 | Dry | December MPM for chlorpyrifos. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Fall1 | 10/21/2008 | 08:50 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Fall2 | 11/11/2008 | 09:30 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Storm3 | 12/16/2008 | 09:20 | None | Discharge recorded as zero due to no measurable flow. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Winter1 | 1/20/2009 | 09:10 | None | Discharge recorded as zero due to no measurable flow. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Storm1 | 2/7/2009 | 11:10 | None | Discharge recorded as zero due to no measurable flow. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Winter2 | 3/17/2009 | 10:50 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Irrigation1 | 4/21/2009 | 11:20 | None | Pipe upstream actively discharging into Dry Creek. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Irrigation2 | 5/19/2009 | 11:30 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Irrigation3 | 6/16/2009 | 10:50 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM, MPM | Irrigation4, Management Plan Monitoring | 7/21/2009 | 10:50 | None | July MPM for chlorpyrifos. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM, MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 12:30 | None | August MPM for chlorpyrifos. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Irrigation6 | 9/22/2009 | 11:00 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Fall1 | 10/20/2009 | 11:10 | None | |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Fall2 | 11/17/2009 | 12:20 | None | Discharge recorded as zero due to no measurable flow. |
| Dry Creek @ Wellsford Rd | 535XDCAWR | NM | Storm2 | 12/15/2009 | 09:50 | None | |
| Dry Creek at Waterford | 535XDCWF | MPM | Irrigation4, Management Plan Monitoring | 7/21/2009 | 11:50 | None | July MPM for chlorpyrifos. |
| Dry Creek at Waterford | 535XDCWF | MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 13:30 | None | August MPM for chlorpyrifos. |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Fall1 | 10/21/2008 | 11:41 | Dry | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Fall2 | 11/11/2008 | 11:27 | Dry | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Storm3 | 12/16/2008 | 14:00 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Winter1 | 1/20/2009 | 13:50 | None | |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Storm1 | 2/7/2009 | 12:40 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Winter2, Non Contiguous | 3/17/2009 | 11:20 | None | Non contiguous water body, discharge recorded as zero. |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Irrigation1 | 4/21/2009 | 13:20 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Irrigation2 | 5/19/2009 | 13:40 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Irrigation3 | 6/16/2009 | 12:30 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Irrigation4 | 7/21/2009 | 13:20 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Irrigation5 | 8/18/2009 | 15:40 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Irrigation6 | 9/22/2009 | 14:50 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Fall1 | 10/20/2009 | 12:30 | None | |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Fall2, Non Contiguous | 11/17/2009 | 12:10 | None | Non contiguous water body, discharge recorded as zero. |
| Duck Slough @ Gurr Rd | 535XDSAGR | NM | Storm2 | 12/15/2009 | 14:40 | None | Too deep to measure discharge. |
| Duck Slough @ Hwy 99 | 535XDSAHN | MPM | Irrigation1, Management Plan Monitoring | 4/21/2009 | 10:40 | None | April MPM for *Selenastrum* toxicity; Discharge not measured due to toxicity monitoring only. |
| Duck Slough @ Hwy 99 | 535XDSAHN | MPM | Irrigation2, Management Plan Monitoring | 5/19/2009 | 09:00 | None | May MPM for chlorpyrifos; Too deep to measure discharge. |
| Duck Slough @ Hwy 99 | 535XDSAHN | MPM | Irrigation3, Management Plan Monitoring | 6/16/2009 | 09:00 | None | June MPM for copper; Too deep to measure discharge. |
| Duck Slough @ Hwy 99 | 535XDSAHN | MPM | Irrigation4, Management Plan Monitoring | 7/21/2009 | 09:50 | None | July MPM for chlorpyrifos and copper; Too deep to measure discharge. |
| Duck Slough @ Hwy 99 | 535XDSAHN | MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 09:00 | None | August MPM for copper; Too deep to measure discharge. |
| Duck Slough @ Hwy 99 | 535XDSAHN | MPM | Irrigation6, Management Plan Monitoring | 9/22/2009 | 09:00 | None | September MPM for chlorpyrifos and copper; Too deep to measure discharge. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Fall1, Non Contiguous | 10/21/2008 | 12:50 | Stagnant | Non contiguous water body, no samples taken due to a miscommunication with field crew; Discharge recorded as zero. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Fall2 | 11/11/2008 | 08:09 | Dry | |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Storm3 | 12/16/2008 | 13:32 | Dry | |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Winter1 | 1/20/2009 | 08:47 | Dry | |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Storm1 | 2/7/2009 | 14:20 | None | Discharge recorded as zero due to no measurable flow. |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Winter2 | 3/17/2009 | 12:30 | Dry | |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM, MPM | Irrigation1, Management Plan Monitoring | 4/21/2009 | 15:50 | None | April MPM for *Selenastrum* toxicity. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM, MPM | Irrigation2, Management Plan Monitoring | 5/19/2009 | 15:40 | None | May MPM for *Selenastrum* toxicity; Too deep to measure discharge. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Irrigation3 | 6/16/2009 | 14:20 | None | Too deep to measure discharge. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM, MPM | Irrigation4, Management Plan Monitoring | 7/21/2009 | 08:30 | None | July MPM for chlorpyrifos. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Irrigation5 | 8/18/2009 | 18:00 | None | Too deep to measure discharge. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Irrigation6 | 9/22/2009 | 16:10 | None | Too deep to measure discharge. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Fall1 | 10/20/2009 | 15:10 | None | Too deep to measure discharge. |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Fall2 | 11/17/2009 | 13:09 | Dry | |
| Highline Canal @ Hwy 99 | 535XHCHNN | NM | Storm2, Non Contiguous | 12/15/2009 | 15:50 | None | Non contiguous water body, discharge recorded as zero. |
| Highline Canal @ Lombardy Rd | 535XHCALR | MPM | Irrigation2, Management Plan Monitoring | 5/19/2009 | 16:00 | None | May MPM for *Selenastrum* toxicity; Discharge not measured due to toxicity monitoring only. |
| Highline Canal @ Lombardy Rd | 535XHCALR | MPM | Irrigation4, Management Plan Monitoring | 7/21/2009 | 16:40 | None | July MPM for chlorpyrifos and *Ceriodaphnia* toxicity; Too deep to measure discharge. |
| Highline Canal @ Lombardy Rd | 535XHCALR | MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 18:20 | None | August MPM for chlorpyrifos, copper, and *Ceriodaphnia* toxicity; Too deep to measure discharge. |
| Hilmar Drain @ Central Ave | 535XHDACA | MPM | Irrigation1, Management Plan Monitoring | 4/21/2009 | 14:50 | None | April MPM for *Selenastrum* toxicity; Discharge not measured due to toxicity monitoring only. |
| Hilmar Drain @ Central Ave | 535XHDACA | MPM | Irrigation6, Management Plan Monitoring | 9/22/2009 | 14:10 | None | September MPM for *Selenastrum* toxicity; Discharge not measured due to toxicity monitoring only. |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Fall1 | 10/21/2008 | 12:12 | Dry | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Fall2 | 11/11/2008 | 11:59 | Dry | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Storm3 | 12/16/2008 | 14:56 | Dry | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Winter1 | 1/20/2009 | 14:44 | Dry | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Storm1 | 2/7/2009 | 13:40 | Dry | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Winter2 | 3/17/2009 | 12:00 | Dry | |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM, SED | Irrigation1 | 4/21/2009 | 14:30 | None | Sediment chemistry analyzed for toxic samples only; Discharge recorded as zero due to no measurable flow. |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Irrigation2 | 5/19/2009 | 14:40 | None | Discharge recorded as zero due to no measurable flow. |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Irrigation3 | 6/16/2009 | 13:30 | None | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Irrigation4 | 7/21/2009 | 15:30 | None | Discharge recorded as zero due to no measurable flow. |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM, SED | Irrigation5 | 8/18/2009 | 16:30 | None | Sediment chemistry analyzed for toxic samples only. |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Irrigation6 | 9/22/2009 | 17:00 | None | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Fall1 | 10/20/2009 | 13:50 | None | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Fall2 | 11/17/2009 | 12:37 | Dry | |
| Howard Lateral @ Hwy 140 | 535XHLAHO | NM | Storm2 | 12/15/2009 | 15:10 | Dry | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Fall1 | 10/21/2008 | 10:40 | None | Discharge recorded as zero due to flow moving in upstream direction, from west to east. |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Fall2 | 11/11/2008 | 11:10 | None | Too shallow to measure discharge. |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Storm3 | 12/16/2008 | 10:11 | Dry | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Winter1 | 1/20/2009 | 09:55 | Dry | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Storm1 | 2/7/2009 | 12:20 | Dry | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Winter2 | 3/17/2009 | 12:03 | Dry | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM, SED | Irrigation1 | 4/21/2009 | 12:50 | None | Sediment chemistry analyzed for toxic samples only. |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Irrigation2 | 5/19/2009 | 13:00 | None | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Irrigation3 | 6/16/2009 | 12:20 | None | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Irrigation4 | 7/21/2009 | 13:30 | None | Too shallow to measure discharge. |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM, SED | Irrigation5 | 8/18/2009 | 15:10 | None | Sediment chemistry analyzed for toxic samples only. |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Irrigation6 | 9/22/2009 | 12:20 | None | Turlock Irrigation District (TID) was cleaning the canal the day of sample collection. |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Fall1 | 10/20/2009 | 12:40 | None | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Fall2 | 11/17/2009 | 13:30 | Dry | |
| Lateral 2 1/2 near Keys Rd | 535LTHNKR | NM | Storm2 | 12/15/2009 | 11:20 | Dry | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Fall1 | 10/21/2008 | 15:00 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Fall2 | 11/11/2008 | 13:00 | None | |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Merced River @ Santa Fe | 535XMRSFD | NM | Storm3 | 12/16/2008 | 13:00 | None | Online discharge information not available from CDEC site for Merced River at Cressy. (CRS) Discharge is an average from CDEC Merced River near Stevinson (MST) downstream and Merced River near Snelling (MSN) upstream. |
| Merced River @ Santa Fe | 535XMRSFD | NM | Winter1 | 1/20/2009 | 14:10 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Storm1 | 2/7/2009 | 14:20 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Winter2 | 3/17/2009 | 13:20 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Irrigation1 | 4/21/2009 | 15:50 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Irrigation2 | 5/19/2009 | 15:30 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Irrigation3 | 6/16/2009 | 14:40 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Irrigation4 | 7/21/2009 | 15:40 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Irrigation5 | 8/18/2009 | 18:00 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Irrigation6 | 9/22/2009 | 15:10 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Fall1 | 10/20/2009 | 15:50 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Fall2 | 11/17/2009 | 14:30 | None | |
| Merced River @ Santa Fe | 535XMRSFD | NM | Storm2 | 12/15/2009 | 14:40 | None | |
| Miles Creek @ Reilly Rd | 535XMCARR | MPM | Irrigation1, Management Plan Monitoring | 4/21/2009 | 11:20 | None | April MPM for *Selenastrum* toxicity; Discharge not measured due to toxicity monitoring only. |
| Miles Creek @ Reilly Rd | 535XMCARR | MPM | Irrigation4, Management Plan Monitoring | 7/21/2009 | 14:00 | None | July MPM for chlorpyrifos and copper. |
| Miles Creek @ Reilly Rd | 535XMCARR | MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 13:20 | None | August MPM for chlorpyrifos and copper. |
| Miles Creek @ Reilly Rd | 535XMCARR | MPM | Irrigation6, Management Plan Monitoring | 9/22/2009 | 12:40 | None | September MPM for chlorpyrifos. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Fall1 | 10/21/2008 | 08:19 | Dry | |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Fall2, Non Contiguous | 11/11/2008 | 08:30 | None | Non contiguous water body, discharge recorded as zero. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Storm3, Non Contiguous | 12/16/2008 | 08:40 | None | Non contiguous water body, discharge recorded as zero. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Winter1 | 1/20/09 | 08:40 | No access | No samples collected; unable to access site due to gate. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Storm1, Non Contiguous | 2/7/2009 | 08:40 | None | Non contiguous water body, discharge recorded as zero. |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Winter2, Non Contiguous | 3/17/2009 | 08:50 | None | Non contiguous water body, discharge recorded as zero. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM, SED | Irrigation1 | 4/21/2009 | 09:00 | None | Sediment chemistry analyzed for toxic samples only; Discharge recorded as zero due to no measurable flow. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Irrigation2 | 5/19/2009 | 09:00 | None | |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Irrigation3 | 6/16/2009 | 09:20 | None | |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Irrigation4 | 7/21/2009 | 09:00 | None | |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM, SED | Irrigation5 | 8/18/2009 | 09:30 | None | Sediment chemistry analyzed for toxic samples only. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Irrigation6 | 9/22/2009 | 09:30 | None | |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Fall1, Non Contiguous | 10/20/2009 | 09:00 | None | Non contiguous water body, discharge recorded as zero. |
| Mootz Drain @ Langworth Rd | 535XMDALR | NM | Fall2, Non Contiguous | 11/17/2009 | 09:30 | None | Non contiguous water body, discharge recorded as zero. |
| Mootz Drain Downstream of Langworth Pond* | 535XMDDLP | NM | Storm2 | 12/15/2009 | 08:50 | None | Discharge recorded as zero due to no measurable flow. |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Fall1 | 10/21/2008 | 13:45 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Fall2 | 11/11/2008 | 13:35 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Storm3 | 12/16/2008 | 12:17 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Winter1 | 1/20/2009 | 14:40 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Storm1 | 2/7/2009 | 15:30 | None | Discharge recorded as zero due to no measurable flow. |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Winter2, Non Contiguous | 3/17/2009 | 14:20 | None | Non contiguous water body, discharge recorded as zero. |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Irrigation1 | 4/21/2009 | 17:00 | Dry | Water too shallow to fill bottles, no water samples collected. |
| Mustang Creek @ East Ave | 535XMCAEA | SED | Irrigation1 | 4/21/2009 | 17:00 | None | Sediment chemistry analyzed for toxic samples only. |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Irrigation2 | 5/19/2009 | 16:14 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Irrigation3 | 6/16/2009 | 14:44 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Irrigation4 | 7/21/2009 | 16:07 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM, SED | Irrigation5 | 8/18/2009 | 18:32 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Irrigation6 | 9/22/2009 | 15:35 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Fall1, Non Contiguous | 10/20/2009 | 15:20 | None | Non contiguous water body, discharge recorded as zero. |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Fall2 | 11/17/2009 | 13:45 | Dry | |
| Mustang Creek @ East Ave | 535XMCAEA | NM | Storm2 | 12/15/2009 | 13:30 | None | Discharge recorded as zero due to no measurable flow. |

| Station Name | Station Code | Monitoring Event | Season, Group | Sample Date | Sample Time | Failure Reason | Sample Comments |
|---|---|---|---|---|---|---|---|
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Fall1 | 10/21/2008 | 13:50 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Fall2 | 11/11/2008 | 13:30 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Storm3 | 12/16/2008 | 11:10 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Winter1 | 1/20/2009 | 10:40 | None | Confirm all YSI meter #2 readings with YSI meter #1 for field results; Too shallow to take discharge. |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Storm1 | 2/7/2009 | 13:10 | None | Sample time incorrectly recorded as 12:10 on all COCs and all sample labels; actual sample time is 13:10; Field results confirmed with second YSI meter. |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Winter2 | 3/17/2009 | 12:40 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM, MPM | Irrigation1, Management Plan Monitoring | 4/21/2009 | 14:20 | None | April MPM for *Selenastrum* toxicity. |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM, MPM | Irrigation2, Management Plan Monitoring | 5/19/2009 | 14:20 | None | May MPM for *Selenastrum* toxicity. |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Irrigation3 | 6/16/2009 | 13:40 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Irrigation4 | 7/21/2009 | 14:40 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM, MPM | Irrigation5, Management Plan Monitoring | 8/18/2009 | 16:40 | None | August MPM for chlorpyrifos. |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Irrigation6 | 9/22/2009 | 13:30 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Fall1 | 10/20/2009 | 14:00 | None | |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Fall2 | 11/17/2009 | 14:20 | None | Discharge recorded as zero due to no measurable flow. |
| Prairie Flower Drain @ Crows Landing Rd | 535XPFDCL | NM | Storm2 | 12/15/2009 | 12:00 | None | |

*Replaced Mootz Drain @ Langworth Rd in December 2009.

MPM-Management Plan Monitoring

NM-Normal Monitoring

SED-Sediment Monitoring Event

COC-Chain of Custody form

## Sampling and Analytical Methods

Sample collection procedures and field instruments are provided in Table 10 and Table 11, respectively. Site-specific discharge methods are provided in Table 12, and analytical methods and reporting limits are provided in Table 13. Beginning with the May 2009 sampling event, the Coalition omitted Total Kjeldahl Nitrogen and orthophosphate from its monitoring program. At the same time, the ESJWQC omitted metals not applied by agriculture (arsenic, cadmium, lead, and molybdenum), sediment bound pesticides (glyphosate, paraquat dichloride), and organochlorine pesticides no longer applied by agriculture (including Group A pesticides) except for once a year during a high Total Suspended Solids (TSS) sampling event.

All methods and reporting limits (RLs) stayed constant throughout the year, with one exception. The RL for trifluralin was decreased from 0.1 µg/L to 0.05 µg/L beginning in July of 2009. All laboratory reports thereafter used the new reporting limit.

Eight constituents used MDL values different than those recorded in the ESJWQC Quality Assurance Project Plan (QAPP); arsenic decreased from 0.01 µg/L to 0.008 µg/L, glyphosate decreased from 4.0 µg/L to 2.8 µg/L (December 2009 sampling only), hardness decreased from 3.0 mg/L to 1.7 mg/L, nitrate + nitrite (as N) decreased from 0.05 mg/L to 0.02 mg/L, paraquat dichloride increased from 0.08 µg/L to 0.21 µg/L , total organic carbon decreased from 0.30 mg/L to 0.10 mg/L , total phosphorus decreased from 0.04 mg/L to 0.01 mg/L , and soluble orthophosphate decreased from 0.01 mg/L to 0.006 mg/L. All field sampling methods were performed as outlined in the standard operating procedures (SOPs) provided in the QAPP. All analytical methods were performed as described in the ESJWQC QAPP. No deviations from these procedures occurred during the monitoring.

### *Table 10. Sampling procedures, containers, sample volumes, preservation and storage techniques, and holding times.*

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

[1] Additional volumes may be required for QC analyses.
[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.
[4] Constituents sampled through April 2009; after this date, no longer sampled.
[5] To include arsenic, boron, cadmium, copper, lead, nickel, molybdenum, selenium, and zinc; arsenic, cadmium, lead, and molybdenum were sampled through April 2009; after this date, only sampled for during storm events.
[6] Constituents sampled through April 2009; after this date, only sampled once per year during a high TSS event.

*Table 11. Field parameters and instruments used to collect measurements.*

| Parameter | Instrument |
|---|---|
| Dissolved oxygen | YSI Model 556 |
| Temperature | YSI Model 556 |
| pH | YSI Model 556 |
| Specific Conductance | YSI Model 556 |
| Discharge | Marsh-McBirney Flow Mate 2000 |

*Table 12. Site specific discharge methods.*

| Site | Discharge Method | Meter/ Gauge |
|---|---|---|
| Ash Slough @ Ave 21 | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Cottonwood Creek @ Rd 20 | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Deadman Creek @ Gurr Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Deadman Creek @ Hwy 59 | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Dry Creek @ Oakdale Ave | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Dry Creek @ Waterford Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Dry Creek @ Wellsford Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Duck Slough @ Gurr Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Duck Slough @ Hwy 99 | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Highline Canal @ Hwy 99 | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Highline Canal @ Lombardy Ave | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Hilmar Drain @ Central Ave | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Howard Lateral @ Hwy 140 | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Lateral 2 1/2 near Keyes Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Merced River @ Santa Fe Rd | DWR Gauge | CDEC Merced River at Cressy (CRS) |
| Miles Creek @ Reilly Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Mootz Drain @ Langworth Rd | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Mootz Drain downstream of Langworth Pond | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Mustang Creek @ East Ave | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |
| Prairie Flower Drain @ Crows Landing | USGS R2Cross Streamflow Method | Marsh McBirney Flo-Mate 2000 |

*Table 13. Field and Laboratory Analytical Methods.*

| Constituent | Matrix | Analyzing Lab | RL | MDL | Analytical Method |
|---|---|---|---|---|---|
| **Physical Parameters** | | | | | |
| Flow | Fresh Water | Field Measure | 1 cfs | NA | USGS R2Cross streamflow Method |
| pH | Fresh Water | Field Measure | 0.1 pH units | NA | EPA 150.1 |
| Electrical Conductivity | Fresh Water | Field Measure | 100 µmhos/cm | NA | EPA 120.1 |
| Dissolved oxygen | Fresh Water | Field Measure | 0.1 mg/L | NA | SM 4500-O |
| Temperature | Fresh Water | Field Measure | 0.1 °C | NA | SM 2550 |
| Turbidity | Fresh Water | Caltest | 0.5 NTU | 0.020 NTU | EPA 180.1 |
| Total Dissolved Solids | Fresh Water | Caltest | 10 mg/L | 4.0 mg/L | SM2540C |
| Total Suspended Solids | Fresh Water | Caltest | 3 mg/L | 2.0 mg/L | EPA 160.2 |
| Hardness | Fresh Water | Caltest | 10 mg/L | 1.7 mg/L | SM2340C |
| Total Organic Carbon | Fresh Water | Caltest | 0.5 mg/L | 0.10 mg/L | EPA 415.1 |
| **Pathogens** | | | | | |
| Escherichia coli | Fresh Water | Caltest | 1 MPN/ 100 mL | 1.0 MPN/ 100 mL | SM 9223 |
| **Toxicity** | | | | | |
| Water Column Toxicity | Fresh Water | AQUA-Science | NA | NA | EPA 821-R-02-012 |
| | Fresh Water | AQUA-Science | NA | NA | EPA 821-R-02-013 |
| Sediment Toxicity | Sediment | AQUA-Science | NA | NA | EPA 600/R-99-064 |
| **Carbamates** | | | | | |
| Aldicarb | Fresh Water | APPL Inc | 0.4 µg/L | 0.20 µg/L | EPA 8321A |
| Carbaryl | Fresh Water | APPL Inc | 0.07 µg/L | 0.050 µg/L | EPA 8321A |
| Carbofuran | Fresh Water | APPL Inc | 0.07 µg/L | 0.050 µg/L | EPA 8321A |
| Methiocarb | Fresh Water | APPL Inc | 0.4 µg/L | 0.20 µg/L | EPA 8321A |
| Methomyl | Fresh Water | APPL Inc | 0.07 µg/L | 0.050 µg/L | EPA 8321A |
| Oxamyl | Fresh Water | APPL Inc | 0.4 µg/L | 0.20 µg/L | EPA 8321A |
| **Organochlorines** | | | | | |
| DDD[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.003 µg/L | EPA 8081A |
| DDE[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.004 µg/L | EPA 8081A |

| Constituent | Matrix | Analyzing Lab | RL | MDL | Analytical Method |
|---|---|---|---|---|---|
| DDT[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.007 µg/L | EPA 8081A |
| Dicofol[1] | Fresh Water | APPL Inc | 0.1 µg/L | 0.01 µg/L | EPA 8081A |
| Dieldrin[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.005 µg/L | EPA 8081A |
| Endrin[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.007 µg/L | EPA 8081A |
| Methoxychlor[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.008 µg/L | EPA 8081A |
| **Group A Pesticides** | | | | | |
| Aldrin[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.009 µg/L | EPA 8081A |
| Chlordane[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.007 µg/L | EPA 8081A |
| Heptachlor[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.008 µg/L | EPA 8081A |
| Heptachlor epoxide[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.007 µg/L | EPA 8081A |
| Hexachlorocyclohexane (alpha-BHC) | Fresh Water | APPL Inc | 0.01 µg/L | 0.005 µg/L | EPA 8081A |
| Hexachlorocyclohexane (beta-BHC)[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.008 µg/L | EPA 8081A |
| Hexachlorocyclohexane (gamma-BHC; Lindane)[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.005 µg/L | EPA 8081A |
| Hexachlorocyclohexane (delta-BHC)[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.005 µg/L | EPA 8081A |
| Endosulfan I[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.005 µg/L | EPA 8081A |
| Endosulfan II[1] | Fresh Water | APPL Inc | 0.01 µg/L | 0.004 µg/L | EPA 8081A |
| Toxaphene[1] | Fresh Water | APPL Inc | 0.5 µg/L | 0.380 µg/L | EPA 8081A |
| **Organophosphates** | | | | | |
| Azinphos-methyl | Fresh Water | APPL Inc | 0.1 µg/L | 0.02 µg/L | EPA 8141A |
| Chlorpyrifos | Fresh Water | APPL Inc | 0.015 µg/L | 0.0026 µg/L | EPA 8141A |
| Diazinon | Fresh Water | APPL Inc | 0.02 µg/L | 0.004 µg/L | EPA 8141A |
| Dichlorvos | Fresh Water | APPL Inc | 0.1 µg/L | 0.02 µg/L | EPA 8141A |
| Dimethoate | Fresh Water | APPL Inc | 0.1 µg/L | 0.08 µg/L | EPA 8141A |
| Dimeton-s | Fresh Water | APPL Inc | 0.1 µg/L | 0.01 µg/L | EPA 8141A |

| Constituent | Matrix | Analyzing Lab | RL | MDL | Analytical Method |
|---|---|---|---|---|---|
| Disulfoton | Fresh Water | APPL Inc | 0.05 µg/L | 0.02 µg/L | EPA 8141A |
| Malathion | Fresh Water | APPL Inc | 0.1 µg/L | 0.05 µg/L | EPA 8141A |
| Methamidiphos | Fresh Water | APPL Inc | 0.2 µg/L | 0.08 µg/L | EPA 8141A |
| Methidathion | Fresh Water | APPL Inc | 0.1 µg/L | 0.04 µg/L | EPA 8141A |
| Parathion, methyl | Fresh Water | APPL Inc | 0.1 µg/L | 0.075 µg/L | EPA 8141A |
| Phorate | Fresh Water | APPL Inc | 0.1 µg/L | 0.07 µg/L | EPA 8141A |
| Phosmet | Fresh Water | APPL Inc | 0.2 µg/L | 0.06 µg/L | EPA 8141A |
| **Herbicides** | | | | | |
| Atrazine | Fresh Water | APPL Inc | 0.5 µg/L | 0.07 µg/L | EPA 619 |
| Cyanazine | Fresh Water | APPL Inc | 0.5 µg/L | 0.09 µg/L | EPA 619 |
| Diuron | Fresh Water | APPL Inc | 0.4 µg/L | 0.2 µg/L | EPA 8321A |
| Glyphosate[1] | Fresh Water | NCL Ltd | 5 µg/L | 2.8 µg/L[2] | EPA 547M |
| Linuron | Fresh Water | APPL Inc | 0.4 µg/L | 0.2 µg/L | EPA 8321A |
| Paraquat dichloride[1] | Fresh Water | APPL Inc | 0.5 µg/L | 0.21 µg/L | EPA 549.2M |
| Simazine | Fresh Water | APPL Inc | 0.5 µg/L | 0.08 µg/L | EPA 619 |
| Trifluralin | Fresh Water | APPL Inc | 0.05 µg/L[3] | 0.036 µg/L | EPA 8141A |
| **Metals** | | | | | |
| Arsenic[1] | Fresh Water | Caltest | 0.5 µg/L | 0.008 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Boron | Fresh Water | Caltest | 10 µg/L | 0.47 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Cadmium[1] | Fresh Water | Caltest | 0.1 µg/L | 0.01 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Copper | Fresh Water | Caltest | 0.5 µg/L | 0.06 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Lead[1] | Fresh Water | Caltest | 0.25 µg/L | 0.07 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Molybdenum[1] | Fresh Water | Caltest | 0.3 µg/L | 0.02 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Nickel | Fresh Water | Caltest | 0.5 µg/L | 0.01 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| Selenium | Fresh Water | Caltest | 1 µg/L | 0.06 µg/L | EPA 200.8 (ICPMS Reaction Cell) |
| Zinc | Fresh Water | Caltest | 1 µg/L | 0.8 µg/L | EPA 200.8 (ICPMS Collision Cell) |
| **Nutrients** | | | | | |

| Constituent | Matrix | Analyzing Lab | RL | MDL | Analytical Method |
|---|---|---|---|---|---|
| Total Kjeldahl Nitrogen[4] | Fresh Water | Caltest | 0.5 mg/L | 0.06 mg/L | EPA 351.3 |
| Nitrate (as N)+ Nitrite (as N) | Fresh Water | Caltest | 0.05 mg/L | 0.02 mg/L | EPA 353.2 |
| Total Ammonia | Fresh Water | Caltest | 0.1 mg/L | 0.040 mg/L | EPA 350.2 |
| Total Phosphorus | Fresh Water | Caltest | 0.01 mg/L | 0.01 mg/L | EPA 365.2 |
| Soluble Orthophosphate[4] | Fresh Water | Caltest | 0.01 mg/L | 0.006 mg/L | EPA 365.2 |
| **Sediment** | | | | | |
| Bifenthrin | Sediment | Caltest | 0.0003 mg/kg | 0.0003 mg/kg | EPA 8270 (GCMS/SIM) |
| Cyfluthrin | Sediment | Caltest | 0.0003 mg/kg | 0.0002 mg/kg | EPA 8270 (GCMS/SIM) |
| Cypermethrin | Sediment | Caltest | 0.0003 mg/kg | 0.0002 mg/kg | EPA 8270 (GCMS/SIM) |
| Esfenvalerate | Sediment | Caltest | 0.0003 mg/kg | 0.0002 mg/kg | EPA 8270 (GCMS/SIM) |
| Lambda-Cyhalothrin | Sediment | Caltest | 0.0003 mg/kg | 0.0003 mg/kg | EPA 8270 (GCMS/SIM) |
| Permethrin | Sediment | Caltest | 0.0003 mg/kg | 0.0002 mg/kg | EPA 8270 (GCMS/SIM) |
| Fenpropathrin | Sediment | Caltest | 0.0003 mg/kg | 0.0002 mg/kg | EPA 8270 (GCMS/SIM) |
| Chlorpyrifos | Sediment | Caltest | 0.003 mg/kg | 0.002 mg/kg | EPA 8270 (GCMS/SIM) |
| Total Solids | Sediment | Caltest | 0.10% | 0.10% | SM2540B |
| Total Organic Carbon | Sediment | Caltest[5] | 200 mg/kg | 100 mg/kg | Walkley Black |
| Grain Size | Sediment | Caltest[5] | 1% sand, silt, clay, gravel | 0.4 µm | ASTM D-422-63, ASTM D4464M-85 |

[1]Constituents sampled through April 2009; after this date, only sampled once per year during a high TSS event.
[2]MDL reported as 4.0 µg/L through April 2009.
[3]RL reported as 0.1 µg/L until through June 2009.
[4]Constituents sampled through April 2009; after this date, no longer sampled.
[5] Subcontracted to PTS Laboratories.
CFS-Cubic Feet per Second

## Precision, Accuracy and Completeness

Normal surface water monitoring occurred fifteen times from October 2008 through December 2009 for 13 sites with the following exceptions due to:

- Ash Slough @ Ave 21
  - Dry all sampling events except 5/19/09
- Cottonwood Creek @ Rd 20
  - Dry: 10/21/08, 11/11/08, 12/16/08, 1/20/09, 3/17/09, 4/21/09, 7/21/09, 9/22/09
- Duck Slough @ Gurr Rd
  - Dry: 10/21/08, 11/11/08
- Highline Canal @ Hwy 99
  - Dry: 11/11/08, 12/16/08, 1/20/09, 3/17/09, 11/17/09
  - Stagnant: 10/21/08*
- Howard Lateral @ Hwy 140
  - Dry: 10/21/08, 11/11/08, 12/16/08, 1/20/09, 2/7/09, 3/17/09, 11/17/09, 12/15/09
- Lateral 2 ½ near Keys Rd
  - Dry: 12/16/08, 1/20/09, 2/7/09, 3/17/09, 11/17/09, 12/15/09
- Mootz Drain @ Langworth Rd
  - Dry: 10/21/08
  - No access: 1/20/09
- Mustang Creek @ East Ave
  - Dry: 10/21/08, 11/11/08, 12/16/08, 1/20/09, 4/21/09, 5/19/09, 6/16/09, 7/21/09, 8/18/09, 9/22/09, 11/17/09

*The Coalition did not sample this non contiguous water body in October 2008 due to a miscommunication with field crews; starting in November 2008 all water bodies including those that were non-contiguous, stagnant and puddle-like were sampled.

Mootz Drain @ Langworth Rd was replaced by Mootz Drain Downstream of Langworth Pond in December 2009. The ESJWQC also dropped the following constituents from its monitoring program: metals not applied by agriculture (arsenic, cadmium, lead and molybdenum), sediment bound pesticides (glyphosate, paraquat dichloride), organochlorine pesticides no longer applied by agriculture (including Group A pesticides) along with a subset of nutrients (Total Kjeldahl Nitrogen and orthophosphate) in May 2009. These constituents will be sampled once a year during events with high total suspended solids. All updates to the monitoring schedule are included in the ESJWQC MRPP (amended on May 15, 2009) and are referenced in the Monitoring Objectives and Design section of this report.

Sediment sampling occurred twice during the irrigation season, once on April 21, 2009 and again on August 18, 2009. Sediment from the following sites was not submitted due to the sites being dry:

- Ash Slough @ Ave 21
    - Dry: 4/21/09, 8/18/09
- Cottonwood Creek @ Rd 20
    - Dry: 4/21/09
- Mustang Creek @ East Ave
    - Dry: 8/18/09

During the 2009 irrigation and fall seasons, 10 Management Plan Monitoring sites were sampled in addition to the normal monitoring sites as scheduled in the ESJWQC Management Plan Update Report (submitted April 1, 2009). See Table 6 in the Monitoring Objectives and Design section for a list of all Management Plan sites. The following Management Plan sites were not sampled due to a lack of water:

- Deadman Creek @ Hwy 59
    - Dry: 4/21/08, 8/18/09, 9/22/09
- Dry Creek @ Oakdale Rd
    - Dry: 11/17/09, 12/15/09

As required in the document "Irrigated Lands Regulatory Program General Procedures Sample Collection for Low Flow or No-Flow Conditions" the Coalition sampled both sediment and water under both no flow and low flow conditions. If a site had no flow, discharge was recorded as zero. If a water body had "puddle like conditions" the entire sample was flagged as "non contiguous". All results including field parameters, chemistry and toxicity are therefore associated with the non contiguous flag and any water quality exceedances should be evaluated relative to the fact that the water was neither flowing nor connected to a downstream water body. The exception to this was for sampling that occurred in October 2008 at Highline Canal @ Hwy 99. Due to miscommunication with field staff, this location was not in sampled in October 2008 due to puddle-like conditions.

From October 2008 through December 2009 the following sites were sampled when water was non contiguous:

- Ash Slough @ Ave 21
    - 5/19/06
- Cottonwood Creek @ Rd 20
    - 2/7/09
- Deadman Creek @ Gurr Rd
    - 11/17/09, 12/15/09
- Duck Slough @ Gurr Rd

    - 3/17/09, 11/17/09
- Highline Canal @ Hwy 99
    - 12/15/09
- Mootz Drain @ Langworth Rd
    - 11/11/08, 12/16/08, 2/7/09, 3/17/09, 10/20/09, 11/17/09
- Mustang Creek @ East Ave
    - 3/17/09, 10/20/09

## Chemistry

All results are tabulated in the Monitoring Results section of this report (Appendix II). Each result is flagged if it does not meet data quality objectives (acceptability criteria) using Surface Water Ambient Monitoring Program (SWAMP) codes and can also be found in the SWAMP comparable database managed by the Coalition. The Coalition works with the University of California, Davis Regional Data Center (UCD RDC) to ensure that all data remain SWAMP comparable and that all data are suitable to be uploaded to the California Environmental Data Exchange Network (CEDEN). A copy of the database has been submitted to the Regional Board with the hardcopy of this report.

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

### Chemistry Completeness

The constituents sampled from October 2008 through December 2009 are listed by site in Tables 6 and 7. For normal and Management Plan Monitoring, not including laboratory or field quality control (QC) samples, 49-56 carbamate, 28 organochlorine, 21-54 herbicide, 62-79 organophosphate, 17 Group A pesticides, 123 *E. coli*, 47-123 physical parameters, 37-123 nutrient and 33-77 dissolved and total metal samples were collected and analyzed from October 2008 – December 2009 (Table 14). There was 100% completeness for environmental samples collected for chemistry analyses.

For each sampling event, a field duplicate and field blank were collected. In addition, an equipment blank and travel blank were analyzed for dissolved metals and total metals respectively. Field blanks and field duplicates each comprised 13.7-21.5% of organic samples, 9.8% of *E. coli* samples, 9.8-14.5% of physical parameter samples, 9.8-11.5% of nutrient samples, 12.3-14% of dissolved and 12.4-14.3% total metal samples. Equipment blanks

comprised 12.3-14% of dissolved metal samples. Travel blanks comprised 11.5-13.1% of total metal samples (Table 14).

### *Batch Completeness*

All chemistry batches were reviewed for quality assurance/control completeness. Eight batches this sampling period were flagged as having incomplete quality control (QC).

Six organochlorine batches from October 2008 – March 2009 were run without toxaphene LCS, MS and MSDs due to laboratory error.

In July 2009 the sample bottle collected for carbamate analysis from Duck Slough @ Gurr Rd was broken by the lab. The lab was able to re-extract the sample within hold time but there was insufficient volume left to perform the MS and MSD. An LCS and LCDs were run with the batch meeting precision and accuracy requirements; however, since the batch was missing a matrix spike it was flagged as having incomplete QC.

In December 2009, an ammonia batch was run without a MSD due to instrument failure.

### *Hold Time Compliance*

Hold times for all chemistry analysis were met, except for two orthophosphate samples in January 2009 and a TSS field blank sample in October 2009. Overall hold time compliance for all analytes was 99.95%.

The orthophosphate samples from Prairie Flower Drain and Dry Creek @ Wellsford were analyzed 26 hours past the 48 hour hold time due to miscommunication between the analytical laboratories receiving department and wet chemistry department.

The October 2009 TSS field blank was re-analyzed three weeks past the hold time due to an error by the laboratory during the original analyses. To determine if the hold time affected the results, two other samples with original detections were run along with the field blank. The re-analyzed TSS field blank sample was non-detect while the other two samples yielded similar results indicating that the exceeded hold time did not affect the results.

## Chemistry Precision and Accuracy

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 provided below to assess overall precision and accuracy per analyte (all pesticides and metals are grouped and discussed together). Overall, precision and accuracy criteria were met for more than 90% of the samples for all analytes and all criteria.

***Ammonia as N:*** Unionized ammonia values determined using the fraction of unionized ammonia in the total ammonia result based on field temperature and pH. Unionized ammonia values were calculated with the following formula:

$$\text{Ammonia as N, unionized} = \text{Ammonia as N, total} * f$$

Where:

$f$ = unionized ammonia fraction of total ammonia
$= 1/(10(pK_a\text{-}pH)+ 1$
$pK_a$ = the temperature related equilibrium constant
$= 0.0901821 + (2729.92/T_k)$
$T_k$ = temperature in degrees Kelvin
= field temperature (°C) +273.2
pH = field pH

- Ammonia and calculated unionized ammonia results can be found in Table 4 in Appendix II and Table 7 in Appendix III.
  One hundred percent of field blanks met acceptability criteria. Seventy-three percent of field duplicates had relative percent differences (RPDs) below 25% (11 of 15). One hundred percent of laboratory blanks and LCSs met acceptability criteria. MS and MSDs were run with each batch and 100% met acceptability criteria.

  ***E. coli:*** Sterility checks of laboratory blanks, negative control and positive control samples were run for each batch. One hundred percent of laboratory blanks met acceptability criteria. One hundred percent of field blanks collected had *E. coli* counts less than the reporting limit of 1. Due to the nature of the analysis method and *E. coli* distribution within the water column, precision of *E. coli* analysis is conducted by evaluating $R_{log}$ values of environmental and duplicate samples with the $R_{log}$ criterion developed by the laboratory using similar samples. The mean $R_{log}$ for the laboratory was calculated to be 0.40. This value multiplied by 3.27 resulted in a precision criterion of 1.30. All laboratory duplicates had $R_{logs}$ below the criteria acceptance level.

  ***Hardness:*** From October 2008 – May 2009 hardness was analyzed from unfiltered samples. Hardness is used to determine the bioavailable fraction of the dissolved metals detected in a sample. Therefore, starting in June 2009 the Coalition instructed the laboratory to analyze the hardness from the samples filtered for dissolved metals analysis. In addition, the analytical laboratory conducted a brief analysis and it was determined that there is little to no difference between the hardness analyzed in the unfiltered sample versus the hardness analyzed in the filtered sample. This study was done on several Coalition samples to ensure that the hardness analysis performed prior to June 2009 accurately reflects the hardness in the associated filtered sample. For this report hardness is reported with a fraction of "none" analysis performed on unfiltered

samples (October 2008 through May 2009) and with a fraction of "dissolved" for analysis performed on filtered samples (June 2009 through December 2009).

One hundred percent of hardness field blanks were below the reporting limit. Seventy-five percent of hardness field duplicates (6 of 8) met acceptability criteria. All laboratory blanks and LCSs met laboratory QC criteria. Seventy-nine percent of MS met the acceptability criteria (19 of 24). Five MS, four of them non project samples, recovered below the acceptability criteria due to possible matrix interferences in the QC samples. Batch QC data based on LCS and RPD data. In addition, one of the non project MS/MSD pairs outside of control limits were analyzed for total hardness instead of dissolved. One hundred percent of MSDs met acceptability criteria.

One hundred percent of dissolved hardness field blanks met acceptability criteria. Seventy-one percent of field duplicates had RPDs less than 25%. Lab blanks and LCSs met acceptability criteria in 100% of the dissolved hardness samples. Seventy-nine percent of dissolved hardness MS met the acceptability criteria (PR 80-120). All five MS (from three batches) that did not meet the acceptance criteria were due to possible matrix interferences. One of the low recovery pairs were non project samples. Batch QC data were accepted based on LCS and RPD results. MSDs met the acceptability criteria for precision, RPD < 25%, in 100% of the dissolved hardness samples analyzed.

***Inorganic sediment (grain size and TOC):*** Sediment grain size and total organic carbon were analyzed for both sets of sediment samples collected during the October 2008 – December 2009 sampling period (April 21 and August 18, 2009).

The Coalition QAPP lists the acceptable limit criterion for grain size duplicates as RSD ≤ 20% where RSD is the relative standard deviation. The RSD is traditionally defined as the standard deviation divided by the mean (equivalent to the Coefficient of Variation). The Coalition discussed with the sediment laboratory possible methods for evaluating sediment grain size precision, and it was agreed that evaluating the relative percent difference between grain size standard deviations of the environmental sample and the duplicate sample is the most suitable and accurate method for determining precision. Currently there is no standard method for evaluating grain size precision. Due to the nature of sediment and grain size analysis, results should be evaluated with the understanding that samples are not homogenous in grain size due to 1) settling of sediment within the sample container (affects laboratory duplicate precision) and 2) heterogeneity of the sediment in the field (affects field duplicate precision).

Individual grain size classes are reported as a percentage based on the composition of the entire sample and therefore are not values that can be evaluated individually (they are not independent from other percentages in the sample). Therefore it is more

accurate to assess precision of the entire sample rather than each grain size class for both field and laboratory duplicates. The grain size standard deviation (SD) for all classes of a single sample was calculated using the following Folk and Ward (1957) Logarithmic equation:

$$SD = \sigma 1 = \frac{\Phi_{84} - \Phi_{16}}{4} + \frac{\Phi_{95} - \Phi_{5}}{6.6}$$

Where $\Phi_{84}$ = phi value of the 84th percentile sediment grain size category
$\Phi_{16}$ = phi value of the 16th percentile sediment grain size category
$\Phi_{95}$ = phi value of the 95th percentile sediment grain size category
$\Phi_{5}$ = phi value of the 5th percentile sediment grain size category

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

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

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

The criterion used in this report to assess precision for sediment grain size and sediment total organic carbon is RPDSD ≤20%. The field duplicate $RPD_{SD}$ were less than 20% (Table 27). One of the two laboratory duplicate $RPD_{SD}$ was greater than 20% ($RPD_{SD}$ = 21%) with the largest difference in standard deviations between the laboratory duplicate and the environmental sample occurring in the 95th percentile phi class. Based on the overall sample composition, all analysis conducted for grain size are considered accurate.

One hundred percent of the sediment Total Organic Carbon (TOC) lab blank samples had results less than the RL. Fifty percent (1 of 2) of the field duplicate samples and 100% of the lab duplicate samples were within acceptability criteria (RSD <20). Both TOC certified reference materials were within acceptability criteria (PR 21-199).

***Metals (dissolved):*** Dissolved cadmium and lead were dropped from the ESJWQC constituent sampling list in May 2009.

One hundred percent of dissolved metal field blanks met field precision criteria except for one dissolved zinc sample in June 2009 (field blank result = 1.1 µg/L, environmental result = 2.2 µg/L). The associated equipment blank (used to assess contamination of the filtering equipment) had no detectable amounts of dissolved zinc, but there were dissolved zinc exceedances in three of the environmental samples in the batch. Contamination in the field may be due to contamination of the field blank water, the field blank storage container, the field blank bottle, or contamination from the sampler. All sampling SOPs (which include the steps to prevent contamination presented in the

total metals analysis section above) were followed. Other sources of contamination may have occurred during transport from the field to the laboratory (all bottles were closed tightly and only touched when being put in the cooler by the sampler and taken from the cooler by the laboratory with gloved hands) and/or during the laboratory extraction process.

Equipment blanks were analyzed starting in October 2008 with all dissolved metal batches and 100% of dissolved metals met acceptability criteria for at least 90% of samples. Laboratory blanks were run with each metals batch and 100% met acceptability criteria.

All dissolved metal field duplicate samples met acceptability criteria except for lead (87.5%) and zinc (86.6%). The lead field duplicate and associated environmental samples were both below the reporting limit. The total metal field duplicate and environmental sample collected at the same time had an RPD greater than 25 and is most likely due to heterogeneity within the water column where the samples were collected (there was no flow at this location).

The field duplicate RPDs outside the acceptance limits for dissolved zinc were 44.1% (September 2009) and 33.3% (October 2009); the results for the field duplicates and associated environmental samples were above the RL of 1 µg/L and both pairs of samples were collected from the same location. The zinc field duplicate collected in October 2009 was collected from a non contiguous water body; it is possible that the differences in the environmental and field duplicate were due to heterogeneity within the water column. Overall, field duplicate precision for all dissolved metals was 95%.

LCSs were within acceptable recovery limits for 100% of dissolved metals. At least 90% of all dissolved metal MS and MSDs met acceptance criteria for accuracy and precision.

***Metals (total):*** Arsenic, cadmium, lead and molybdenum were dropped from the ESJWQC constituent sampling list in May 2009.

One hundred percent of field and travel blanks for total metals met acceptability criteria. Laboratory blanks were run with each total metals batch and 100% met acceptability criteria.

All field duplicates, except for total lead and total cadmium, met acceptability criteria (RPDs < 25%) for at least 90% of samples. The RPDs outside the acceptance limits for lead were 127.3% and 31.2% and each field duplicate and associated environmental sample pair was above the RL of 0.25 µg/L. The one cadmium RPD outside of acceptance limits was 50%. The concentration of the environmental sample was equal to the RL (0.1 µg/L) and the field duplicate was less than the RL at 0.06 µg/L. It is most

likely that the high RPD for the cadmium duplicate was due to the environmental and field duplicate results being equal to or below the RL. The sample site associated with the high RPDs was characterized by a mud substrate, murky, brown water and no flow. All field SOPs were followed including collecting the environmental and field duplicate samples at the same time next one another in the water column. A water body that is not well mixed across the width of the channel can result in unequal concentrations of metals and pesticides. As the analyses involve total metals (no filtration in the field), elevated amounts of suspended sediment in the sample could account for the differences between the lead and cadmium environmental and field duplicate samples.

LCSs were within acceptable recovery limits for 100% of samples run. MS recoveries were within control limits for 98% of all total metals samples analyzed. All total metals had over 90% of MSDs samples meet the acceptability criteria for precision (RPD < 25%).

***Nitrate + Nitrite as N***: Eighty percent (12 of 15) of field blanks met acceptability criteria. All field blanks not meeting acceptability criteria had associated environmental samples with results above the RL (0.05 µg/L). Forty percent of field duplicates had RPDs below 25%. Of the nine instances of high RPDs, all of the field duplicate and associated environmental results were no more than 0.17 µg/L above the RL and four of the instances involved undiluted field duplicate results being compared to diluted environmental results. Laboratory blanks and LCSs were run with each batch and 100% of the samples met acceptance criteria. Eighty-five percent of MS were within the acceptability criteria due to possible matrix interference in the QC samples (29 of 34). All MS were recovered below the quality control limit of 110%, but all LCSs were within range. One hundred percent of MSDs met the acceptability requirement for precision.

***Nitrogen, Total Kjeldahl (TKN)***: Total Kjeldahl Nitrogen was dropped from the ESJWQC constituent sampling list in May 2009. From October 2008 – April 2009, 100% of field blanks met acceptance criteria. Eighty-five percent of field duplicates had RPDs below 25% (6 of 7). The TKN RPD result above the limit was 58% (environmental sample = 14 mg/L, field duplicate = 7.7mg/L). Lab blanks were run with every batch and 100% were less than the minimum detection limit. Laboratory control spikes were within acceptance criteria for all batches. Matrix spikes were performed in each batch with 95% meeting acceptability requirements (19 of 20). The single matrix spike below control limits was due to possible matrix interferences in the QC sample. One hundred percent of matrix spike duplicates met the requirements for precision.

***Orthophosphate as P***: Orthophosphate was dropped from ESJWQC constituent sampling in May 2009. From October 2008 – April 2009 one hundred percent of field blanks and field duplicates collected met acceptance criteria. Lab blanks were run with every batch and 100% were less than the RL. LCSs were within acceptability criteria for

all batches. MS were performed in each batch with 100% meeting acceptability criteria and 100% of MSDs meeting the requirements of accuracy and precision.

***Pesticides:*** From October 2008 – April 2009 pesticides were analyzed in eight different groups: organochlorines (EPA 8081A), Group A pesticides (EPA 8081A), organophosphates (EPA 8141A), carbamates (EPA 8321A), methamidophos (EPA 8141A), paraquat (EPA 549.2), glyphosate (EPA 547M) and triazines (EPA 619). Starting in May 2009 – December 2009 four groups of pesticides were dropped from the ESJWQC constituent sampling list (organochlorines, Group A pesticides, glyphosate and paraquat) and are only scheduled to be analyzed for during a high total suspended solids event. Field blanks were run with each batch and 100% met acceptability criteria. One hundred percent of field duplicates met acceptability criteria for at least 90% of the samples analyzed. Lab blanks were run with each batch and 100% of the samples met acceptability criteria.

Surrogates were run for each applicable pesticide analysis (surrogates are not performed for glyphosate and paraquat analysis). Surrogate recoveries were within specific acceptance criteria for 98.2% of all samples analyzed. All batches with laboratory QC analyses 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 quality control sample may be outside of acceptability criteria, the entire batch may be accepted due to the other quality control samples within that batch meeting acceptability criteria.

MS and LCSs were performed for each batch to assess accuracy as well as possible matrix interference. Either a MSD and/or a LCSD were performed per batch to assess precision. Ninety-six percent of MS samples run were within acceptability criteria. The individual pesticides with less than 90% of samples within acceptable recoveries for matrix spikes include HCH (68.7%), demeton (83.3%), disulfoton (83.3%) and phosmet (80%). Four MS/MSD were above control limits for HCH, while only one MS was below the control results. All associated environmental samples were non-detect, except for one sample in one batch (0.051 µg/L, RL = 0.01 µg/L), and in two of the three batches with high HCH, the LCS recovery was above control limits as well. All of the batches containing a demeton MS/MSD above the acceptability criteria had LCS samples within acceptability range and non-detect environmental sample results. Three of the five disulfoton MS/MSDs not meeting acceptability criteria were above the percent recovery range (47-117) and one MS/MSD pair was below the recovery range. In all cases, the laboratory control spikes were within the acceptable criteria and all other environmental samples in the batches were non detect. Three phosmet MS/MSD pairs

(from three batches) were recovered below the acceptability criteria (PR 50-150). Two of the batches had LCS samples within the acceptability criteria and all environmental samples were non-detect. In the last phosmet batch the LCS was also recovered below acceptability criteria due to problems with the laboratory's vendor-supplied calibration standard. The samples were not re-analyzed since the problem was not recognized until after hold times had expired for the samples. Once the issue was identified, the laboratory contacted the vendor and a new calibration standard was prepared and shipped.

Laboratory precision assessed by the RPD of laboratory duplicates, met acceptability criteria in 95.1% of matrix spike duplicates. The individual pesticides with less than 90% of samples within acceptable recoveries for matrix spike duplicates include carbofuran, methomyl and disulfoton with 86.6% (13 of 15), DDE, DDT, dieldrin, methoxychlor, chlordane, heptachlor, and endosulfan I with 87.5% (7 of 8), and aldrin with 75% (6 of 8). All three batches containing the carbofuran and methomyl high RPDs had MS, MSDs and LCSs within acceptability criteria and no environmental sample detections. Disulfoton had RPDs above 25% in two batches. In one of the batches the MS/MSD pair exceeded recovery limits, and in the other the MS/MSD pair was below recovery limits, but in both cases the LCS was within acceptability criteria and all environmental samples were non detect. Aldrin, chlordane, DDE, DDT, dieldrin, endosulfan I, heptachlor and methoxychlor all had RPDs above acceptability criteria in the same February 2009 batch. All other quality control measures in the batch met acceptance criteria and all environmental samples were non detect. Aldrin also had a duplicate RPD above the 25% acceptability criteria (26.7%) in a December 2009 batch. All environmental sample results were non detect and the MS, MSD, and LCSD all met acceptability criteria.

LCSs were within acceptability criteria for 98.6% of samples analyzed. The LCS did not meet acceptability criteria in at least 90% of HCH (4 of 8) and phosmet (14 of 16) samples. All four HCH LCS samples were recovered above the acceptability criteria (PR 12-97). In three of the four cases a MS and/or MSD in the batch was also recovered above acceptance limits, and in one batch a single environmental result was above the RL (0.01 µg/L) at 0.051µg/L. Both phosmet LCS were recovered below the acceptance criteria. The associated MS/MSD in one batch met acceptance criteria, but were recovered below the acceptance criteria in the second batch due the vendor calibration standard issues noted in the above paragraph. The low LCS recoveries can be attributed to the incorrect calibration standards for the single batch of samples. The samples associated with this set of calibration standards all had no detectable amount of phosmet (six environmental samples).

The Coalition supplies the laboratory with sufficient sample water to perform MS/MSDs for every 20 samples. Therefore, the laboratory will only perform a laboratory duplicate

in a batch where there is no MSD. A carbamates batch in October 2008 was run with a laboratory control spike duplicate for quality assurance purposes even though MS and MSDs were run. Aldicarb and oxamyl had LCSDs above the 25% limit, at 26.4% and 35.5% respectively and all other acceptance limits were met for the LCS. The aldicarb MSD exceeded the acceptance range in the batch, and all MS/MSD in the batch were re-analyzed with similar results.

***Phosphate as P:*** Field blanks met acceptance criteria in 93.3% of the samples collected (14 of 15). The single field blank result above the reporting limit of 0.01 mg/L was 0.058 mg/L and its associated environmental sample result equaled 0.27 mg/L. All other environmental samples in the batch also had results above the RL. Eighty-seven percent of field duplicates had RPDs less than 25%. Laboratory blanks and LCSs were within acceptability criteria for all batches. Eighty six percent of MS (26 of 30) met acceptability criteria for accuracy. Two MS/MSD pairs recovered below percent recovery limits due to possible matrix interferences in the QC samples. All associated LCS were within criteria. One hundred percent of MSD met acceptability criteria for precision.

***Total Dissolved Solids (TDS):*** Field blanks met acceptability criteria in 100% of the samples analyzed. Ninety-three percent of field duplicates had RPDs less than 25%. Lab blanks were run with every batch and met acceptance criteria for 95% of samples. The single lab blank above acceptance criteria was a low level contamination (result = 10, RL = 10) and was not re-analyzed due to hold time limitations. LCSs met acceptability criteria in 100% of the samples analyzed. A single lab duplicate did not meet the batch precision requirements, RPD < 25% (environmental sample = 28 mg/L, duplicate = 21 mg/L, RPD 29%). MS/MSD cannot be performed for TDS.

***Total Organic Carbon (TOC):*** One hundred percent of field blanks and 93.3% of field duplicates met acceptability criteria. Laboratory blanks and LCSs met acceptance criteria for 100% of the samples. One hundred percent of MS and MSDs performed met acceptability requirements.

***Total Suspended Solids (TSS):*** One hundred percent of field blanks met acceptability criteria. Only 40% of field duplicates (6 of 15) had RPDs less than 25%. The 9 field duplicate RPDs > 25% ranged from 25.81% - 107.4%, and all field duplicate and associated environmental sample results were above the RL (3 mg/L). In 5 of the 9 cases, both samples were diluted. One hundred percent of lab blanks, LCSs and laboratory duplicates met acceptance criteria. MS and MSDs cannot be performed for TSS.

***Turbidity:*** One hundred percent of field blanks and 60% of field duplicates (9 of 15) met acceptability criteria. Laboratory blanks were run with every batch and 100% were less than the reporting limit. LCS and laboratory duplicates were analyzed with each batch and all of the samples met acceptance criteria. MS cannot be performed for turbidity.

## Toxicity

For aquatic toxicity testing, 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 ESJWQC QAPP. In addition to the quality assurance (QA) requirements for the toxicity testing methods, a field duplicate must be collected with each sampling event or every 20 samples, whichever is more frequent. Field duplicates were collected every sampling event. The overall percentage of field duplicates are as follows: *Ceriodaphnia* 23%, *Pimephales* 21%, *Selenastrum* 19% and *Hyalella* 16%.

***Water Column Toxicity:*** Field duplicates were collected during each monitoring event and were tested for toxicity to *Ceriodaphnia*, *Selenastrum* and *Pimephales* (Table 26). All three species had 100% of field duplicates within the acceptability criteria (RPD < 25%) except for *Pimephales*, which had 93.3% of RPDs less than 25% (14 of 15). The *Pimephales* field duplicate and environmental samples associated with the high RPD (26.4%) both exhibited significant toxicity compared to the control. All tests met holding time requirements (< 36 hours), water quality requirements and control requirements (as listed in the EPA method guidelines).

***Sediment Toxicity:*** Sediment was collected on April 21, 2009 and August 18, 2009. Two field duplicates were collected and both had RPDs less than 25% (Table 26). One hundred percent of the sediment samples had laboratory control negatives within acceptability criteria. All sediment samples met holding time criteria.

## *Table 14. ESJWQC sample counts, field quality control counts and percentages.*

| Method | Analyte | Env. Samples (#) | Env. and Field QC Samples (#) | Field Blanks (#) | Field Blanks (%) | Field Dup. (#) | Field Dup. (%) | Equip. Blank (#) | Equip. Blank (%) | Travel Blank (#) | Travel Blank (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 8321A CARB | Carbaryl | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 8321A CARB | Carbofuran | 56 | 86 | 15 | 17.4% | 15 | 17.4% | | NA | | NA |
| EPA 8321A CARB | Methiocarb | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 8321A CARB | Methomyl | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 8321A CARB | Oxamyl | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 8321A CARB | Diuron | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 8321A CARB | Linuron | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| | | | | | | | | | | | |
| EPA 619 | Atrazine | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| EPA 619 | Cyanazine | 54 | 84 | 15 | 17.9% | 15 | 17.9% | | NA | | NA |
| EPA 619 | Simazine | 54 | 84 | 15 | 17.9% | 15 | 17.9% | | NA | | NA |
| | | | | | | | | | | | |
| EPA 547M | Glyphosate | 21 | 37 | 8 | 21.6% | 8 | 21.6% | | NA | | NA |
| EPA 549.2M | Paraquat dichloride | 21 | 37 | 8 | 21.6% | 8 | 21.6% | | NA | | NA |
| | | | | | | | | | | | |
| EPA 8081A | DDD(p,p') | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | DDE(p,p') | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | DDT(p,p') | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | Dicofol | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | Dieldrin | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | Endrin | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | Methoxychlor | 28 | 44 | 8 | 18.2% | 8 | 18.2% | | NA | | NA |
| EPA 8081A | Aldrin | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | Chlordane | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | Heptachlor | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | Heptachlor epoxide | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | HCH, alpha | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | HCH, beta | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | HCH, delta | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | HCH, gamma | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | Endosulfan I | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | Endosulfan II | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| EPA 8081A | Toxaphene | 17 | 29 | 6 | 20.7% | 6 | 20.7% | | NA | | NA |
| | | | | | | | | | | | |
| EPA 8141A OP | Azinphos methyl | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Chlorpyrifos | 79 | 109 | 15 | 13.8% | 15 | 13.8% | | NA | | NA |
| EPA 8141A OP | Diazinon | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Dichlorvos | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Dimethoate | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Demeton-s | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Disulfoton | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |

| Method | Analyte | Env. Samples (#) | Env. and Field QC Samples (#) | Field Blanks (#) | Field Blanks (%) | Field Dup. (#) | Field Dup. (%) | Equip. Blank (#) | Equip. Blank (%) | Travel Blank (#) | Travel Blank (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EPA 8141A OP | Malathion | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Methidathion | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Parathion, Methyl | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Phorate | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Phosmet | 63 | 93 | 15 | 16.1% | 15 | 16.1% | | NA | | NA |
| EPA 8141A OP | Trifluralin | 49 | 79 | 15 | 19.0% | 15 | 19.0% | | NA | | NA |
| | | | | | | | | | | | |
| EPA 8141A OP | Methamidophos | 62 | 92 | 15 | 16.3% | 15 | 16.3% | | NA | | NA |
| | | | | | | | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | 41 | 55 | 7 | 12.7% | 7 | 12.7% | | NA | | NA |
| SM 2340 C | Hardness as CaCO3 | 37 | 55 | 8 | 14.5% | 8 | 14.5% | | NA | 2 | 3.6% |
| EPA 160.1 | Total Dissolved Solids | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| EPA 160.2 | Total Suspended Solids | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| EPA 180.1 | Turbidity | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| EPA 350.2 | Ammonia as N | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| EPA 351.3 | Nitrogen, Total Kjeldahl | 47 | 61 | 7 | 11.5% | 7 | 11.5% | | NA | | NA |
| EPA 353.2 | Nitrate + Nitrite as N | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| EPA 365.2 | OrthoPhosphate as P | 47 | 61 | 7 | 11.5% | 7 | 11.5% | | NA | | NA |
| EPA 365.2 | Phosphate as P | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| EPA 415.1 | Total Organic Carbon | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| Walkley-Black | Total Organic Carbon (sediment) | 10 | 12 | | 0.0% | 2 | 16.7% | | NA | | NA |
| SM 9223 | *E. coli* | 123 | 153 | 15 | 9.8% | 15 | 9.8% | | NA | | NA |
| | | | | | | | | | | | |
| EPA 200.8 | Arsenic | 33 | 56 | 8 | 14.3% | 8 | 14.3% | | NA | 7 | 12.5% |
| EPA 200.8 | Boron | 63 | 107 | 15 | 14.0% | 15 | 14.0% | | NA | 14 | 13.1% |
| EPA 200.8 | Cadmium | 33 | 56 | 8 | 14.3% | 8 | 14.3% | | NA | 7 | 12.5% |
| EPA 200.8 | Copper | 77 | 121 | 15 | 12.4% | 15 | 12.4% | | NA | 14 | 11.6% |
| EPA 200.8 | Lead | 34 | 57 | 8 | 14.0% | 8 | 14.0% | | NA | 7 | 12.3% |
| EPA 200.8 | Molybdenum | 33 | 56 | 8 | 14.3% | 8 | 14.3% | | NA | 7 | 12.5% |
| EPA 200.8 | Nickel | 63 | 107 | 15 | 14.0% | 15 | 14.0% | | NA | 14 | 13.1% |
| EPA 200.8 | Selenium | 63 | 107 | 15 | 14.0% | 15 | 14.0% | | NA | 14 | 13.1% |
| EPA 200.8 | Zinc | 63 | 107 | 15 | 14.0% | 15 | 14.0% | | NA | 14 | 13.1% |
| | | | | | | | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | 33 | 57 | 8 | 14.0% | 8 | 14.0% | 8 | 14.0% | | NA |
| EPA 200.8 | Copper (Dissolved) | 77 | 122 | 15 | 12.3% | 15 | 12.3% | 15 | 12.3% | | NA |
| EPA 200.8 | Lead (Dissolved) | 34 | 58 | 8 | 13.8% | 8 | 13.8% | 8 | 13.8% | | NA |
| EPA 200.8 | Nickel (Dissolved) | 63 | 108 | 15 | 13.9% | 15 | 13.9% | 15 | 13.9% | | NA |
| EPA 200.8 | Zinc (Dissolved) | 63 | 108 | 15 | 13.9% | 15 | 13.9% | 15 | 13.9% | | NA |

## *Table 15. ESJWQC summary of field blank quality control sample evaluations.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Carbaryl | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Carbofuran | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Methiocarb | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Methomyl | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Oxamyl | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Diuron | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8321A CARB | Linuron | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 619 | Cyanazine | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 619 | Simazine | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 549.2M | Paraquat dichloride | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | DDE(p,p') | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | DDT(p,p') | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | Dicofol | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | Dieldrin | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | Endrin | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | Methoxychlor | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 8081A | Aldrin | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | Chlordane | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | Heptachlor | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | Heptachlor epoxide | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | HCH, alpha | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | HCH, beta | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | HCH, delta | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | HCH, gamma | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | Endosulfan I | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | Endosulfan II | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| EPA 8081A | Toxaphene | <RL or < (env sample/5) | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Diazinon | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Dichlorvos | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Dimethoate | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Demeton-s | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Disulfoton | <RL or < (env sample/5) | 15 | 15 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8141A OP | Malathion | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Methidathion | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Phorate | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Phosmet | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 8141A OP | Trifluralin | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| SM 2340 C | Hardness as CaCO3 | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 160.2 | Total Suspended Solids | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 180.1 | Turbidity | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 350.2 | Ammonia as N | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 353.2 | Nitrate + Nitrite as N | <RL or < (env sample/5) | 15 | 12 | 80.00 |
| EPA 365.2 | OrthoPhosphate as P | <RL or < (env sample/5) | 7 | 7 | 100.00 |
| EPA 365.2 | Phosphate as P | <RL or < (env sample/5) | 15 | 14 | 93.33 |
| EPA 415.1 | Total Organic Carbon | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| Walkley-Black | Total Organic Carbon (sediment) | NA | | | NA |
| SM 9223 | *E. coli* | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| EPA 200.8 | Arsenic | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Boron | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Cadmium | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Copper | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Lead | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Molybdenum | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Selenium | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel (Dissolved) | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | <RL or < (env sample/5) | 15 | 14 | 93.33 |
| | | | | | |
| | | **TOTAL** | **830** | **825** | **99.40** |

*Table 16. ESJWQC summary of equipment blank (dissolved metals) and travel blank (total metals) quality control sample evaluations.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 200.8 | Arsenic | <RL or < (env sample/5) | 7 | 7 | NA |
| EPA 200.8 | Boron | <RL or < (env sample/5) | 14 | 14 | NA |
| EPA 200.8 | Cadmium | <RL or < (env sample/5) | 7 | 7 | NA |
| EPA 200.8 | Copper | <RL or < (env sample/5) | 14 | 14 | NA |
| EPA 200.8 | Lead | <RL or < (env sample/5) | 7 | 7 | NA |
| EPA 200.8 | Molybdenum | <RL or < (env sample/5) | 7 | 7 | NA |
| EPA 200.8 | Nickel | <RL or < (env sample/5) | 14 | 14 | NA |
| EPA 200.8 | Selenium | <RL or < (env sample/5) | 14 | 14 | NA |
| EPA 200.8 | Zinc | <RL or < (env sample/5) | 14 | 14 | NA |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | <RL or < (env sample/5) | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel (Dissolved) | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | <RL or < (env sample/5) | 15 | 15 | 100.00 |
| | | | | | |
| | | **TOTAL** | **61** | **61** | **100.00** |

## *Table 17. ESJWQC summary of field duplicate quality control sample evaluations.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Carbaryl | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Carbofuran | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Methiocarb | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Methomyl | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Oxamyl | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Diuron | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8321A CARB | Linuron | RPD ≤ 25 | 15 | 15 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 619 | Cyanazine | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 619 | Simazine | RPD ≤ 25 | 15 | 14 | 93.33 |
| | | | | | |
| EPA 547M | Glyphosate | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 549.2M | Paraquat dichloride | RPD ≤ 25 | 8 | 8 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | DDE(p,p') | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | DDT(p,p') | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Dicofol | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Dieldrin | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Endrin | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Methoxychlor | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Aldrin | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | Chlordane | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | Heptachlor | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | Heptachlor epoxide | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | HCH, alpha | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | HCH, beta | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | HCH, delta | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | HCH, gamma | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | Endosulfan I | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | Endosulfan II | RPD ≤ 25 | 6 | 6 | 100.00 |
| EPA 8081A | Toxaphene | RPD ≤ 25 | 6 | 6 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8141A OP | Diazinon | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Dichlorvos | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Dimethoate | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Demeton-s | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Disulfoton | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Malathion | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Methidathion | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | RPD ≤ 25 | 15 | 15 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8141A OP | Phorate | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Phosmet | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Trifluralin | RPD ≤ 25 | 15 | 15 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | RPD ≤ 25 | 15 | 15 | 100.00 |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | RPD ≤ 25 | 7 | 5 | 71.43 |
| SM 2340 C | Hardness as CaCO3 | RPD ≤ 25 | 8 | 6 | 75.00 |
| EPA 160.1 | Total Dissolved Solids | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 160.2 | Total Suspended Solids | RPD ≤ 25 | 15 | 6 | 40.00 |
| EPA 180.1 | Turbidity | RPD ≤ 25 | 15 | 9 | 60.00 |
| EPA 350.2 | Ammonia as N | RPD ≤ 25 | 15 | 11 | 73.33 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | RPD ≤ 25 | 7 | 6 | 85.71 |
| EPA 353.2 | Nitrate + Nitrite as N | RPD ≤ 25 | 15 | 6 | 40.00 |
| EPA 365.2 | OrthoPhosphate as P | RPD ≤ 25 | 7 | 7 | 100.00 |
| EPA 365.2 | Phosphate as P | RPD ≤ 25 | 15 | 13 | 86.67 |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | 15 | 14 | 93.33 |
| Walkley-Black | Total Organic Carbon (sediment) | RSD ≤ 20 | 2 | 1 | 50.00 |
| SM 9223 | *E. coli* | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 200.8 | Arsenic | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Boron | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 200.8 | Cadmium | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 200.8 | Copper | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 200.8 | Lead | RPD ≤ 25 | 8 | 6 | 75.00 |
| EPA 200.8 | Molybdenum | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 200.8 | Selenium | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc | RPD ≤ 25 | 15 | 14 | 93.33 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 200.8 | Nickel (Dissolved) | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | RPD ≤ 25 | 15 | 13 | 86.67 |
| | | | | | |
| | | **TOTAL** | **817** | **768** | **94.00** |

## *Table 18. ESJWQC summary of method blank quality control sample evaluations.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | <RL | 15 | 15 | 100.00 |
| EPA 8321A CARB | Carbaryl | <RL | 15 | 15 | 100.00 |
| EPA 8321A CARB | Carbofuran | <RL | 16 | 16 | 100.00 |
| EPA 8321A CARB | Methiocarb | <RL | 15 | 15 | 100.00 |
| EPA 8321A CARB | Methomyl | <RL | 15 | 15 | 100.00 |
| EPA 8321A CARB | Oxamyl | <RL | 15 | 15 | 100.00 |
| EPA 8321A CARB | Diuron | <RL | 15 | 15 | 100.00 |
| EPA 8321A CARB | Linuron | <RL | 15 | 15 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | <RL | 15 | 15 | 100.00 |
| EPA 619 | Cyanazine | <RL | 15 | 15 | 100.00 |
| EPA 619 | Simazine | <RL | 15 | 15 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | <RL | 8 | 8 | 100.00 |
| EPA 549.2M | Paraquat dichloride | <RL | 8 | 8 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | <RL | 8 | 8 | 100.00 |
| EPA 8081A | DDE(p,p') | <RL | 8 | 8 | 100.00 |
| EPA 8081A | DDT(p,p') | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Dicofol | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Dieldrin | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Endrin | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Methoxychlor | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Aldrin | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Chlordane | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Heptachlor | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Heptachlor epoxide | <RL | 8 | 8 | 100.00 |
| EPA 8081A | HCH, alpha | <RL | 8 | 8 | 100.00 |
| EPA 8081A | HCH, beta | <RL | 8 | 8 | 100.00 |
| EPA 8081A | HCH, delta | <RL | 8 | 8 | 100.00 |
| EPA 8081A | HCH, gamma | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Endosulfan I | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Endosulfan II | <RL | 8 | 8 | 100.00 |
| EPA 8081A | Toxaphene | <RL | 8 | 8 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Diazinon | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Dichlorvos | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Dimethoate | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Demeton-s | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Disulfoton | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Malathion | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Methidathion | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Phorate | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Phosmet | <RL | 15 | 15 | 100.00 |
| EPA 8141A OP | Trifluralin | <RL | 15 | 15 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | <RL | 15 | 15 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | <RL | 10 | 10 | 100.00 |
| SM 2340 C | Hardness as CaCO3 | <RL | 11 | 11 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | <RL | 20 | 19 | 95.00 |
| EPA 160.2 | Total Suspended Solids | <RL | 20 | 20 | 100.00 |
| EPA 180.1 | Turbidity | <RL | 15 | 15 | 100.00 |
| EPA 350.2 | Ammonia as N | <RL | 23 | 23 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | <RL | 10 | 10 | 100.00 |
| EPA 353.2 | Nitrate + Nitrite as N | <RL | 17 | 17 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | <RL | 8 | 8 | 100.00 |
| EPA 365.2 | Phosphate as P | <RL | 15 | 15 | 100.00 |
| EPA 415.1 | Total Organic Carbon | <RL | 20 | 20 | 100.00 |
| Walkley-Black | Total Organic Carbon (sediment) | <RL | 2 | 2 | 100.00 |
| SM 9223 | *E. coli* | <RL | 15 | 15 | 100.00 |
| | | | | | |
| EPA 200.8 | Arsenic | <RL | 8 | 8 | 100.00 |
| EPA 200.8 | Boron | <RL | 17 | 17 | 100.00 |
| EPA 200.8 | Cadmium | <RL | 8 | 8 | 100.00 |
| EPA 200.8 | Copper | <RL | 18 | 18 | 100.00 |
| EPA 200.8 | Lead | <RL | 8 | 8 | 100.00 |
| EPA 200.8 | Molybdenum | <RL | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel | <RL | 17 | 17 | 100.00 |
| EPA 200.8 | Selenium | <RL | 17 | 17 | 100.00 |
| EPA 200.8 | Zinc | <RL | 20 | 20 | 100.00 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | <RL | 8 | 8 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | <RL | 16 | 16 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | <RL | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel (Dissolved) | <RL | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | <RL | 15 | 15 | 100.00 |
| | | | | | |
| | | **TOTAL** | **905** | **904** | **99.89** |

## *Table 19. ESJWQC summary of lab control spike quality control sample evaluations.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | PR 31-133 | 16 | 16 | 100.00 |
| EPA 8321A CARB | Carbaryl | PR 44-133 | 16 | 16 | 100.00 |
| EPA 8321A CARB | Carbofuran | PR 36-165 | 18 | 18 | 100.00 |
| EPA 8321A CARB | Methiocarb | PR 35-142 | 16 | 16 | 100.00 |
| EPA 8321A CARB | Methomyl | PR 23-152 | 16 | 16 | 100.00 |
| EPA 8321A CARB | Oxamyl | PR 10-117 | 16 | 16 | 100.00 |
| EPA 8321A CARB | Diuron | PR 52-136 | 16 | 16 | 100.00 |
| EPA 8321A CARB | Linuron | PR 49-144 | 16 | 16 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | PR 39-156 | 16 | 16 | 100.00 |
| EPA 619 | Cyanazine | PR 22-172 | 16 | 16 | 100.00 |
| EPA 619 | Simazine | PR 21-179 | 16 | 16 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | PR 72-131 | 16 | 16 | 100.00 |
| EPA 549.2M | Paraquat dichloride | PR 50-141 | 9 | 9 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | PR 38-135 | 8 | 8 | 100.00 |
| EPA 8081A | DDE(p,p') | PR 21-134 | 8 | 8 | 100.00 |
| EPA 8081A | DDT(p,p') | PR 18-145 | 8 | 8 | 100.00 |
| EPA 8081A | Dicofol | PR 40-135 | 8 | 8 | 100.00 |
| EPA 8081A | Dieldrin | PR 48-121 | 8 | 8 | 100.00 |
| EPA 8081A | Endrin | PR 24-143 | 8 | 8 | 100.00 |
| EPA 8081A | Methoxychlor | PR 30-163 | 8 | 8 | 100.00 |
| EPA 8081A | Aldrin | PR 11-138 | 8 | 8 | 100.00 |
| EPA 8081A | Chlordane | PR 44-152 | 8 | 8 | 100.00 |
| EPA 8081A | Heptachlor | PR 24-124 | 8 | 8 | 100.00 |
| EPA 8081A | Heptachlor epoxide | PR 58-109 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, alpha | PR 33-111 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, beta | PR 49-119 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, delta | PR 12-97 | 8 | 4 | 50.00 |
| EPA 8081A | HCH, gamma | PR 40-114 | 8 | 8 | 100.00 |
| EPA 8081A | Endosulfan I | PR 50-131 | 8 | 8 | 100.00 |
| EPA 8081A | Endosulfan II | PR 55-128 | 8 | 8 | 100.00 |
| EPA 8081A | Toxaphene | PR 23-140 | 2 | 2 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | PR 36-189 | 16 | 16 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | PR 61-125 | 16 | 16 | 100.00 |
| EPA 8141A OP | Diazinon | PR 57-130 | 16 | 16 | 100.00 |
| EPA 8141A OP | Dichlorvos | PR 10-175 | 16 | 16 | 100.00 |
| EPA 8141A OP | Dimethoate | PR 68-202 | 16 | 16 | 100.00 |
| EPA 8141A OP | Demeton-s | PR 40-125 | 16 | 16 | 100.00 |
| EPA 8141A OP | Disulfoton | PR 47-117 | 16 | 15 | 93.75 |
| EPA 8141A OP | Malathion | PR 47-125 | 16 | 16 | 100.00 |
| EPA 8141A OP | Methidathion | PR 50-150 | 16 | 16 | 100.00 |
| EPA 8141A OP | Parathion, Methyl | PR 55-164 | 16 | 16 | 100.00 |
| EPA 8141A OP | Phorate | PR 44-117 | 16 | 15 | 93.75 |
| EPA 8141A OP | Phosmet | PR 50-150 | 16 | 14 | 87.50 |
| EPA 8141A OP | Trifluralin | PR 40-148 | 16 | 16 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | PR 25-136 | 16 | 16 | 100.00 |
| | | | | | |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| SM 2340 C | Hardness as CaCO3 (Dissolved) | PR 80-120 | 10 | 10 | 100.00 |
| SM 2340 C | Hardness as CaCO3 | PR 80-120 | 11 | 11 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | PR 80-120 | 20 | 20 | 100.00 |
| EPA 160.2 | Total Suspended Solids | PR 80-120 | 20 | 20 | 100.00 |
| EPA 180.1 | Turbidity | PR 90-110 | 15 | 15 | 100.00 |
| EPA 350.2 | Ammonia as N | PR 80-120 | 23 | 23 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | PR 80-120 | 10 | 10 | 100.00 |
| EPA 353.2 | Nitrate + Nitrite as N | PR 80-120 | 17 | 17 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | PR 80-120 | 8 | 8 | 100.00 |
| EPA 365.2 | Phosphate as P | PR 80-120 | 15 | 15 | 100.00 |
| EPA 415.1 | Total Organic Carbon | PR 75-125 | 20 | 20 | 100.00 |
| Walkley-Black | Total Organic Carbon (sediment) | PR 21-199 | 2 | 2 | 100.00 |
| SM 9223 | *E. coli* | NA | | | NA |
| | | | | | |
| EPA 200.8 | Arsenic | PR 75-125 | 8 | 8 | 100.00 |
| EPA 200.8 | Boron | PR 75-125 | 17 | 17 | 100.00 |
| EPA 200.8 | Cadmium | PR 75-125 | 8 | 8 | 100.00 |
| EPA 200.8 | Copper | PR 75-125 | 18 | 18 | 100.00 |
| EPA 200.8 | Lead | PR 75-125 | 8 | 8 | 100.00 |
| EPA 200.8 | Molybdenum | PR 75-125 | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel | PR 75-125 | 17 | 17 | 100.00 |
| EPA 200.8 | Selenium | PR 75-125 | 17 | 17 | 100.00 |
| EPA 200.8 | Zinc | PR 75-125 | 20 | 20 | 100.00 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | PR 75-125 | 8 | 8 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | PR 75-125 | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel (Dissolved) | PR 75-125 | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | PR 75-125 | 15 | 15 | 100.00 |
| | | | | | |
| | | **TOTAL** | **919** | **911** | **99.13** |

### *Table 20. ESJWQC summary of lab control spike duplicate quality control sample evaluations.*

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | RPD ≤ 25 | 1 | 0 | 0.00 |
| EPA 8321A CARB | Carbaryl | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8321A CARB | Carbofuran | RPD ≤ 25 | 2 | 2 | 100.00 |
| EPA 8321A CARB | Methiocarb | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8321A CARB | Methomyl | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8321A CARB | Oxamyl | RPD ≤ 25 | 1 | 0 | 0.00 |
| EPA 8321A CARB | Diuron | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8321A CARB | Linuron | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 619 | Cyanazine | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 619 | Simazine | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 549.2M | Paraquat dichloride | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A | DDE(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A | DDT(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A | Dicofol | RPD ≤ 25 | | | NA |
| EPA 8081A | Dieldrin | RPD ≤ 25 | | | NA |
| EPA 8081A | Endrin | RPD ≤ 25 | | | NA |
| EPA 8081A | Methoxychlor | RPD ≤ 25 | | | NA |
| EPA 8081A | Aldrin | RPD ≤ 25 | | | NA |
| EPA 8081A | Chlordane | RPD ≤ 25 | | | NA |
| EPA 8081A | Heptachlor | RPD ≤ 25 | | | NA |
| EPA 8081A | Heptachlor epoxide | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, alpha | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, beta | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, delta | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, gamma | RPD ≤ 25 | | | NA |
| EPA 8081A | Endosulfan I | RPD ≤ 25 | | | NA |
| EPA 8081A | Endosulfan II | RPD ≤ 25 | | | NA |
| EPA 8081A | Toxaphene | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Diazinon | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Dichlorvos | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Dimethoate | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Demeton-s | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Disulfoton | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Malathion | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Methidathion | RPD ≤ 25 | 1 | 1 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8141A OP | Parathion, Methyl | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Phorate | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Phosmet | RPD ≤ 25 | 1 | 1 | 100.00 |
| EPA 8141A OP | Trifluralin | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | RPD ≤ 25 | 1 | 1 | 100.00 |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | RPD ≤ 25 | | | NA |
| SM 2340 C | Hardness as CaCO3 | RPD ≤ 25 | | | NA |
| EPA 160.1 | Total Dissolved Solids | RPD ≤ 25 | | | NA |
| EPA 160.2 | Total Suspended Solids | RPD ≤ 25 | | | NA |
| EPA 180.1 | Turbidity | RPD ≤ 25 | | | NA |
| EPA 350.2 | Ammonia as N | RPD ≤ 25 | | | NA |
| EPA 351.3 | Nitrogen, Total Kjeldahl | RPD ≤ 25 | | | NA |
| EPA 353.2 | Nitrate + Nitrite as N | RPD ≤ 25 | | | NA |
| EPA 365.2 | OrthoPhosphate as P | RPD ≤ 25 | | | NA |
| EPA 365.2 | Phosphate as P | RPD ≤ 25 | | | NA |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | | | NA |
| Walkley-Black | Total Organic Carbon (sediment) | RSD ≤ 20 | | | 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 | Molybdenum | RPD ≤ 25 | | | NA |
| EPA 200.8 | Nickel | RPD ≤ 25 | | | NA |
| EPA 200.8 | Selenium | RPD ≤ 25 | | | NA |
| EPA 200.8 | Zinc | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Copper (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Lead (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Nickel (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Zinc (Dissolved) | RPD ≤ 25 | | | NA |
| | | | | | |
| | | **TOTAL** | **35** | **33** | **94.29** |

*Table 21. ESJWQC summary of matrix spike quality control sample evaluations. Non project matrix spikes are included for batch completeness.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | PR 31-133 | 30 | 28 | 93.33 |
| EPA 8321A CARB | Carbaryl | PR 44-133 | 30 | 29 | 96.67 |
| EPA 8321A CARB | Carbofuran | PR 36-165 | 30 | 30 | 100.00 |
| EPA 8321A CARB | Methiocarb | PR 35-142 | 30 | 29 | 96.67 |
| EPA 8321A CARB | Methomyl | PR 23-152 | 30 | 30 | 100.00 |
| EPA 8321A CARB | Oxamyl | PR 10-117 | 30 | 30 | 100.00 |
| EPA 8321A CARB | Diuron | PR 52-136 | 30 | 27 | 90.00 |
| EPA 8321A CARB | Linuron | PR 49-144 | 30 | 29 | 96.67 |
| | | | | | |
| EPA 619 | Atrazine | PR 39-156 | 30 | 30 | 100.00 |
| EPA 619 | Cyanazine | PR 22-172 | 30 | 27 | 90.00 |
| EPA 619 | Simazine | PR 21-179 | 30 | 30 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | PR 72-131 | 16 | 16 | 100.00 |
| EPA 549.2M | Paraquat dichloride | PR 50-141 | 16 | 16 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | PR 38-135 | 16 | 16 | 100.00 |
| EPA 8081A | DDE(p,p') | PR 21-134 | 16 | 16 | 100.00 |
| EPA 8081A | DDT(p,p') | PR 18-145 | 16 | 16 | 100.00 |
| EPA 8081A | Dicofol | PR 40-135 | 16 | 16 | 100.00 |
| EPA 8081A | Dieldrin | PR 48-121 | 16 | 16 | 100.00 |
| EPA 8081A | Endrin | PR 24-143 | 16 | 16 | 100.00 |
| EPA 8081A | Methoxychlor | PR 30-163 | 16 | 16 | 100.00 |
| EPA 8081A | Aldin | PR 11-138 | 16 | 16 | 100.00 |
| EPA 8081A | Chlordane | PR 44-152 | 16 | 16 | 100.00 |
| EPA 8081A | Heptachlor | PR 24-124 | 16 | 16 | 100.00 |
| EPA 8081A | Heptachlor epoxide | PR 58-109 | 16 | 16 | 100.00 |
| EPA 8081A | HCH, alpha | PR 33-111 | 16 | 16 | 100.00 |
| EPA 8081A | HCH, beta | PR 49-119 | 16 | 16 | 100.00 |
| EPA 8081A | HCH, delta | PR 12-97 | 16 | 11 | 68.75 |
| EPA 8081A | HCH, gamma | PR 40-114 | 16 | 16 | 100.00 |
| EPA 8081A | Endosulfan I | PR 50-131 | 16 | 16 | 100.00 |
| EPA 8081A | Endosulfan II | PR 55-128 | 16 | 16 | 100.00 |
| EPA 8081A | Toxaphene | PR 23-140 | 4 | 4 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | PR 36-189 | 30 | 30 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | PR 61-125 | 30 | 28 | 93.33 |
| EPA 8141A OP | Diazinon | PR 57-130 | 30 | 30 | 100.00 |
| EPA 8141A OP | Dichlorvos | PR 10-175 | 30 | 30 | 100.00 |
| EPA 8141A OP | Dimethoate | PR 68-202 | 30 | 30 | 100.00 |
| EPA 8141A OP | Demeton-s | PR 40-125 | 30 | 25 | 83.33 |
| EPA 8141A OP | Disulfoton | PR 47-117 | 30 | 25 | 83.33 |
| EPA 8141A OP | Malathion | PR 47-125 | 30 | 30 | 100.00 |
| EPA 8141A OP | Methidathion | PR 50-150 | 30 | 30 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8141A OP | Parathion, Methyl | PR 55-164 | 30 | 30 | 100.00 |
| EPA 8141A OP | Phorate | PR 44-117 | 30 | 27 | 90.00 |
| EPA 8141A OP | Phosmet | PR 50-150 | 30 | 24 | 80.00 |
| EPA 8141A OP | Trifluralin | PR 40-148 | 30 | 30 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | PR 25-136 | 30 | 30 | 100.00 |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | PR 80-120 | 18 | 13 | 72.22 |
| SM 2340 C | Hardness as CaCO3 | PR 80-120 | 24 | 19 | 79.17 |
| EPA 160.1 | Total Dissolved Solids | PR 80-120 | | | NA |
| EPA 160.2 | Total Suspended Solids | PR 80-120 | | | NA |
| EPA 180.1 | Turbidity | PR 90-110 | | | NA |
| EPA 350.2 | Ammonia as N | PR 80-120 | 45 | 45 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | PR 80-120 | 20 | 19 | 95.00 |
| EPA 353.2 | Nitrate + Nitrite as N | PR 80-120 | 34 | 29 | 85.29 |
| EPA 365.2 | OrthoPhosphate as P | PR 80-120 | 16 | 16 | 100.00 |
| EPA 365.2 | Phosphate as P | PR 80-120 | 30 | 26 | 86.67 |
| EPA 415.1 | Total Organic Carbon | PR 80-120 | 40 | 40 | 100.00 |
| Walkley-Black | Total Organic Carbon (sediment) | PR 21-199 | | | NA |
| SM 9223 | *E. coli* | NA | | | NA |
| | | | | | |
| EPA 200.8 | Arsenic | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Boron | PR 75-125 | 34 | 32 | 94.12 |
| EPA 200.8 | Cadmium | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Copper | PR 75-125 | 36 | 36 | 100.00 |
| EPA 200.8 | Lead | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Molybdenum | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Nickel | PR 75-125 | 34 | 34 | 100.00 |
| EPA 200.8 | Selenium | PR 75-125 | 34 | 34 | 100.00 |
| EPA 200.8 | Zinc | PR 75-125 | 40 | 38 | 95.00 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | PR 75-125 | 16 | 16 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | PR 75-125 | 32 | 31 | 96.88 |
| EPA 200.8 | Lead (Dissolved) | PR 75-125 | 16 | 15 | 93.75 |
| EPA 200.8 | Nickel (Dissolved) | PR 75-125 | 30 | 29 | 96.67 |
| EPA 200.8 | Zinc (Dissolved) | PR 75-125 | 30 | 29 | 96.67 |
| | | | | | |
| | | **TOTAL** | **1651** | **1586** | **96.06** |

*Table 22. ESJWQC summary of matrix spike duplicate quality control sample evaluations. Non project matrix spikes are included for batch completeness.*

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8321A CARB | Carbaryl | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8321A CARB | Carbofuran | RPD ≤ 25 | 15 | 13 | 86.67 |
| EPA 8321A CARB | Methiocarb | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8321A CARB | Methomyl | RPD ≤ 25 | 15 | 13 | 86.67 |
| EPA 8321A CARB | Oxamyl | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8321A CARB | Diuron | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8321A CARB | Linuron | RPD ≤ 25 | 15 | 14 | 93.33 |
| | | | | | |
| EPA 619 | Atrazine | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 619 | Cyanazine | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 619 | Simazine | RPD ≤ 25 | 15 | 15 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 549.2M | Paraquat dichloride | RPD ≤ 25 | 8 | 8 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | DDE(p,p') | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | DDT(p,p') | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | Dicofol | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Dieldrin | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | Endrin | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Methoxychlor | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | Aldrin | RPD ≤ 25 | 8 | 6 | 75.00 |
| EPA 8081A | Chlordane | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | Heptachlor | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | Heptachlor epoxide | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, alpha | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, beta | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, delta | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | HCH, gamma | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Endosulfan I | RPD ≤ 25 | 8 | 7 | 87.50 |
| EPA 8081A | Endosulfan II | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 8081A | Toxaphene | RPD ≤ 25 | 2 | 2 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Diazinon | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Dichlorvos | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8141A OP | Dimethoate | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Demeton-s | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8141A OP | Disulfoton | RPD ≤ 25 | 15 | 13 | 86.67 |
| EPA 8141A OP | Malathion | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8141A OP | Methidathion | RPD ≤ 25 | 15 | 15 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Pairs | Pairs Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8141A OP | Parathion, Methyl | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Phorate | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 8141A OP | Phosmet | RPD ≤ 25 | 15 | 14 | 93.33 |
| EPA 8141A OP | Trifluralin | RPD ≤ 25 | 15 | 15 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | RPD ≤ 25 | 15 | 14 | 93.33 |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | RPD ≤ 25 | 9 | 9 | 100.00 |
| SM 2340 C | Hardness as CaCO3 | RPD ≤ 25 | 12 | 12 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | RPD ≤ 25 | | | NA |
| EPA 160.2 | Total Suspended Solids | RPD ≤ 25 | | | NA |
| EPA 180.1 | Turbidity | RPD ≤ 25 | | | NA |
| EPA 350.2 | Ammonia as N | RPD ≤ 25 | 22 | 22 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | RPD ≤ 25 | 10 | 10 | 100.00 |
| EPA 353.2 | Nitrate + Nitrite as N | RPD ≤ 25 | 17 | 17 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 365.2 | Phosphate as P | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | 20 | 20 | 100.00 |
| Walkley-Black | Total Organic Carbon (sediment) | RSD ≤ 20 | | | NA |
| SM 9223 | *E. coli* | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 200.8 | Arsenic | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Boron | RPD ≤ 25 | 17 | 17 | 100.00 |
| EPA 200.8 | Cadmium | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Copper | RPD ≤ 25 | 18 | 18 | 100.00 |
| EPA 200.8 | Lead | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Molybdenum | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel | RPD ≤ 25 | 17 | 17 | 100.00 |
| EPA 200.8 | Selenium | RPD ≤ 25 | 17 | 17 | 100.00 |
| EPA 200.8 | Zinc | RPD ≤ 25 | 20 | 19 | 95.00 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | RPD ≤ 25 | 16 | 16 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | RPD ≤ 25 | 8 | 8 | 100.00 |
| EPA 200.8 | Nickel (Dissolved) | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | RPD ≤ 25 | 15 | 15 | 100.00 |
| | | | | | |
| | | **TOTAL** | **825** | **798** | **96.73** |

*Table 23. ESJWQC summary of lab duplicate quality control sample evaluations. Non project matrix spikes are included for batch completeness.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Carbaryl | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Carbofuran | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Methiocarb | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Methomyl | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Oxamyl | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Diuron | RPD ≤ 25 | | | NA |
| EPA 8321A CARB | Linuron | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 619 | Atrazine | RPD ≤ 25 | | | NA |
| EPA 619 | Cyanazine | RPD ≤ 25 | | | NA |
| EPA 619 | Simazine | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 547M | Glyphosate | RPD ≤ 25 | | | NA |
| EPA 549.2M | Paraquat dichloride | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 8081A | DDD(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A | DDE(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A | DDT(p,p') | RPD ≤ 25 | | | NA |
| EPA 8081A | Dicofol | RPD ≤ 25 | | | NA |
| EPA 8081A | Dieldrin | RPD ≤ 25 | | | NA |
| EPA 8081A | Endrin | RPD ≤ 25 | | | NA |
| EPA 8081A | Methoxychlor | RPD ≤ 25 | | | NA |
| EPA 8081A | Aldrin | RPD ≤ 25 | | | NA |
| EPA 8081A | Chlordane | RPD ≤ 25 | | | NA |
| EPA 8081A | Heptachlor | RPD ≤ 25 | | | NA |
| EPA 8081A | Heptachlor epoxide | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, alpha | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, beta | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, delta | RPD ≤ 25 | | | NA |
| EPA 8081A | HCH, gamma | RPD ≤ 25 | | | NA |
| EPA 8081A | Endosulfan I | RPD ≤ 25 | | | NA |
| EPA 8081A | Endosulfan II | RPD ≤ 25 | | | NA |
| EPA 8081A | Toxaphene | 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 | Dichlorvos | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Dimethoate | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Demeton-s | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Disulfoton | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Malathion | RPD ≤ 25 | | | NA |
| EPA 8141A OP | Methidathion | RPD ≤ 25 | | | NA |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| 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 | Trifluralin | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 8141A OP | Methamidophos | RPD ≤ 25 | | | NA |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | RPD ≤ 25 | | | NA |
| SM 2340 C | Hardness as CaCO3 | RPD ≤ 25 | | | NA |
| EPA 160.1 | Total Dissolved Solids | RPD ≤ 25 | 20 | 19 | 95.00 |
| EPA 160.2 | Total Suspended Solids | RPD ≤ 25 | 20 | 20 | 100.00 |
| EPA 180.1 | Turbidity | RPD ≤ 25 | 15 | 15 | 100.00 |
| EPA 350.2 | Ammonia as N | RPD ≤ 25 | | | NA |
| EPA 351.3 | Nitrogen, Total Kjeldahl | RPD ≤ 25 | | | NA |
| EPA 353.2 | Nitrate + Nitrite as N | RPD ≤ 25 | | | NA |
| EPA 365.2 | OrthoPhosphate as P | RPD ≤ 25 | | | NA |
| EPA 365.2 | Phosphate as P | RPD ≤ 25 | | | NA |
| EPA 415.1 | Total Organic Carbon | RPD ≤ 25 | | | NA |
| Walkley-Black | Total Organic Carbon (sediment) | RSD ≤ 20 | 2 | 2 | 100.00 |
| SM 9223 | *E. coli* | RPD ≤ 25 | 15 | 15 | 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 | Molybdenum | RPD ≤ 25 | | | NA |
| EPA 200.8 | Nickel | RPD ≤ 25 | | | NA |
| EPA 200.8 | Selenium | RPD ≤ 25 | | | NA |
| EPA 200.8 | Zinc | RPD ≤ 25 | | | NA |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Copper (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Lead (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Nickel (Dissolved) | RPD ≤ 25 | | | NA |
| EPA 200.8 | Zinc (Dissolved) | RPD ≤ 25 | | | NA |
| | | | | | |
| | | **TOTAL** | **72** | **71** | **98.61** |

***Table 24. ESJWQC summary of surrogate recovery quality control sample evaluations.*** Surrogates were run with water samples collected and LABQAs analyzed during the irrigation season of 2008 for all organics except paraquat and glyphosate; non project samples are included.

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Tributylphosphate(Surrogate) | RPD ≤ 25; PR 36-140 | 150 | 150 | 100.00 |
| EPA 8321A CARB | Triphenyl phosphate(Surrogate) | RPD ≤ 25; PR 56-129 | | | NA |
| | | | | | |
| EPA 619 | Tributylphosphate(Surrogate) | RPD ≤ 25; PR 62-145 | 145 | 143 | 98.62 |
| EPA 619 | Triphenyl phosphate(Surrogate) | RPD ≤ 25; PR 54-144 | 145 | 144 | 99.31 |
| | | | | | |
| EPA 8081A | Decachlorobiphenyl(Surrogate) | RPD ≤ 25; PR 16-146 | 81 | 81 | 100.00 |
| EPA 8081A | Tetrachloro-m-xylene(Surrogate) | RPD ≤ 25; PR 15-98 | 81 | 81 | 100.00 |
| | | | | | |
| EPA 8141A OP | Tributylphosphate(Surrogate) | RPD ≤ 25; PR 60-150 | 323 | 316 | 97.83 |
| EPA 8141A OP | Triphenyl phosphate(Surrogate) | RPD ≤ 25; PR 56-129 | 323 | 310 | 95.98 |
| | | | | | |
| | | **TOTAL** | **1248** | **1225** | **98.16** |

*Table 25. ESJWQC summary of holding time evaluations for environmental, field blank, field duplicate and matrix spike samples.*

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8321A CARB | Aldicarb | 7 days | 94 | 94 | 100.00 |
| EPA 8321A CARB | Carbaryl | 7 days | 94 | 94 | 100.00 |
| EPA 8321A CARB | Carbofuran | 7 days | 101 | 101 | 100.00 |
| EPA 8321A CARB | Methiocarb | 7 days | 94 | 94 | 100.00 |
| EPA 8321A CARB | Methomyl | 7 days | 94 | 94 | 100.00 |
| EPA 8321A CARB | Oxamyl | 7 days | 94 | 94 | 100.00 |
| EPA 8321A CARB | Diuron | 7 days | 94 | 94 | 100.00 |
| EPA 8321A CARB | Linuron | 7 days | 94 | 94 | 100.00 |
| | | | | | |
| EPA 619 | Atrazine | 7 days | 94 | 94 | 100.00 |
| EPA 619 | Cyanazine | 7 days | 99 | 99 | 100.00 |
| EPA 619 | Simazine | 7 days | 99 | 99 | 100.00 |
| | | | | | |
| EPA 547M | Glyphosate | 14 days | 45 | 45 | 100.00 |
| EPA 549.2M | Paraquat dichloride | 7 days | 45 | 45 | 100.00 |
| | | | | | |
| EPA 8081A | DDD(p,p') | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | DDE(p,p') | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | DDT(p,p') | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | Dicofol | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | Dieldrin | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | Endrin | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | Methoxychlor | 7 days | 52 | 52 | 100.00 |
| EPA 8081A | Aldrin | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | Chlordane | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | Heptachlor | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | Heptachlor epoxide | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | HCH, alpha | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | HCH, beta | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | HCH, delta | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | HCH, gamma | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | Endosulfan I | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | Endosulfan II | 7 days | 36 | 36 | 100.00 |
| EPA 8081A | Toxaphene | 7 days | 31 | 31 | 100.00 |
| | | | | | |
| EPA 8141A OP | Azinphos methyl | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Chlorpyrifos | 7 days | 124 | 124 | 100.00 |
| EPA 8141A OP | Diazinon | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Dichlorvos | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Dimethoate | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Demeton-s | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Disulfoton | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Malathion | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Methidathion | 7 days | 108 | 108 | 100.00 |

| Method | Analyte | Data Quality Objective | Number of Samples | Samples Within Control Limits | Percent Samples Acceptable |
|---|---|---|---|---|---|
| EPA 8141A OP | Parathion, Methyl | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Phorate | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Phosmet | 7 days | 108 | 108 | 100.00 |
| EPA 8141A OP | Trifluralin | 7 days | 94 | 94 | 100.00 |
| | | | | | |
| EPA 8141A OP | Methamidophos | 7 days | 107 | 107 | 100.00 |
| | | | | | |
| SM 2340 C | Hardness as CaCO3 (Dissolved) | 6 months | 63 | 63 | 100.00 |
| SM 2340 C | Hardness as CaCO3 | 6 months | 63 | 63 | 100.00 |
| EPA 160.1 | Total Dissolved Solids | 7 days | 153 | 153 | 100.00 |
| EPA 160.2 | Total Suspended Solids | 7 days | 153 | 152 | 99.35 |
| EPA 180.1 | Turbidity | 48 hours | 153 | 153 | 100.00 |
| EPA 350.2 | Ammonia as N | Field acidify, 28 days | 168 | 168 | 100.00 |
| EPA 351.3 | Nitrogen, Total Kjeldahl | Field acidify, 28 days | 68 | 68 | 100.00 |
| EPA 353.2 | Nitrate + Nitrite as N | Field acidify, 28 days | 168 | 168 | 100.00 |
| EPA 365.2 | OrthoPhosphate as P | 48 hours | 69 | 67 | 97.10 |
| EPA 365.2 | Phosphate as P | Field acidify, 28 days | 168 | 168 | 100.00 |
| EPA 415.1 | Total Organic Carbon | 28 days | 171 | 171 | 100.00 |
| Walkley-Black | Total Organic Carbon (sediment) | 2 days | 12 | 12 | 100.00 |
| SM 9223 | *E. coli* | 24 hours | 153 | 153 | 100.00 |
| | | | | | |
| EPA 200.8 | Arsenic | Field acidify, 6 months | 64 | 64 | 100.00 |
| EPA 200.8 | Boron | Field acidify, 6 months | 124 | 124 | 100.00 |
| EPA 200.8 | Cadmium | Field acidify, 6 months | 64 | 64 | 100.00 |
| EPA 200.8 | Copper | Field acidify, 6 months | 138 | 138 | 100.00 |
| EPA 200.8 | Lead | Field acidify, 6 months | 65 | 65 | 100.00 |
| EPA 200.8 | Molybdenum | Field acidify, 6 months | 64 | 64 | 100.00 |
| EPA 200.8 | Nickel | Field acidify, 6 months | 124 | 124 | 100.00 |
| EPA 200.8 | Selenium | Field acidify, 6 months | 124 | 124 | 100.00 |
| EPA 200.8 | Zinc | Field acidify, 6 months | 124 | 124 | 100.00 |
| | | | | | |
| EPA 200.8 | Cadmium (Dissolved) | Field acidify, 6 months | 65 | 65 | 100.00 |
| EPA 200.8 | Copper (Dissolved) | Field acidify, 6 months | 137 | 137 | 100.00 |
| EPA 200.8 | Lead (Dissolved) | Field acidify, 6 months | 66 | 66 | 100.00 |
| EPA 200.8 | Nickel (Dissolved) | Field acidify, 6 months | 123 | 123 | 100.00 |
| EPA 200.8 | Zinc (Dissolved) | Field acidify, 6 months | 123 | 123 | 100.00 |
| | | | | | |
| | | **TOTAL** | **6376** | **6373** | **99.95** |

*Table 26. ESJWQC summary of toxicity field duplicate sample evaluations.*

| Method | Toxicity Species | Total Field Duplicate Samples | Data Quality Objective (DQO) | Total Field Duplicate Samples Within DQO | Percent Samples Within Acceptable Criteria |
|---|---|---|---|---|---|
| EPA 821/R-02-012 | *Ceriodaphnia dubia* | 15 | RPD ≤ 25 | 15 | 100.00 |
| EPA 821/R-02-012 | *Pimephales promelas* | 15 | RPD ≤ 25 | 14 | 93.33 |
| EPA 821/R-02-013 | *Selenastrum capricornutum* | 15 | RPD ≤ 25 | 15 | 100.00 |
| EPA 600/R-99-064 | *Hyalella azteca* | 2 | RPD ≤ 25 | 2 | 100.00 |

*Table 27. ESJWQC summary of calculated sediment grain size $RPD_{SD}$ results.*
Batch calculations based on the relative percent difference ($RPD_{SD}$) between the standard deviation (SD) of the environmental samples and the standard deviation of their duplicate samples.

| Sample Type | Analysis Month | $\Phi_5$ | $\Phi_{16}$ | $\Phi_{84}$ | $\Phi_{95}$ | SD | $RPD_{SD}$ |
|---|---|---|---|---|---|---|---|
| Environmental Sample | April 2009 | -0.11 | 0.55 | 5.45 | 7.71 | 2.41 | - |
| Lab Duplicate | April 2009 | -0.23 | 0.38 | 4.17 | 6.35 | 1.94 | 21.38 |
| Field Duplicate | April 2009 | -0.36 | 0.38 | 4.88 | 7.29 | 2.28 | 5.36 |
| Environmental Sample | August 2009 | -0.43 | 0.05 | 6.49 | 8.95 | 3.03 | - |
| Lab Duplicate | August 2009 | -0.46 | 0.10 | 5.75 | 8.51 | 2.77 | 8.95 |
| Field Duplicate | August 2009 | -0.52 | 0.07 | 5.47 | 8.34 | 2.69 | 11.84 |

## Discussion of Results

The Coalition monitored all constituents as required in the MRP and outlined in the MRPP submitted on August 25, 2008 from October 2008 through April 2009 and amended May 15, 2009 with an update of constituents for sampling from March 2009 through December 2010. All data met 90 percent completeness, precision and accuracy. A discussion of all quality control is included in the Precision and Accuracy section of this report. All exceedances of water quality trigger limits (WQTLs) (Table 29) were reported within five business days upon receipt of lab results except for an HCH exceedance that occurred in samples collected on November 11, 2008. An amended exceedance report was submitted on June 19, 2009.

TIEs were performed for all samples when survival or growth was 50 percent or less compared to the control. A TIE report is included in Appendix VI.

Evaluation of WQTL exceedances of applied pesticides were reviewed in the context of the Pesticide Use Report (PUR) data relevant to exceedances. PUR data from October 2008 through November 2009 for all counties in the Coalition were available for review (Table 28). Any outstanding PUR data that are made available after this report is submitted will be included in an addendum to the Annual Monitoring Report (AMR) on June 30, 2010.

***Table 28. Status of PUR data associated with exceedances that occurred from October 2008 through December 2009.***

| County | PUR Data Obtained | PUR Data Outstanding |
|---|---|---|
| Madera | October 2008-November 2009 | December 2009 |
| Merced | October 2008-November 2009 | December 2009 |
| Stanislaus | October 2008-November 2009 | December 2009 |

Coalition monitoring between October 1, 2008 and December 31, 2009 resulted in exceedances of WQTLs (Table 29) for DO, pH, SC, *E. coli*, TDS, ammonia, nitrate, arsenic, copper, chlorpyrifos, diuron, DDE, and HCH (Tables 30-33). Water column toxicity to *Ceriodaphnia dubia, Pimephales promelas, Selenastrum capricornutum,* and sediment toxicity to *Hyalella azteca* also occurred (Table 34 Exceedances are tallied by the number of environmental exceedances, the number of exceedances that occurred in non contiguous water bodies, the number of Management Plan Monitoring exceedances and a total count for all WQTL exceedances (Tables 36 – 41). If a WQTL exceedance occurred in the environmental sample and the field duplicate sample, the result is only counted once.

## *Table 29. Water Quality Trigger Limits (WQTLs).*

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit | Category (see footnotes) |
|---|---|---|---|---|---|
| | | | | | |
| pH | 6.5 - 8.5 units | Numeric | | Sacramento/San Joaquin Rivers Basin Plan (page III.6.00) | 1 |
| Electrical Conductivity (maximum) | 700 umhos/cm | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) | 3 |
| Dissolved Oxygen (minimum) | 7 mg/L | Numeric | Cold Freshwater Habitat, Spawning | Sacramento/San Joaquin Rivers Basin Plan. Water Quality Control Plan for the Tulare Lake Basin. | 1 |
| | 5 mg/L | | Warm Freshwater Habitat | Basin Plan Objective, page III-5.00: for waters designated WARM (aquatic life). Tulare Lake Basin Plan | |
| Turbidity | variable | Numeric | Municipal and Domestic Supply | Basin Plan Objective - increase varies based on natural turbidity | 1 |
| Total Dissolved Solids | 450 mg/L | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) | 3 |
| Total Suspended Solids | NA | | | | |
| Temperature | variable | Numeric | | Basin Plan Objective (see objectives for COLD, WARM, and Enclosed Bays and Estuaries) | 1 |
| E coli | 235 MPN/100 ml | Narrative | Water Contact Recreation | EPA ambient water quality criteria, single-sample maximum | 3 |
| Fecal coliform | 200 MPN/100 ml **400 MPN/100 ml** | Numeric | Water Contact Recreation | Sacramento/San Joaquin Rivers Basin Plan (page III.3.00) Geometric mean of not less than five samples for any 30- day period, **nor shall more than 10% of the total number of samples taken during a 30 -day period.** | 1 |
| TOC | NA | | | | |
| **Pesticides - Carbamates** | | | | | |
| Aldicarb | 3 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health) | 1 |
| Carbaryl | 2.53 ug/L | Narrative | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average | 3 |
| Carbofuran | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition | 2 |
| Methiocarb | 0.5 ug/L | Narrative | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Toxicity Objective: Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates | 3 |
| Methomyl | 0.52 ug/L | Narrative | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Toxicity Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average (California Department of Fish and Game) (aquatic life) | 3 |
| Oxamyl | 50 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Drinking Water Standards - Maximum Contaminant Levels (MCLs). California Dept of Health Services. Primary MCL | 3 |
| **Pesticides - Organochlorines** | | | | | |
| DDD(p,p') | 0.00083 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: | 1 |

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

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit | Category (see footnotes) |
|---|---|---|---|---|---|
| Disulfoton | 0.05 ug/L | Narrative | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA National Ambient Water Quality Criteria - Freshwater Aquatic Life Protection - instantaneous maximum | 3 |
| Malathion | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition | 2 |
| Methamidophos | 0.35 ug/L | Narrative | Municipal and Domestic Supply | Basin Plan Toxicity Objective, Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level. | 3 |
| Methidathion | 0.7 | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose (MUN, human health) | 3 |
| Parathion, Methyl | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Prohibition | 2 |
| Phorate | 0.7 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level. | 3 |
| Phosmet | 140 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: Drinking Water Health Advisories or Suggested No-Adverse-Response Levels for non-cancer health effects. USEPA IRIS Reference Dose (RfD) as a drinking water level. | 3 |
| **Group A Pesticides** | | | | | |
| Aldrin | 0.00013 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |
| | 3 ug/L | | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Instantaneous maximum | |
| Chlordane | 0.00057 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |
| | 0.0043 ug/L | | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA ) - Continuous Concentration 4-day average (total) | |
| Heptachlor | 0.00021ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |
| | 0.0038 ug/L | | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA ) - Continuous Concentration 4-day average (total) | |
| Heptachlor Epoxide | 0.0001 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit | Category (see footnotes) |
|---|---|---|---|---|---|
| | 0.0038 ug/L | | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA ) - Continuous Concentration 4-day average (total) | |
| Total Hexachlorocyclohexane (including lindane) | 0.0039 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |
| | 0.95 ug/L | | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA) - Maximum Concentration (1-hour Average) | |
| Endosulfan | 110 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |
| | 0.056 ug/L | | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR (USEPA ) - Continuous Concentration 4-day average (total) | |
| Toxaphene | 0.00073 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA), Human Health Protection, 30-Day Average - Sources of Drinking Water (water & fish consumption) | 1 |
| | 0.0002 ug/L | | Cold Freshwater Habitat, Spawning | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR (USEPA ) - Continuous Concentration 4-day average (total) | |
| **Pesticides - Herbicides** | | | | | |
| Atrazine | 1.0 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL | 1 |
| Cyanazine | 1.0 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Health Advisory (human health) | 3 |
| Diuron | 2 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water. USEPA Health Advisory. Likely to be carcinogenic to humans (U.S. Environmental Protection Agency, 2005 Guidelines for Carcinogen Risk Assessment). | 3 |
| Glyphosate | 700 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |
| Linuron | 1.4 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level | 3 |
| Molinate | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition | 2 |
| Paraquat dichloride | 3.2 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level | 3 |
| Simazine | 4.0 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |
| Thiobencarb | ND | Numeric | | Sacramento/San Joaquin Basin Plan - Basin Plan Discharge Prohibition | 2 |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit | Category (see footnotes) |
|---|---|---|---|---|---|
| Trifluralin | 5 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Cancer Risk Level. One-in-a-Million Incremental Cancer Risk Estimates for Drinking Water | 3 |
| **Metals (c)** | | | | | |
| Arsenic | 10 ug/L | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: USEPA Primary MCL (MUN, human health) | 1 |
| Boron | 700 ug/L | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) | 3 |
| Cadmium | for aquatic life; variable (see cadmium worksheet). | Numeric | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness | 1 |
| | 5 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |
| Copper | for aquatic life; variable (see copper worksheet). | Numeric | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - Varies with water hardness/ | 1 |
| | 1,300 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |
| Lead | for aquatic life; variable (see lead worksheet). | Numeric | Freshwater Habitat | CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness | 1 |
| | 15 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |
| Molybdenum | 15 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan - San Joaquin River, Mouth of the Merced River to Vernalis | 1 |
| | 50 ug/L | | | Sacramento/San Joaquin Basin Plan - Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River | |
| | 10 ug/L | Narrative | Agricultural Supply | Water Quality for Agriculture (Ayers & Westcot) | 3 |
| | 35 ug/L | | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA IRIS Reference Dose as a drinking water level. | |
| Nickel | For aquatic life variable (see Nickel worksheet). | Numeric | Freshwater Habitat | CTR Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness | 1 |
| | 100 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |
| Selenium | 50 ug/L | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL (MUN, human health) | 1 |

| Constituent | Water Quality Trigger Limit (WQTL) | Standard Type | Beneficial Use (BU) with most protective limit | Reference for the Trigger Limit | Category (see footnotes) |
|---|---|---|---|---|---|
| | 5 ug/L (4-day average) | Numeric | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: NTR Freshwater Aquatic Life Protection - Continuous Concentration - 4-Day Average | |
| Zinc | For aquatic life variable (see Zinc worksheet). | Numeric | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: Freshwater Aquatic Life Protection - Continuous Concentration, 4-Day Average - varies with water hardness/ | 1 |
| **Nutrients** | | | | | |
| Nitrate as NO3<br>Nitrate as N | 45,000 ug/L as NO3<br>10,000 ug/L as N | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL | 1 |
| Nitrite as Nitrogen | 1,000 ug/L as N | Numeric | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Chemical Constituents Objective: California Primary MCL | 1 |
| Ammonia | For aquatic life variable (see ammonia worksheet). | Narrative | Freshwater Habitat | Sacramento/San Joaquin Basin Plan Toxicity Objective: USEPA Freshwater Aquatic Life Criteria, Continuous Concentration | 3 |
| | 1.5 mg/L (regardless of pH and Temperature values) | Narrative | Municipal and Domestic Supply | Sacramento/San Joaquin Basin Plan Toxicity Objective: Taste and Odor Threshold (Ammore and Hautala) | 3 |
| Hardness | NA | | | | |
| Phosphorus, total | NA | | | | |
| Orthophosphate, soluble | NA | | | | |
| TKN | NA | | | | |

**Category 1:** Constituents that have numeric water quality objectives in the Sac-SJR Basin Plan or other WQO listed by reference such as MCLs (Page III-3.0)* , CTRs (Page III-10.1)*,

**Category 2:** Pesticides with discharge prohibitions. Prohibitions apply to any discharges not subject to board-approved management practices (Page IV-25.0)*.

**Category 3:** Constituent does not have numeric WQO, and does not have a primary MCL. WQ Trigger Limit exceedance is based on implementation of narrative objective. All detections should be tracked. None are default exceedances.

MUN-Municipal and Domestic Supply

**NA**-Not Available. Until completion of evaluation studies and MRP Plan submittals with site specific information on beneficial uses.

**ND**-Non Detect

**(*)**-Water Quality Control Plan for the Sacramento and San Joaquin River Basins. Revised on October 2007.

-Narrative WQTLs are based on Water Quality Goals Database. Updated by Jon Marshack on July 16, 2008.

## Summary of Exceedance Reports

All Exceedance Reports are included in Appendix V. If any errors occurred in the original communication, an updated report was emailed to the Regional Board; all communications regarding updates are documented in Appendix V. A summary update report was submitted to the Regional Board on June 19, 2009 containing amendments to past exceedance reports. A copy of this report can be found in Appendix V. A tally of all exceedances that occurred between October 2008 and December 2010 are listed by constituent group in Tables 30 - 34. All exceedances are tabulated by zone in Tables 36 – 41 followed by an assessment of agricultural applications of pesticides that are potential sources to the listed exceedances.

### *Table 30. Exceedances of WQTLs for parameters measured in the field including dissolved oxygen, specific conductivity and pH.*

Field parameters under a management plan are all classified as Priority E constituents and are monitored only as a part of normal monitoring (see Management Plan submitted September 30, 2008, Prioritization of Exceedances section).

| Station Name | Season | Sample Date | DO, mg/L | pH, none | SC, µS/cm |
|---|---|---|---|---|---|
| Ash Slough @ Ave 21 | Irrigation2, Non Contiguous | 5/19/2009 | 6.99 | | |
| Cottonwood Creek @ Rd 20 | Irrigation2 | 5/19/2009 | 6.72 | | |
| Deadman Creek @ Gurr Rd | Winter1 | 1/20/2009 | 5.61 | | 762 |
| Deadman Creek @ Gurr Rd | Storm1 | 2/7/2009 | 1.01 | | 1802 |
| Deadman Creek @ Gurr Rd | Irrigation4 | 7/21/2009 | 6.04 | | |
| Deadman Creek @ Gurr Rd | Irrigation5 | 8/18/2009 | 6.94 | | |
| Deadman Creek @ Gurr Rd | Fall1 | 10/20/2009 | 6.08 | | |
| Deadman Creek @ Gurr Rd | Storm2, Non Contiguous | 12/15/2009 | 5.02 | | 995 |
| Dry Creek @ Wellsford Rd | Fall1 | 10/21/2008 | 4.91 | | |
| Dry Creek @ Wellsford Rd | Storm3 | 12/16/2008 | 2.77 | 8.86 | |
| Dry Creek @ Wellsford Rd | Winter1 | 1/20/2009 | 5.1 | | 707 |
| Dry Creek @ Wellsford Rd | Irrigation2 | 5/19/2009 | 6.24 | | |
| Dry Creek @ Wellsford Rd | Irrigation4, MPM | 7/21/2009 | 5.9 | | |
| Dry Creek @ Wellsford Rd | Fall1 | 10/20/2009 | 4.04 | | |
| Dry Creek @ Wellsford Rd | Fall2 | 11/17/2009 | 3.04 | | |
| Dry Creek @ Wellsford Rd | Storm2 | 12/15/2009 | 6.65 | | |
| Dry Creek at Waterford | Irrigation4, MPM | 7/21/2009 | 6.89 | | |
| Duck Slough @ Gurr Rd | Winter2, Non Contiguous | 3/17/2009 | | 9.7 | |
| Duck Slough @ Gurr Rd | Irrigation6 | 9/22/2009 | | 9.03 | |
| Duck Slough @ Gurr Rd | Fall2, Non Contiguous | 11/17/2009 | | | 1215 |
| Duck Slough @ Hwy 99 | Irrigation3, MPM | 6/16/2009 | 6.78 | | |
| Highline Canal @ Hwy 99 | Storm1 | 2/7/2009 | | 8.86 | |
| Highline Canal @ Hwy 99 | Irrigation3 | 6/16/2009 | | 8.95 | |
| Highline Canal @ Hwy 99 | Irrigation5 | 8/18/2009 | | 9.03 | |
| Highline Canal @ Hwy 99 | Irrigation6 | 9/22/2009 | | 8.61 | |
| Highline Canal @ Hwy 99 | Storm2, Non Contiguous | 12/15/2009 | | 8.61 | |
| Hilmar Drain @ Central Ave | Irrigation1, MPM | 4/21/2009 | | | 904 |
| Hilmar Drain @ Central Ave | Irrigation6, MPM | 9/22/2009 | | | 934 |
| Howard Lateral @ Hwy 140 | Irrigation1 | 4/21/2009 | 1.55 | | |
| Howard Lateral @ Hwy 140 | Irrigation2 | 5/19/2009 | | | 810 |
| Howard Lateral @ Hwy 140 | Irrigation4 | 7/21/2009 | | 8.88 | |
| Howard Lateral @ Hwy 140 | Irrigation5 | 8/18/2009 | | 9.14 | |
| Howard Lateral @ Hwy 140 | Irrigation6 | 9/22/2009 | | 9.15 | |
| Lateral 2 1/2 near Keys Rd | Fall1 | 10/21/2008 | | 9.57 | |
| Lateral 2 1/2 near Keys Rd | Fall2 | 11/11/2008 | | 9.09 | |
| Lateral 2 1/2 near Keys Rd | Irrigation1 | 4/21/2009 | | 9.2 | |
| Lateral 2 1/2 near Keys Rd | Fall1 | 10/20/2009 | | 8.68 | |
| Merced River @ Santa Fe | Irrigation4 | 7/21/2009 | 6.12 | | |
| Merced River @ Santa Fe | Fall1 | 10/20/2009 | 4.82 | | |

| Station Name | Season | Sample Date | DO, mg/L | pH, none | SC, µS/cm |
|---|---|---|---|---|---|
| Miles Creek @ Reilly Rd | Irrigation1, MPM | 4/21/2009 | 6.3 | | |
| Miles Creek @ Reilly Rd | Irrigation4, MPM | 7/21/2009 | 6.45 | | |
| Miles Creek @ Reilly Rd | Irrigation5, MPM | 8/18/2009 | 6.58 | | |
| Miles Creek @ Reilly Rd | Irrigation6, MPM | 9/22/2009 | 6.35 | | |
| Mootz Drain @ Langworth Rd | Fall2, Non Contiguous | 11/11/2008 | 3.55 | 4.32 | |
| Mootz Drain @ Langworth Rd | Winter2, Non Contiguous | 3/17/2009 | 4.01 | | |
| Mootz Drain @ Langworth Rd | Irrigation1 | 4/21/2009 | 3.14 | | |
| Mootz Drain @ Langworth Rd | Irrigation2 | 5/19/2009 | 4.59 | | |
| Mootz Drain @ Langworth Rd | Irrigation3 | 6/16/2009 | 5.4 | | |
| Mootz Drain @ Langworth Rd | Irrigation4 | 7/21/2009 | 2.18 | | |
| Mootz Drain @ Langworth Rd | Irrigation5 | 8/18/2009 | 4.9 | | |
| Mootz Drain @ Langworth Rd | Irrigation6 | 9/22/2009 | 5.62 | | |
| Mootz Drain @ Langworth Rd | Fall1, Non Contiguous | 10/20/2009 | 6.35 | | |
| Mootz Drain @ Langworth Rd | Fall2, Non Contiguous | 11/17/2009 | 4.98 | | |
| Mootz Drain Downstream of Langworth Pond | Storm2 | 12/15/2009 | 5.51 | | |
| Mustang Creek @ East Ave | Storm1 | 2/7/2009 | | | 704 |
| Mustang Creek @ East Ave | Winter2, Non Contiguous | 3/17/2009 | | | 1042 |
| Mustang Creek @ East Ave | Irrigation1 | 4/21/2009 | 0.98 | | 1433 |
| Mustang Creek @ East Ave | Fall1, Non Contiguous | 10/20/2009 | 2.95 | | 870 |
| Mustang Creek @ East Ave | Storm2 | 12/15/2009 | | | 892 |
| Prairie Flower Drain @ Crows Landing Rd | Fall1 | 10/21/2008 | | | 1742 |
| Prairie Flower Drain @ Crows Landing Rd | Fall2 | 11/11/2008 | | | 2151 |
| Prairie Flower Drain @ Crows Landing Rd | Storm3 | 12/16/2008 | | | 2298 |
| Prairie Flower Drain @ Crows Landing Rd | Winter1 | 1/20/2009 | | | 2414 |
| Prairie Flower Drain @ Crows Landing Rd | Storm1 | 2/7/2009 | | | 2255 |
| Prairie Flower Drain @ Crows Landing Rd | Winter2 | 3/17/2009 | | 8.74 | 2394 |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation1, MPM | 4/21/2009 | | | 2223 |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation2, MPM | 5/19/2009 | 4.78 | | 2066 |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation3 | 6/16/2009 | | | 2417 |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation4 | 7/21/2009 | | | 1366 |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation5, MPM | 8/18/2009 | | | 1984 |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation6 | 9/22/2009 | | | 2171 |
| Prairie Flower Drain @ Crows Landing Rd | Fall1 | 10/20/2009 | | | 2459 |
| Prairie Flower Drain @ Crows Landing Rd | Fall2 | 11/17/2009 | | | 2415 |
| Prairie Flower Drain @ Crows Landing Rd | Storm2 | 12/15/2009 | | | 2695 |
| **Environmental Exceedances** | | | **24** | **14** | **19** |
| **Non Contiguous Water Body Exceedances** | | | **7** | **3** | **4** |
| **Management Plan Monitoring Exceedances[1]** | | | **8** | **0** | **5** |
| **TOTAL Exceedances** | | | **39** | **17** | **28** |

MPM – Management Plan Monitoring

[1]Refers to sites sampled for only MP monitoring that experienced a field exceedance.

### *Table 31. Exceedances of WQTLs for E. coli, nutrients, metals and physical parameters (sorted by Station Name and Sample Date).*

If a field duplicate and an environmental sample both have an exceedance, only the environmental sample exceedance is included in this table. If there is an exceedance in the field duplicate sample and not the environmental sample, this field duplicate result is included and is noted by (FD) at the end of the station name. Physical parameters under a management plan that are classified as Priority E constituents are monitored only as a part of normal monitoring and not counted toward Management Plan Monitoring Exceedances (see Management Plan submitted September 30, 2008, Prioritization of Exceedances section).

| Station Name[1] | Season | Sample Date | *E. coli*, MPN/100 mL | Total Dissolved Solids, mg/L | Ammonia, mg/L | Nitrate as N, mg/L | Arsenic[2], µg/L | Copper[3], µg/L |
|---|---|---|---|---|---|---|---|---|
| Ash Slough @ Ave 21 | Irrigation2, Non Contiguous | 5/19/2009 | | | | | | 3 (2.17) |
| Cottonwood Creek @ Rd 20 | Storm1, Non Contiguous | 2/7/2009 | >2400 | | | | | |
| Cottonwood Creek @ Rd 20 | Fall2 | 11/17/2009 | 770 | | | | | |
| Deadman Creek @ Gurr Rd | Fall1 | 10/21/2008 | 1400 | | | | 12 | |
| Deadman Creek @ Gurr Rd | Fall2 | 11/11/2008 | 370 | | | | 14 | |
| Deadman Creek @ Gurr Rd | Storm3 | 12/16/2008 | 1400 | | | | | |
| Deadman Creek @ Gurr Rd | Winter1 | 1/20/2009 | >2400 | 470 | 5.5 | | 18 | |
| Deadman Creek @ Gurr Rd | Storm1 | 2/7/2009 | >2400 | 1100 | 50 | | 30 | |
| Deadman Creek @ Gurr Rd | Winter2 | 3/17/2009 | 1600 | | | | 14 | |
| Deadman Creek @ Gurr Rd | Irrigation2 | 5/19/2009 | 490 | | | | | |
| Deadman Creek @ Gurr Rd | Irrigation3 | 6/16/2009 | 730 | | | | | |
| Deadman Creek @ Gurr Rd | Irrigation4 | 7/21/2009 | 460 | | | | | |
| Deadman Creek @ Gurr Rd | Fall1 | 10/20/2009 | 490 | | | | | |
| Deadman Creek @ Gurr Rd | Fall2, Non Contiguous | 11/17/2009 | 2000 | | | | | |
| Deadman Creek @ Gurr Rd | Storm2, Non Contiguous | 12/15/2009 | >2400 | 610 | 15 | | | |
| Dry Creek @ Wellsford Rd | Fall1 | 10/21/2008 | 550 | | | | | |
| Dry Creek @ Wellsford Rd | Winter2 | 3/17/2009 | 250 | | | | | |
| Dry Creek @ Wellsford Rd | Irrigation2 | 5/19/2009 | 260 | | | | | |
| Dry Creek @ Wellsford Rd | Irrigation3 | 6/16/2009 | 1600 | | | | | |
| Dry Creek @ Wellsford Rd | Irrigation4, MPM | 7/21/2009 | 270 | | | | | |
| Dry Creek @ Wellsford Rd | Irrigation5, MPM | 8/18/2009 | 410 | | | | | |
| Dry Creek @ Wellsford Rd | Fall1 | 10/20/2009 | 490 | | | | | |
| Dry Creek @ Wellsford Rd | Fall2 | 11/17/2009 | 730 | | | | | |

| Station Name[1] | Season | Sample Date | *E. coli*, MPN/100 mL | Total Dissolved Solids, mg/L | Ammonia, mg/L | Nitrate as N, mg/L | Arsenic[2], µg/L | Copper[3], µg/L |
|---|---|---|---|---|---|---|---|---|
| Dry Creek @ Wellsford Rd | Storm2 | 12/15/2009 | 820 | | | | | |
| Duck Slough @ Gurr Rd | Storm1 | 2/7/2009 | | | | 13 | | |
| Duck Slough @ Gurr Rd | Irrigation2 | 5/19/2009 | >2400 | | | | | 7.3 (6.12) |
| Duck Slough @ Gurr Rd | Fall2, Non Contiguous | 11/17/2009 | 340 | | | | | |
| Duck Slough @ Gurr Rd | Storm2 | 12/15/2009 | >2400 | | | | | |
| Highline Canal @ Hwy 99 | Irrigation2, MPM | 5/19/2009 | 340 | | | | | |
| Howard Lateral @ Hwy 140 | Irrigation2 | 5/19/2009 | | 530 | | 13 | | |
| Howard Lateral @ Hwy 140 | Irrigation6 | 9/22/2009 | 330 | | | | | |
| Howard Lateral @ Hwy 140 | Fall1 | 10/20/2009 | 240 | | | | | 3.3 (1.57) |
| Lateral 2 1/2 near Keys Rd | Fall1 | 10/21/2008 | 280 | | | | | |
| Lateral 2 1/2 near Keys Rd | Fall2 | 11/11/2008 | 370 | | 0.65 | | | |
| Lateral 2 1/2 near Keys Rd | Irrigation1 | 4/21/2009 | >2400 | | | | | |
| Lateral 2 1/2 near Keys Rd | Irrigation2 | 5/19/2009 | >2400 | | | | | |
| Lateral 2 1/2 near Keys Rd | Irrigation3 | 6/16/2009 | 370 | | | | | |
| Lateral 2 1/2 near Keys Rd | Irrigation4 | 7/21/2009 | 1600 | | | | | |
| Lateral 2 1/2 near Keys Rd | Irrigation5 | 8/18/2009 | >2400 | | | 15 | | |
| Lateral 2 1/2 near Keys Rd | Irrigation6 | 9/22/2009 | 1700 | | | | | |
| Mootz Drain @ Langworth Rd | Storm3, Non Contiguous | 12/16/2008 | >2400 | | | | | |
| Mootz Drain @ Langworth Rd | Irrigation1 | 4/21/2009 | >2400 | | | | | |
| Mootz Drain @ Langworth Rd | Irrigation2 | 5/19/2009 | >2400 | | | | | |
| Mootz Drain @ Langworth Rd | Irrigation3 | 6/16/2009 | 390 | | | | | |
| Mootz Drain @ Langworth Rd | Irrigation4 | 7/21/2009 | 2000 | | | | | |
| Mootz Drain @ Langworth Rd | Irrigation5 | 8/18/2009 | >2400 | | | | | |
| Mootz Drain @ Langworth Rd | Irrigation6 | 9/22/2009 | 1700 | | | | | |
| Mootz Drain @ Langworth Rd | Fall1, Non Contiguous | 10/20/2009 | 240 | | | | | |
| Mootz Drain @ Langworth Rd | Fall2, Non Contiguous | 11/17/2009 | >2400 | | 2.1 | | | |
| Mootz Drain Downstream of Langworth Pond | Storm2 | 12/15/2009 | >2400 | | | | | |
| Mustang Creek @ East Ave | Storm1 | 2/7/2009 | | 560 | | 12 | | 25 (20.93) |
| Mustang Creek @ East Ave | Winter2, Non Contiguous | 3/17/2009 | | 710 | | 33 | | |
| Mustang Creek @ East Ave | Fall1, Non Contiguous | 10/20/2009 | 250 | 670 | 2.3 | | | 44 (24.20) |

| Station Name[1] | Season | Sample Date | *E. coli*, MPN/100 mL | Total Dissolved Solids, mg/L | Ammonia, mg/L | Nitrate as N, mg/L | Arsenic[2], µg/L | Copper[3], µg/L |
|---|---|---|---|---|---|---|---|---|
| Mustang Creek @ East Ave | Storm2 | 12/15/2009 | | | | | | 25 (22.90) |
| Prairie Flower Drain @ Crows Landing Rd | Fall1 | 10/21/2008 | 370 | 1100 | | 27 | | |
| Prairie Flower Drain @ Crows Landing Rd | Fall2 | 11/11/2008 | | 1500 | | 39 | | |
| Prairie Flower Drain @ Crows Landing Rd | Storm3 | 12/16/2008 | 1300 | 2900 | | 40 | | |
| Prairie Flower Drain @ Crows Landing Rd | Winter1 | 1/20/2009 | | 1500 | | 43 | | |
| Prairie Flower Drain @ Crows Landing Rd | Storm1 | 2/7/2009 | | 1300 | | 31 | | |
| Prairie Flower Drain @ Crows Landing Rd | Winter2 | 3/17/2009 | | 1400 | | 34 | | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation1, MPM | 4/21/2009 | 410 | 1400 | | 24 | | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation2, MPM | 5/19/2009 | >2400 | 1200 | 3.2 | 20 | | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation3 | 6/16/2009 | | 1400 | 1.3 | 22 | | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation4 | 7/21/2009 | | 820 | 1.8 | 14 | | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation5, MPM | 8/18/2009 | | 1200 | | 22 | | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation6 | 9/22/2009 | 1300 | 1400 | | 35 | | |
| Prairie Flower Drain @ Crows Landing Rd | Fall1 | 10/20/2009 | 1300 | 1400 | | 25 | | |
| Prairie Flower Drain @ Crows Landing Rd | Fall2 | 11/17/2009 | >2400 | 1500 | 8.8 | 36 | | |
| Prairie Flower Drain @ Crows Landing Rd | Storm2 | 12/15/2009 | 2000 | 1600 | | 36 | | |
| **Environmental Exceedances** | | | **48** | **19** | **7** | **19** | **5** | **4** |
| **Non Contiguous Water Body Exceedances** | | | **8** | **3** | **3** | **1** | **0** | **2** |
| **Management Plan Monitoring Exceedances[4]** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **TOTAL Exceedances** | | | **56** | **22** | **10** | **20** | **5** | **6** |

MPM – Management Plan Monitoring FD – Field Duplicate

[1] A field duplicate with the same exceedance as its associated environmental sample is not recorded as a part of the exceedance counts.

[2] Arsenic was omitted from normal monitoring in May 2009 (see Monitoring Objectives section).

[3] If copper exceedance is the dissolved fraction of copper, the limit based on hardness is shown in parenthesis.

[4] Refers to monitoring for high priority Management Plan constituents at Assessment, Core or Management Plan Monitoring locations.

### *Table 32. Exceedances of WQTLs for pesticides.*

If a field duplicate and an environmental sample both have an exceedance, only the environmental sample exceedance is included in this table. If there is an exceedance in the field duplicate sample and not the environmental sample, this field duplicate result is included and is noted by (FD) at the end of the station name.

| Station Name[1] | Season | Sample Date | Chlorpyrifos, µg/L | Diuron, µg/L | DDE[2], µg/L | HCH[3], alpha, µg/L | HCH[3], delta, µg/L |
|---|---|---|---|---|---|---|---|
| Dry Creek @ Wellsford Rd | Irrigation4, MPM | 8/18/2009 | 0.027 | | | | |
| Highline Canal @ Hwy 99 | Irrigation4, MPM | 7/21/2009 | 0.093 | | | | |
| Lateral 2 1/2 near Keys Rd | Fall2 | 11/11/2008 | | | | 0.013 | |
| Lateral 2 1/2 near Keys Rd | Irrigation4 | 7/21/2009 | 0.049 | | | | |
| Merced River @ Santa Fe | Fall2 | 11/11/2008 | 0.1 | | | | 0.051 |
| Miles Creek @ Reilly Rd | Irrigation4, MPM | 7/21/2009 | 0.028 | | | | |
| Mootz Drain @ Langworth Rd | Storm3, Non Contiguous | 12/16/2008 | 0.017 | | | | |
| Mootz Drain @ Langworth Rd | Storm1, Non Contiguous | 2/7/2009 | | 2.1 | | | |
| Mootz Drain @ Langworth Rd | Irrigation3 | 6/16/2009 | 0.033 | | | | |
| Mustang Creek @ East Ave | Storm2 | 12/15/2009 | | | 0.022 | | |
| **Environmental Exceedances** | | | **3** | **0** | **1** | **1** | **1** |
| **Non Contiguous Water Body Exceedances** | | | **1** | **1** | **0** | **0** | **0** |
| **Management Plan Monitoring Exceedances[4]** | | | **3** | **0** | **0** | **0** | **0** |
| **TOTAL Exceedances** | | | **7** | **1** | **1** | **1** | **1** |

MPM – Management Plan Monitoring
FD – Field Duplicate
[1] A field duplicate with the same exceedance as its associated environmental sample is not recorded as a part of the exceedance counts.
[2] DDE-Dichlorodiphenyldichloroethylene
[3] HCH – Hexachlorocyclohexane, results compared to the WQTL for total HCH.
[4] Refers to monitoring for high priority Management Plan constituents at Assessment, Core or Management Plan Monitoring locations.

***Table 33. Water column and sediment toxicity exceedance summary.***

If a field duplicate and an environmental sample both have an exceedance, only the environmental sample exceedance is included in this table. If there is an exceedance in the field duplicate sample and not the environmental sample, this field duplicate result is included and is noted by (FD) at the end of the station name.

| Station Name | Season | Sample Date | Species | Toxicity End Point | Mean | Percent Control | Toxicity Significance | Summary Comments |
|---|---|---|---|---|---|---|---|---|
| Deadman Creek @ Gurr Rd | Winter1 | 1/20/2009 | *Pimephales promelas* | Survival (%) | 87.5 | 87.5 | SG | |
| Deadman Creek @ Gurr Rd | Storm1 | 2/7/2009 | *Ceriodaphnia dubia* | Survival (%) | 0 | 0 | SL | Complete mortality on Day 1. TIE initiated on 02/17/09 and it was concluded that ammonia was the cause of toxicity. |
| Deadman Creek @ Gurr Rd | Storm1 | 2/7/2009 | *Pimephales promelas* | Survival (%) | 0 | 0 | SL | Due to low and unstable DO, the sample was aerated throughout test. Complete mortality on Day 1. TIE initiated on 02/17/09 and it was concluded that ammonia was the cause of toxicity. |
| Deadman Creek @ Gurr Rd | Storm1 | 2/7/2009 | *Selenastrum capricornutum* | Total Cell Count | 60069 | 7.0 | SL | TIE initiated on 02/17/09 and it was concluded that ammonia was the cause of toxicity. |
| Deadman Creek @ Gurr Rd | Winter2 | 3/17/2009 | *Ceriodaphnia dubia* | Survival (%) | 10 | 10 | SL | TIE initiated on 3/25/09 and it was concluded that pyrethroids were the cause of toxicity. |
| Deadman Creek @ Gurr Rd | Storm2, Non contiguous | 12/15/2009 | *Pimephales promelas* | Survival (%) | 75 | 75 | SL | |
| Howard Lateral @ Hwy 140 | Irrigation2 | 5/19/2009 | *Selenastrum capricornutum* | Total Cell Count | 631526 | 77 | SL | |
| Lateral 2 1/2 near Keys Rd | Irrigation1, Sediment | 4/21/2009 | *Hyalella azteca* | Survival (%) | 74 | 90 | SG | |
| Lateral 2 1/2 near Keys Rd | Irr2 | 5/19/2009 | *Selenastrum capricornutum* | Total Cell Count | 501266 | 56 | SL | |
| Mootz Drain @ Langworth Rd | Storm1, Non contiguous | 2/7/2009 | *Selenastrum capricornutum* | Total Cell Count | 605474 | 70.9 | SL | |
| Prairie Flower Drain @ Crows Landing Rd | Irrigation2, MPM | 5/19/2009 | *Selenastrum capricornutum* | Total Cell Count | 266798 | 30 | SL | TIE initiated on 5/27/09 and it was concluded that cationic chemical(s) and ammonia were the cause of toxicity. |

MPM – Management Plan Monitoring FD – Field Duplicate SG-Statistically significantly different from control; Greater than 80% threshold SL-Statistically significantly different from control; Less than 80% threshold

### *Table 34. Water column and sediment toxicity exceedance counts.*

| Monitoring Type | *C. dubia* | *P. promelas* | *S. capricornutum* | *H. azteca* |
|---|---|---|---|---|
| Environmental Exceedances | 2 | 2 | 3 | 1 |
| Non Contiguous Water Body Environmental Exceedances | 0 | 1 | 1 | 0 |
| Management Plan Monitoring Exceedances[1] | 0 | 0 | 1 | 0 |
| **Total** | **2** | **3** | **5** | **1** |

[1]Refers to monitoring for high priority Management Plan constituents at Assessment, Core or Management Plan Monitoring locations.

## Discussion of Exceedances

### *Pesticide Use Report Data*

Pesticide Use Report (PUR) data are provided to the Coalition from each of the county Agricultural Commissioner's offices and are evaluated for applications relevant to WQTL exceedances. To assess sources toxicity not associated with exceedances of chemical WQTLs, applications of pesticides known to be toxic to the test species are identified based on a variety of factors including the organic carbon partition coefficient ($K_{oc}$), chemical type, mode of action and solubility. If sediment toxicity occurs then pesticides with a relatively high $K_{oc}$ (1600 or greater) are considered relevant. If water toxicity occurs then pesticides with a relatively low $K_{oc}$ (below 1900) are evaluated. Most pesticides are queried for applications within 30 days prior to water sampling. Pyrethroid pesticides, due to their long half-life, are queried for applications made for a period of 180 days prior to the date of the exceedance, and metals are queried for a period of 90 days prior to the exceedance (Table 35). If there were no applications within the specified time period, the PUR database was queried for applications an additional 30 days prior to the standard query period. Appendix IV includes tables and maps of all pesticide applications that are relevant to WQTL exceedances or toxicity. If the PUR data for any county were unattainable at the time of this report, a note was made in Appendix IV. Information regarding obtained and outstanding PUR is included in Table 28 in the Discussion of Results section of this report. Any outstanding PUR will be submitted in an addendum to the AMR on June 30, 2010.

Aldrin, dieldrin, endrin, HCH, DDT and DDE exceedances are not queried since there are no registered products that contain these chemicals.

***Table 35. Pesticide use data collected for exceedances reported.***

| Exceedance Type | Pesticides Use Data Collected |
|---|---|
| Pesticides | 1 month |
| Metals | 3 months |
| Sediment Toxicity | 3 months with 6 months for pyrethroids |
| Water Column Toxicity | 1 months with 6 months for pyrethroids<br>3 months for metals |

Tables 36 - 41 provide details on all exceedances in each Coalition Zone that occurred between October 2008 and December 2009. The following section discusses possible sources of WQTL exceedances that are due to pesticide applications. All exceedances are included in the Tables 36 - 41 as reference when discussing possible sources and contributing factors. PUR data relevant to pesticide exceedances and toxicity are discussed based on the pounds of active

ingredient applied upstream of the sampling site. Measures taken to address these exceedances are described in the section Actions Taken to Address Water Quality Exceedances.

*Table 36. Zone 1 (Dry Creek @ Wellsford Rd, Dry Creek @ Waterford Rd, Mootz Drain @ Langworth Rd, Mootz Drain downstream of Langworth Pond) Exceedances.*

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | *E. coli*, MPN/100 mL | Chlorpyrifos, µg/L | Diuron, µg/L | *S. capricornutum*, % Control |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 10/21/2008 | 4.91 | | | | 550 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 12/16/2008 | 2.77 | 8.86 | | | | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 1/20/2009 | 5.1 | | 707 | | | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 3/17/2009 | | | | | 250 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 5/19/2009 | 6.24 | | | | 260 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 6/16/2009 | | | | | 1600 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | MPM | 7/21/2009 | 5.9 | | | | 270 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | MPM | 8/18/2009 | | | | | 410 | 0.027 | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 10/20/2009 | 4.04 | | | | 490 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 11/17/2009 | 3.04 | | | | 730 | | | |
| Zone 1 | Dry Creek @ Wellsford Rd | NM | 12/15/2009 | 6.65 | | | | 820 | | | |
| Zone 1 | Dry Creek @ Waterford | MPM | 7/21/2009 | 6.89 | | | | | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 11/11/2008 | 3.55 | 4.32 | | | | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 12/16/2008 | | | | | 2400 | 0.017 | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD | 2/7/2009 | | | | | | | 2.1 | 72 |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 2/7/2009 | | | | | | | 2.1 | 71 |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 3/17/2009 | 4.01 | | | | | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD, Sediment | 4/21/2009 | | | | | 2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM, Sediment | 4/21/2009 | 3.14 | | | | 2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD | 5/19/2009 | | | | | 2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 5/19/2009 | 4.59 | | | | 2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD | 6/16/2009 | | | | | 370 | 0.066 | | |

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | *E. coli*, MPN/100 mL | Chlorpyrifos, µg/L | Diuron, µg/L | *S. capricornutum*, % Control |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 6/16/2009 | 5.4 | | | | 390 | 0.033 | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD | 7/21/2009 | | | | | 1600 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 7/21/2009 | 2.18 | | | | 2000 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD, Sediment | 8/18/2009 | | | | | >2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM, Sediment | 8/18/2009 | 4.9 | | | | >2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD | 9/22/2009 | | | | | 1700 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 9/22/2009 | 5.62 | | | | 1700 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 10/20/2009 | 6.35 | | | | 240 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | FD | 11/17/2009 | | | | 5 | >2400 | | | |
| Zone 1 | Mootz Drain @ Langworth Rd | NM | 11/17/2009 | 4.98 | | | 2.1 | >2400 | | | |
| Zone 1 | Mootz Drain Downstream of Langworth Pond | NM | 12/15/2009 | 5.51 | | | | >2400 | | | |

FD – field duplicate
NM-Normal Monitoring
MPM-Management Plan Monitoring
DO-Dissolved Oxygen
SC-Specific Conductance

### *Ammonia*

Ammonium can enter a water body through two sources, direct discharge from agricultural fertilizers or animal waste, or from discharges from waste water treatment plants. In soils, ammonia from fertilizers is typically converted to nitrite and then to nitrate over a short period of time. Therefore, discharge of fertilizer would have to be immediate to detect ammonium in the receiving water body. Ammonium can also be created in the water body through the mineralization of organic nitrogen. Previous exceedances of the ammonium WQTL have been attributed to discharge from dairies. Past toxicity analyses have resulted in toxicity that was attributed to ammonium. Zone 1 (Table 36) had two exceedances for both the field duplicate and the environmental sample of ammonium at Mootz Drain @ Langworth Rd during the November 17, 2009 sampling event.

### *Chlorpyrifos*

Chlorpyrifos is an organophosphate pesticide applied for pest control on alfalfa, grapes, and orchards, among other crops in California. In a water body, chlorpyrifos can both bind to sediment and remain in the water column ($K_{oc}$ of 6070). The $LC_{50}$ for chlorpyrifos to *Ceriodaphnia* is 0.055 µg/L. Exceedances of chlorpyrifos occurred at two sites in Zone 1 (Table 36). A chlorpyrifos exceedance at Mootz Drain @ Langworth Rd (0.017 µg/L) occurred in samples collected on December 16, 2008 with no associated toxicity in the water column. There were no reported applications of chlorpyrifos upstream of Mootz Drain in the months prior to sampling. There were chlorpyrifos exceedances in the grab sample (0.033µg/L) and the field duplicate (0.066 µg/L) collected at Mootz Drain @ Langworth Rd on June 16, 2009. There was no toxicity associated with these exceedances. No reported applications of chlorpyrifos upstream of Mootz Drain were associated with this exceedance. Management Plan Monitoring for chlorpyrifos in samples collected on August 18, 2009 at Dry Creek @ Wellsford Rd did have a chlorpyrifos exceedance (0.027 µg/L). PUR data reports (Appendix IV) indicate that between July 22 and July 28, 2009 35 gallons of chlorpyrifos were applied to 75 acres of almonds. Between July 27 and August 18, 2009 there were 18.25 gallons of Lorsban applied to 97.5 acres of walnuts and 12.5 gallons of Warhawk were applied to 120 acres of corn. There was no toxicity associated with this exceedance.

### *Diuron*

Diuron is a broad-spectrum herbicide used for weed control on agriculture and on highway shoulders. It acts by inhibiting photosynthesis and can also affect seed germination. Diuron has a half-life (in soil) of about 90 days and is relatively mobile. It inhibits growth of *Selenastrum* with an $EC_{50}$ of 2.4 µg/L. Samples collected from Mootz Drain on February 7, 2009 contained 2.1 µg/L of diuron. No applications of diuron were reported (Appendix IV).

### *Toxicity*

The concentration of diuron detected in water samples collected from Mootz Drain (2.1 µg/L) during the first 2009 storm sampling event is enough to account for the *Selenastrum* toxicity (NM-71%, and FD-72% cell count relative to control) that occurred in the February samples. These were the only toxic samples collected in Zone 1 (Table 36) between October 2008 and December 2009. PUR data (Appendix IV) indicates that on January 29, 2009 110 acres of almonds were treated with 44 quarts of Orchard Star (Dimethylamine Salt) and 66 quarts of Buccaneer Glyphosate Herbicide (Glyphosate Isopropylamine Salt).

*Table 37. Zone 2 (Hilmar Drain @ Central Ave, Lateral 2 ½ near Keyes Rd, Prairie Flower Drain @ Crows Landing Rd) Exceedances.*

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | Total Dissolved Solids, mg/L | *E. coli*, MPN/100 mL | Nitrate + Nitrite as N, mg/L | Chlorpyrifos, µg/L | HCH, alpha , µg/L | *H. azteca*, % Control | *S. capricornutum*, % Control |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 2 | Hilmar Drain @ Central Ave | MPM | 4/21/2009 | | | 904 | | | | | | | | |
| Zone 2 | Hilmar Drain @ Central Ave | MPM | 9/22/2009 | | | 934 | | | | | | | | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM | 10/21/2008 | | 9.57 | | | | 280 | | | | | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | FD | 11/11/2008 | | | | | | 310 | | | 0.016 | | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM | 11/11/2008 | | 9.09 | | 0.65 | | 370 | | | 0.013 | | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM, Sediment | 4/21/2009 | | 9.2 | | | | | | | | 90 | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM | 5/19/2009 | | | | | | | | | | | 56 |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM | 7/21/2009 | | | | | | | | 0.049 | | | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM, Sediment | 8/18/2009 | | | | | | | 15 | | | | |
| Zone 2 | Lateral 2 1/2 near Keys Rd | NM | 10/20/2009 | | 8.68 | | | | | | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 10/21/2008 | | | 1742 | | 1100 | 370 | 27 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 11/11/2008 | | | 2151 | | 1500 | | 39 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 12/16/2008 | | | 2298 | | 2900 | 1300 | 40 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 1/20/2009 | | | 2414 | | 1500 | | 43 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 2/7/2009 | | | 2255 | | 1300 | | 31 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 3/17/2009 | | 8.74 | 2394 | | 1400 | | 34 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | MPM | 4/21/2009 | | | 2223 | | 1400 | 410 | 24 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | MPM | 5/19/2009 | 4.78 | | 2066 | 3.2 | 1200 | 2400 | 20 | | | | 30 |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 6/16/2009 | | | 2417 | 1.3 | 1400 | | 22 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 7/21/2009 | | | 1366 | 1.8 | 820 | | 14 | | | | |

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | Total Dissolved Solids, mg/L | *E. coli*, MPN/100 mL | Nitrate + Nitrite as N, mg/L | Chlorpyrifos, µg/L | HCH, alpha , µg/L | *H. azteca*, % Control | *S. capricornutum*, % Control |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | MPM | 8/18/2009 | | | 1984 | | 1200 | | 22 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 9/22/2009 | | | 2171 | | 1400 | 1300 | 35 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 10/20/2009 | | | 2459 | | 1400 | 1300 | 25 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 11/17/2009 | | | 2415 | 8.8 | 1500 | >2400 | 36 | | | | |
| Zone 2 | Prairie Flower Drain @ Crows Landing Rd | NM | 12/15/2009 | | | 2695 | | 1600 | 2000 | 36 | | | | |

HCH – Hexachlorocyclohexane
NM-Normal Monitoring
MPM-Management Plan Monitoring
DO-Dissolved Oxygen
SC-Specific Conductance

### *Ammonia*

Ammonium exceedances occurred once in Zone 2 (Table 37) at Lateral 2 ½ near Keyes Rd (0.65 mg/L) in November 2008, and four times at the Prairie Flower Drain site; May, June, July, and November. The greatest concentrations occurred in November and were associated with elevated levels of TDS, *E. coli*, and nitrate. Previous exceedances of the ammonia WQTL have been attributed to discharge from dairies and the exceedances in 2009 are also likely due to diaries.

### *Nitrates*

Potential sources of nitrate in surface waters include runoff of fertilizers or organic matter from irrigated pasture, leaking septic systems, waste-treatment facility effluent, and inputs from animal waste. These sources can move to surface waters through above ground runoff or shallow subsurface flows. Animal waste that enters surface waters can be converted to nitrate by nitrifying bacteria. Possible sources of animal waste in a water body include dairies, poultry operations, pasture and/or wildlife. From years of movement of nitrate from dairies into ground water, there is a significant amount of nitrate in the aquifers beneath the Coalition region. Many of these aquifers are very shallow and many of the drains in the western portion of the Coalition were constructed in the 1800s to lower the water table and allow farming. More recently, tile drains have been placed in some areas of the Coalition, and these further remove shallow ground water from the subsurface and move it to surface drainages. As a result, nitrate from dairies may now intercepted by the field and surface drains resulting in consistent exceedances of the nitrate WQTL. Because of its extreme solubility, it is likely that any applications of nitrate fertilizers would result in immediate runoff to surface waters and it is unlikely that applications in the spring would result in exceedances of the WQTL throughout the irrigation season. In Zone 2 (Table 37), one exceedance of nitrate occurred in Zone 2 at Lateral 2 ½ near Keyes Rd (15 mg/L), and 15 nitrate exceedances occurred at Prairie Flower Drain @ Crows Landing Rd between October 2008 and December 2009.

### *Chlorpyrifos*

One exceedance of chlorpyrifos occurred in Zone 2 (Table 37) at Lateral 2 ½ near Keyes Rd (0.049 µg/L) in samples collected on July 21, 2009. This sample did not cause toxicity. Between June 24 and July 21, 2009 11 gallons of chlorpyrifos were applied to 44 acres of alfalfa, 196 gallons of chlorpyrifos were applied to 517.5 acres of almonds, 95.81 gallons of chlorpyrifos were applied to 408 acres of corn, and 681.5 gallons of chlorpyrifos were applied to 1379.10 acres of walnut. See Appendix IV to review PUR data.

### *Hexachlorocyclohexane*

Hexachlorocyclohexane (lindane) is an organochlorine insecticide that is not currently registered for agricultural use. Lindane was used in the past as a pesticide and a pharmaceutical treatment for lice and scabies. Isomers of lindane include alpha-HCH, beta-HCH

and delta-HCH. Lindane is not produced in the US (since 1970), but has been imported from other nations. In 2006 US EPA called for a voluntary withdraw of all agricultural uses of Lindane. Lindane is still used for its pharmaceutical application but has been banned for use on agriculture in the US. All products containing Lindane are currently banned in California. Detections of the lindane isomers alpha-HCH and delta-HCH are a result of past use and cannot be attributed to current agricultural practices. Zone 2 (Table 37) samples from Lateral 2 ½ near Keyes Rd contained HCH in the grab (0.013 µg/L) and field duplicate (0.016 µg/L) on November 11, 2008.

### *Toxicity*

There were a total of three toxic samples collected from Zone 2 (Table 37) between October 2008 and December 2009. Sediment samples collected from Lateral 2 ½ near Keyes Road on April 21, 2009 tested toxic to *Hyalella*. Because survival was 90 percent relative to the control these samples did not undergo chemical analysis and therefore the chemical responsible for the toxicity is unknown. There were no exceedances of any pesticides or metals in the water samples collected at this site on this date. PUR data specified that pesticide applications occurred during the months of January-April 2009. PUR data (Appendix IV) indicate applications of cypermethrin, bifenthrin, cyfluthrin, fenpropathrin and permethrin were applied in between January 6 and April 15 2009 to a total of 2765 acres of alfalfa, almond, apple, tree, greenhouse plant, and peaches.

Lateral 2 ½ near Keyes Road had toxic water samples resulting 56 percent growth compared to the control for *Selenastrum* during the second irrigation monitoring event on May 19, 2009. This was the first *Selenastrum* toxicity to occur at this site. There were no pesticide or metal exceedances associated with this toxicity. The reduction in growth was not below 50 percent so a TIE was not initiated. There were 674 applications of pesticides that upstream of Lateral 2 ½ near Keyes Rd that occurred between February 24 and May 19, 2009. Since there were no other exceedances detected in the water column during this sampling event, it is likely that a constituent that was not analyzed for in the water chemistry samples could have caused the toxicity. The active ingredients in the pesticide applications reported in PUR data include; 2,4-D, dimethylamine salt, clethodim, copper hydroxide, copper oxide (ous), copper sulfate (basic copper), diflubenzuron, flumioxazin, glufosinate-ammonium, glyphosate, glyphosate isopropylamine salt, glyphosate potassium salt, mancozeb, maneb, metam-sodium, nonflurazon, oryzalin, oxyfluorfen, paraquat dichloride, pendimethalin, sethoxydim, simazine, S-metolachlor, and trifluralin which were applied to a total of 16,127 acres of almond, apricot, dried bean, cherry, corn, grape, wine grape, kiwi, nectarine, greenhouse plant, vine, peach, plum, sweet potato, and walnuts. For PUR data, see Appendix IV.

A sample from Prairie Flower Drain @ Crows Landing Rd tested toxic to *Selenastrum* during the Management Plan Monitoring event for *Selenastrum* on May 19, 2009. The sample collected

on this date resulted in 30 percent growth compared to the control. These results were below 50 percent so a TIE was initiated and can be found in the Toxicity Identification Evaluation Report (Appendix VI). The TIE indicated the cause of toxicity was most likely cationic metals and ammonia. An exceedance of 3.2 mg/L of ammonia was identified in the samples and the lab confirmed a detection of 3.1 mg/L of ammonia in the samples. The role of the cationic metals could not be determined in these samples given that they were not analyzed for metals. Other exceedances experienced during this event were: DO (4.78 mg/L), SC (2066 **µS/cm**), *E. coli* (>2400 MPN/100ml), TDS (1200 mg/L), ammonia (3.20 mg/L), and nitrate (20 mg/L). PUR data (Appendix IV) indicate that applications of trifluralin, clethodim, diglycolamine salt of 3,6-dichloro-o-anisic acid, and glyphosate isopropylamine salt were applied to 521 acres of alfalfa and corn between April 25, and May 15, 2009.

*Table 38. Zone 3 (Highline Canal @ Hwy 99, Mustang Creek @ East Ave) Exceedances.*

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | Total Dissolved Solids, mg/L | *E. coli*, MPN/100 mL, None | Nitrate + Nitrite as N, mg/L | Copper Dissolved, µg/L | Chlorpyrifos, µg/L | DDE(p,p'), µg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 3 | Highline Canal @ Hwy 99 | NM | 2/7/2009 | | 8.86 | | | | | | | | |
| Zone 3 | Highline Canal @ Hwy 99 | MPM | 5/19/2009 | | | | | | 340 | | | | |
| Zone 3 | Highline Canal @ Hwy 99 | NM | 6/16/2009 | | 8.95 | | | | | | | | |
| Zone 3 | Highline Canal @ Hwy 99 | MPM | 7/21/2009 | | | | | | | | | 0.093 | |
| Zone 3 | Highline Canal @ Hwy 99 | NM | 8/18/2009 | | 9.03 | | | | | | | | |
| Zone 3 | Highline Canal @ Hwy 99 | NM | 9/22/2009 | | 8.61 | | | | | | | | |
| Zone 3 | Highline Canal @ Hwy 99 | NM | 12/15/2009 | | 8.61 | | | | | | | | |
| Zone 3 | Mustang Creek @ East Ave | NM | 2/7/2009 | | | 704 | | 560 | | 12 | 25 | | |
| Zone 3 | Mustang Creek @ East Ave | NM | 3/17/2009 | | | 1042 | | 710 | | 33 | | | |
| Zone 3 | Mustang Creek @ East Ave | NM, Sediment | 4/21/2009 | 0.98 | | 1433 | | | | | | | |
| Zone 3 | Mustang Creek @ East Ave | NM | 10/20/2009 | 2.95 | | 870 | 2.3 | 670 | 250 | | 44 | | |
| Zone 3 | Mustang Creek @ East Ave | NM | 12/15/2009 | | | 892 | | | | | 25 | | 0.022 |

DDE-Dichlorodiphenyldichloroethylene
NM-Normal Monitoring
MPM-Management Plan Monitoring
DO-Dissolved Oxygen
SC-Specific Conductance

### *Chlorpyrifos*

Management Plan Monitoring for chlorpyrifos at Highline Canal @ Hwy 99 in Zone 3 (Table 38) resulted in an exceedance of chlorpyrifos (0.093 µg/L). There were no toxicity reports associated with this exceedance. PUR data (Appendix IV) indicate the 14 applications of pesticides (Nufos 4E, Lorsban and Warhawk) occurred between June 23 and July 16, 2009 to walnut and corn over 854.5 acres.

### *Copper*

There are a number of possible sources of copper in water bodies within the Coalition region. Copper is applied in numerous forms such as copper hydroxide, copper sulfide and copper oxide, as a fungicide to a variety of vegetable crops, grains, and fruit and nut orchards. Copper can also enter a drainage system as a result of inputs other than agriculture. Copper is commonly applied by dairies and can also become available to water bodies through the weathering of rocks and soils. Automobile components may also contain copper and wearing of brakes can add substantial amounts of copper to surface waters that pass through or near urban areas. Zone 3 (Table 38) samples collected on February 7, 2009 (after a storm event) from Mustang Creek @ East Ave contained 25 µg/L of copper. In the Mustang Creek site subwatershed there were five applications of copper hydroxide within six months prior to this exceedance. There were four applications to almonds ranging from 78 lbs applied on 13 acres to 360 lbs applied on 30 acres. An application of 456 lbs of copper hydroxide also occurred on 38 acres of peaches. Samples collected from Mustang Creek @ East Ave on October 20, 2009 contained 44 µg/L of copper. No applications of copper were reported in the PUR data after April 18, 2009. Samples collected from Mustang Creek @ East Ave during the storm 2 event on December 15, 2009 contained 25 µg/L of copper. No applications of copper were reported in the PUR data after April 18, 2009. PUR data for Merced County has only been reported through November 2009. Any outstanding PUR data will be provided in the Addendum to the AMR on June 30, 2010. See Appendix IV for PUR data.

### *Dichlorodiphenyldichloroethylene*

Exceedances of DDT and its breakdown products, DDE and DDD, are a result of applications in the past. DDT, aldrin, and dieldrin are no longer registered or applied within the United States 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 years depending on the source, and the half life in aquatic systems is probably over 150 years (http://www.speclab.com/compound/c50293.htm). DDT was banned in 1972, and the USEPA prohibited application of aldrin and dieldrin in 1974 except for uses on termites and banned all uses in 1987. These pesticides may be bound to sediment in the channels and mobilized periodically by unknown mechanisms. Zone 3 (Table 38) samples collected at Mustang Creek @ East Ave contained DDE (0.022µg/L) on December 15, 2009. There was no toxicity associated with this exceedance.

### *Table 39. Zone 4 (Howard Lateral @ Hwy 140, Merced River @ Santa Fe) Exceedances.*

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Total Dissolved Solids, mg/L | *E. coli*, MPN/100 mL, None | Nitrate + Nitrite as N, mg/L | Copper Dissolved, µg/L | Chlorpyrifos, µg/L | HCH, delta, µg/L | *S. capricornutum*, % Conrol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 4 | Howard Lateral @ Hwy 140 | NM, Sediment | 4/21/2009 | 1.55 | | | | | | | | | |
| Zone 4 | Howard Lateral @ Hwy 140 | NM | 5/19/2009 | | | 810 | 530 | | 13 | | | | 77 |
| Zone 4 | Howard Lateral @ Hwy 140 | NM | 7/21/2009 | | 8.88 | | | | | | | | |
| Zone 4 | Howard Lateral @ Hwy 140 | NM, Sediment | 8/18/2009 | | 9.14 | | | | | | | | |
| Zone 4 | Howard Lateral @ Hwy 140 | NM | 9/22/2009 | | 9.15 | | | 330 | | | | | |
| Zone 4 | Howard Lateral @ Hwy 140 | NM | 10/20/2009 | | | | | 240 | | 3.3 | | | |
| Zone 4 | Merced River @ Santa Fe | MPM | 11/11/2008 | | | | | | | | 0.1 | 0.051 | |
| Zone 4 | Merced River @ Santa Fe | NM | 7/21/2009 | 6.12 | | | | | | | | | |
| Zone 4 | Merced River @ Santa Fe | NM | 10/20/2009 | 4.82 | | | | | | | | | |

HCH – Hexachlorocyclohexane; results are compared to the WQTL for HCH total
NM-Normal Monitoring
MPM-Management Plan Monitoring
DO-Dissolved Oxygen
SC-Specific Conductance

### *Chlorpyrifos*

In Zone 4 (Table 39), an exceedance of chlorpyrifos occurred during the fall 2008 Management Plan Monitoring for chlorpyrifos in samples collected on November 11, 2008 from Merced River @ Santa Fe (0.100 µg/L). No toxicity in the water column was reported. PUR data (Appendix IV) indicate six applications of Lorsban occurred in the upstream subwatershed of Merced River between October 14th and 24th. All applications were to wine grapes by the same permittee,.

### *Copper*

Howard Lateral @ Hwy 140 had samples containing 3.3 µg/L of copper on October 20, 2009 in Zone 4 (Table 39). PUR data (Appendix IV) indicate no applications of copper were made after January 2009 and this is the first copper exceedance to occur at this location.

### *Hexachlorocyclohexane*

Detections of the lindane isomers alpha-HCH and delta-HCH, are a result of past use and cannot be attributed to current agricultural practices. Zone 4 (Table 39) samples from Merced River @ Santa Fe contained HCH (0.051 µg/L) on November 11, 2008.

### *Toxicity*

Water samples collected at Howard Lateral @ Hwy 140 during the second irrigation monitoring event on May 19, 2009 tested toxic to *Selenastrum*. The samples resulted in 77 percent growth compared to the control. There were no pesticide or metal exceedances for this site associated with this monitoring event. PUR data (Appendix IV) indicate 46 pesticide applications of 2, 4-D dimethylamine salt, flumioxazin, glyphosate isopropylamine salt, metam-sodium, oxyfluorfen, and paraquat dichloride occurred between April 21 and May 19, 2009 to 1389 acres of almonds, wine grapes, peaches, and sweet potatoes.

*Table 40. Zone 5 (Deadman Creek @ Gurr Rd, Duck Slough @ Gurr Rd, Duck Slough @ Hwy 99, Miles Creek @ Reilly Rd) Exceedances.*

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | Total Dissolved Solids, mg/L | *E. coli*, MPN/100 mL | Nitrate + Nitrite as N, mg/L | Arsenic, µg/L | Copper, Dissolved, µg/L | Chlorpyrifos, µg/L | *C. dubia*, % Control | *P. promelas*, % Control | *S. capricornutum*, % Control |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 10/21/2008 | | | | | | 1400 | | 12 | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 11/11/2008 | | | | | | 370 | | 14 | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | FD | 12/16/2008 | | | | | | 4400 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 12/16/2008 | | | | | | 1400 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | FD | 1/20/2009 | | | | 5.4 | 460 | 2400 | | 18 | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 1/20/2009 | 5.61 | | 762 | 5.5 | 470 | 2400 | | 18 | | | | 87.5 | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 2/7/2009 | 1.01 | | 1802 | 50 | 1100 | 2400 | | 30 | | | 0 | 0 | 7.042 |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 3/17/2009 | | | | | | 1600 | | 14 | | | 10 | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 5/19/2009 | | | | | | 490 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 6/16/2009 | | | | | | 730 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 7/21/2009 | 6.04 | | | | | 460 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM, Sediment | 8/18/2009 | 6.94 | | | | | | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 10/20/2009 | 6.08 | | | | | 490 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 11/17/2009 | | | | | | 2000 | | | | | | | |
| Zone 5 | Deadman Creek @ Gurr Rd | FD | 12/15/2009 | | | | 15 | 610 | | | | | | | 57.5 | |
| Zone 5 | Deadman Creek @ Gurr Rd | NM | 12/15/2009 | 5.02 | | 995 | 15 | 610 | >2400 | | | | | | 75 | |
| Zone 5 | Duck Slough @ Gurr Rd | NM | 2/7/2009 | | | | | | | 13 | | | | | | |
| Zone 5 | Duck Slough @ Gurr Rd | NM | 3/17/2009 | | 9.7 | | | | | | | | | | | |
| Zone 5 | Duck Slough @ Gurr Rd | NM | 5/19/2009 | | | | | | 2400 | | | 7.3 | | | | |
| Zone 5 | Duck Slough @ Gurr Rd | NM | 9/22/2009 | | 9.03 | | | | | | | | | | | |
| Zone 5 | Duck Slough @ Gurr Rd | NM | 11/17/2009 | | | 1215 | | | 340 | | | | | | | |

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | pH, none | SC, µS/cm | Ammonia as N, mg/L | Total Dissolved Solids, mg/L | *E. coli*, MPN/100 mL | Nitrate + Nitrite as N, mg/L | Arsenic, µg/L | Copper, Dissolved, µg/L | Chlorpyrifos, µg/L | *C. dubia*, % Control | *P. promelas*, % Control | *S. capricornutum*, % Control |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 5 | Duck Slough @ Gurr Rd | NM | 12/15/2009 | | | | | | >2400 | | | | | | | |
| Zone 5 | Duck Slough @ Hwy 99 | NM | 6/16/2009 | 6.78 | | | | | | | | | | | | |
| Zone 5 | Miles Creek @ Reilly Rd | NM | 4/21/2009 | 6.3 | | | | | | | | | | | | |
| Zone 5 | Miles Creek @ Reilly Rd | NM | 7/21/2009 | 6.45 | | | | | | | | | 0.028 | | | |
| Zone 5 | Miles Creek @ Reilly Rd | NM | 8/18/2009 | 6.58 | | | | | | | | | | | | |
| Zone 5 | Miles Creek @ Reilly Rd | NM | 9/22/2009 | 6.35 | | | | | | | | | | | | |

NM-Normal Monitoring
DO-Dissolved Oxygen
SC-Specific Conductance

### *Ammonia*

Previous exceedances of the ammonia WQTL have been attributed to discharge from dairies. *Pimephales* is the most sensitive test species to ammonia. *Ceriodaphnia* and *Selenastrum* are also sensitive to ammonia, as shown in samples collected on February 7, 2009, in which ammonia accounted for water toxicity to all three test species at Deadman Creek @ Gurr Rd in Zone 5 (Table 40).

### *Nitrates*

There was one exceedance of nitrate experienced in Zone 5 (Table 40) at Duck Slough @ Gurr Rd (13 mg/L) on February 7, 2009.

### *Arsenic*

There were arsenic exceedances at Deadman Creek @ Gurr Rd (Table 40) in October and November 2008, as well as January, February and March 2009.

### *Copper*

Samples collected from Duck Slough @ Gurr Rd on May 19, 2009 had of 7.3 µg/L of copper (Table 40). PUR data (Appendix IV) indicate there were 18 applications of copper hydroxide to walnuts, process tomatoes, and tomatoes between April 4, and May 8, 2009 ranging between 17 lbs on 9.5 acres to 256 lbs on 32 acres.

### *Chlorpyrifos*

Irrigation 4 Management Plan Monitoring samples in Zone 5 (Table 40) for chlorpyrifos taken from Miles Creek @ Reilly Rd on July 21, 2009 resulted in a chlorpyrifos exceedance of 0.028 µg/L. There was no toxicity associated with these exceedances. PUR data (Appendix IV) indicates that there were 9 applications of chlorpyrifos to 478 acres of alfalfa, almonds and cotton between June 27 and July 20, 2009.

### *Toxicity*

There were seven toxic samples in Zone 5 (Table 40) between October 2008 and December 2009. Deadman Creek @ Gurr Rd tested toxic to *Pimephales* during the first winter monitoring event on January 20, 2009, to all test species during storm monitoring February 7, 2009, to *Ceriodaphnia* during the second winter event on March 17, 2009, and to the environmental sample and field duplicate (FD) December 15, 2009. In samples collected in January 2009, ammonia was detected at 5.5 mg/L, an exceedance of the WQTL for ammonia and enough to account for the 13 percent *Pimephales* mortality experienced. Samples collected in February contained 45 mg/L of ammonia. Due to the high levels of ammonia in the February samples, DO remained below the protocol requirement for *Pimephales* tests, therefore; samples were aerated throughout the test (refer to laboratory report under Appendix VI for details on protocol). Zeolite treatment was used in the TIE to determine if ammonia could account for the toxicity seen in all of the test species. All of the toxicity was eliminated after Zeolite treatment,

and the toxicity was recovered in the ammonia add-back treatment with all three test species. Because the results strongly pointed to ammonia as the source of toxicity, further TIE treatments were not conducted. Samples collected in March, which resulted in 10 percent survival relative to the control in *Ceriodaphnia*, contained 0.34 mg/L of ammonia, which is not enough to account for any of the toxicity. TIE tests were run on these samples. Results from the TIE indicated that the source of toxicity was pyrethroid pesticide(s). Four applications of pyrethroid pesticides occurred during the months of October and November, 2008. Cypermethrin was applied on October 11 and 21, 2008 on 127 acres of radicchio and two applications of bifenthrin occurred on November 28, 2008 on 5.5 acres of almonds. After November, there were no additional applications of pyrethroids that could have contributed to the March toxicity. The December 15, 2009 toxicity to *Pimephales* resulted in 75 percent survival in the grab sample and only 57.5 percent survival in the field duplicate. These results were not below 50 percent so a TIE was not initiated. PUR data for Merced County has only been reported through November 2009. Any outstanding PUR data will be accounted for in the Addendum to the AMR on June 30, 2010. See Appendix IV to review PUR data and Appendix VI for TIE laboratory reports.

*Table 41. Zone 6 (Ash Slough @ Ave 21, Cottonwood Creek @ Rd 20) Exceedances.*

| Zone | Station Name | Sample Type Code | Sample Date | DO, mg/L | *E. coli* MPN/100 mL | Copper Dissolved, µg/L |
|---|---|---|---|---|---|---|
| Zone 6 | Ash Slough @ Ave 21 | NM | 5/19/2009 | 6.99 | | 3 |
| Zone 6 | Cottonwood Creek @ Rd 20 | NM | 2/7/2009 | | 2400 | |
| Zone 6 | Cottonwood Creek @ Rd 20 | NM | 5/19/2009 | 6.72 | | |
| Zone 6 | Cottonwood Creek @ Rd 20 | NM | 11/17/2009 | | 770 | |

NM-Normal Monitoring
DO-Dissolved Oxygen
SC-Specific Conductance

### Copper

Zone 6 (Table 41) samples at Ash Slough @ Ave 21 had a dissolved copper exceedance (3 µg/L) in samples collected on May 19, 2009. Although there have been total copper exceedances at Ash Slough in the past, this is the first dissolved copper exceedance at this location. There were three applications of copper hydroxide to almonds totaling 171 gallons to 175 acres between the dates January 27-29, 2009 (Appendix IV).

## Actions Taken to Address Water Quality Exceedances

Monitoring of ambient surface waters is conducted by the Coalition for the purpose of characterizing discharges from agriculture. Results from each event within a monitoring season can identify constituents, agricultural lands, crops and/or particular pesticides that need to be managed to reduce or eliminate input from agriculture. A series of actions taken to determine the potential sources of exceedances include 1) the use of PURs to identify relevant applications that occurred upstream of the sample site and within a specified time period prior to the sampling event, 2) an analysis of monitoring data and toxicity results to better understand the potential sources and toxicity of detected constituents, 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 (see Discussion of Results section).

The Coalition notified the Regional Board of all exceedances in Exceedance Reports (Appendix V). In addition, the Coalition creates an annual report for Coalition members to review all exceedances. Results are also disseminated via grower mailings, at grower outreach meetings, and, in some cases, by personal communication when evidence such as PURs indicates the likely source of a pesticide.

Grower notification, management practice outreach and education, and management practice tracking and implementation are additional actions taken by the Coalition to ensure that growers are aware of downstream water and sediment quality issues as well as the importance of implementing various management practices within their farm operations. Grower notification of upcoming meetings, water quality results and Coalition news such as available funding for management practice implementation, grower meetings to conduct outreach and education and encourage growers to implement additional management practices and management practice tracking and implementation actions (prioritized according to the ESJWQC Management Plan) are documented in Table 42.

### Management Practices

The Coalition provides growers with information on management practices to reduce storm water runoff, discharge of irrigation water, and mobilization of sediments into receiving waters. Relevant management practices were detailed in a handbook developed by the Coalition for Urban and Rural Environmental Stewardship (CURES) and mailed to all members in October, 2008 (Table 42). Additional management practices such as the use of alternative products, structural changes to manage drain water, and pesticide application practices for minimizing spray drift, were presented at meetings. Appendix VII includes meeting agendas and handouts from meetings held from October 2008 through December 2009.

To evaluate and establish a baseline of current management practices, the Coalition requests that all members complete a general survey. The survey documents irrigation and storm water management practices, pest management strategies and drift management activities. The ESJWQC submitted a General Survey Summary Report to the Regional Board on January 30, 2009.

The Coalition has developed a strategy to prioritize subwatersheds in order to conduct focused outreach with individual members. The purpose of the outreach is to review current farm management practices, determine if additional management practices are applicable, and document implementation of any new practices. From 2008 to 2010 the Coalition has conducted focused outreach in: Dry Creek @ Wellsford Rd, Prairie Flower Drain @ Crows Landing Rd and Duck Slough @ Hwy 99. Growers were contacted during the spring and summer of 2009, a review of management practices was conducted and documented including any recommended practices. Follow up with growers will be conducted in spring of 2010 to document implementation of new practices. This process is further detailed below (Management Plan Status and Table 42), and the Coalition Management Plan Update Report to be submitted on April 1, 2010 will summarize information obtained from these individual contacts. The Coalition has also begun contacting growers in the next priority subwatersheds which include Highline Canal @ Hwy 99, Cottonwood Creek @ Hwy 20, Duck Slough @ Gurr Rd and Bear Creek @ Kibby Rd. The Coalition's Management Plan includes a schedule of prioritized subwatersheds and details regarding the prioritization strategy.

Targeted members in high priority subwatersheds (Dry Creek, Duck Slough above Hwy 99, and Prairie Flower Drain) were notified in a June 4, 2009 mailing that they are required to schedule an individual meeting with Coalition representatives to assess current management practices in order to remain in compliance with the ILRP. A follow-up letter was mailed on June 23, 2009 to unresponsive members, and a final letter informing growers they were dropped from the Coalition for failure to respond was sent on September 11, 2009. The Coalition made several individual grower contacts in high priority subwatersheds over the past year that have enabled the Coalition to assess current management practice implementation and gauge expected future implementation. Individual contacts with growers in the Dry Creek subwatershed occurred between January and August, 2009, in the Duck Slough (above Hwy 99) subwatershed between May and July, 2009, and in the Prairie Flower Drain subwatershed between June and September, 2009 (Table 42). An individual contact summary and letter was mailed to all participating members on September 30, 2009. The Coalition is in the process of assessing and analyzing the survey results and will provide a summary of individual contacts conducted in 2009 in the ESJWQC Management Plan Update Report to be submitted on April 1, 2010.

Also during the month of October 2008, a mailing was sent out to all 118 Coalition members within the Dry Creek @ Wellsford Rd site subwatershed to announce an upcoming grower meeting. Included in the mailing were a blank general survey (if outstanding) and an

exceedance table for all years and seasons. The meeting with Dry Creek growers was held on November 12, 2008 at the Fruit Yard restaurant in Modesto. MLJ-LLC and Coalition representatives discussed water quality exceedances, management plan requirements and management practices to reduce agricultural discharge.

In late November, the Modesto Pesticide Applicator Professional Association Seminar, a grower and Pesticide Control Advisor (PCA) meeting, took place and Coalition Executive Director Parry Klassen presented Coalition monitoring results from sites within Stanislaus County, and information on best management practices for organophosphate and pyrethroid pesticides.

The 2008 Annual Grower Meetings were held on December 16, 17, and 18 in Stanislaus, Merced, and Madera Counties, respectively. Coalition representatives and MLJ-LLC personnel discussed ESJWQC Coalition activities, 2008 monitoring results, and priority subwatershed management plans. Annual reports were available for members and general surveys were available for members to fill out at the meeting.

The Coalition continues to be committed to collaboration with outside sponsors to secure unique opportunities that will enhance the Coalition's ability to achieve its goal of reducing the impact of agricultural discharge on water quality (Table 42). The ESJWQC, along with CURES, the Westside San Joaquin River Watershed Coalition, NRCS, and the West and East Stanislaus Resource Conservation District, applied for money from the USDA Agricultural Water Enhancement Program (AWEP) to be used in Stanislaus and Merced counties. On July 30, 2009 they received an award of $2 million annually over 5 years ($10 million total). The money will fund the installation of management practices on farms and dairies with operations bordering waterways within subwatersheds covered by Management Plans in the two county regions. Two hundred twenty-six members in the Dry Creek, Duck Slough, and Prairie Flower Drain subwatersheds were notified of eligibility, requirements, and the application process to receive the funds via an August 6, 2009 mailing.

The Coalition also hosts a website: http://www.esjcoalition.org/home.asp. This website serves as a clearing house for Coalition activities and outreach on management practices. Information provided on the website functions as a useful supplement to regular grower contacts and meetings.

## Outreach and Education

Outreach and education activities are an important component of the Coalition monitoring program. The Coalition continues to provide information to growers at regular meetings, at meetings conducted by the County Agricultural Commissioner, and by personal contact. Coalition presentations from October 2008 through December 2009 provided members with information regarding the Coalition's intentions and progress and site subwatershed specific monitoring results, as well as management practices that are effective in reducing the discharge

of pesticides to water bodies. All outreach and education activities are documented in Table 42. Overall Coalition representatives conducted or participated in 23 meetings from October 2008 through December 2009. Of those meetings, 14 addressed storm water quality issues, 14 addressed irrigation water quality issues, 7 meetings addressed sediment runoff issues, 17 meetings reviewed management practices and 15 addressed specific site subwatershed management plans.

During the early Fall 2008 monitoring season, prior to dormant sprays, Coalition Executive Director Parry Klassen was invited to present at four sections of the Merced Community College Pest Management Update Course held on October 7, 21, 28, and November 4, 2008. The presentations included Coalition monitoring results, sprayer calibrations, and management of organophosphates and pyrethroids for both orchards and row crops.

Also during the month of October 2008, a mailing was sent out to all 118 Coalition members within the Dry Creek @ Wellsford Rd site subwatershed to announce an upcoming grower meeting. Included in the mailing were a blank general survey (if outstanding) and a table of water quality exceedances for all years and seasons. The meeting with Dry Creek growers was held on November 12, 2008 at the Fruit Yard restaurant in Modesto. MLJ-LLC and Coalition representatives discussed water quality exceedances, management plan requirements and management practices to reduce agricultural discharge.

In late November 2008, Parry Klassen presented Coalition monitoring results from sites within Stanislaus County and information on best management practices for organophosphate and pyrethroid pesticides at the Modesto Pesticide Applicator Professional Association Seminar, a meeting attended by both growers and PCAs in the area.

The 2008 ESJWQC Annual Grower Meetings were held on December 16, 17, and 18 in Stanislaus, Merced, and Madera Counties, respectively. Coalition representatives and MLJ-LLC personnel discussed ESJWQC Coalition activities, 2008 monitoring results, and priority subwatershed management plans. Annual reports were available for members which included maps and water quality exceedances for all sites monitored from since 2004. In addition, general surveys were available for members to complete to continue documentation of current management practices.

The Coalition attended and spoke at meetings coordinated by pest supply companies and irrigation districts to increase their outreach effort to entities with the potential to influence member pest management decisions including PCAs, permittees and farm managers. Parry Klassen reviewed the management plan progression of the high priority subwatersheds Dry Creek and Prairie Flower Drain Management Plans and presented pesticide and nutrient management practices at the California Association of Pest Control Advisors (CAPCA) Continuing Education Meeting on February 5, 2009. On February 9 and March 23, 2009, Parry

Klassen attended meetings hosted by Helena Chemical Company in Modesto and Merced, respectively. Parry Klassen educated Helena Chemical Company staff managers and PCAs on the purpose and strategy of the ESJWQC Management Plan including specific water quality issues within local watersheds and relevant management practice information. Coalition representatives also attended Modesto Irrigation District Meetings held on March 2 and 4, 2009 to discuss with a total of 100 attendees Dry Creek (Stanislaus County) and Prairie Flower Drain Management Plan strategies and status.

On March 10, 2009, Parry Klassen participated in a PCA and grower meeting hosted by Merced City College. He presented an update on the Long-term Irrigated Lands Regulatory Program, discussed management practices for row crops and orchards and focused on organic farming topics to a large grower audience including non-members in Merced.

On March 26, 2009, 43 of the 88 members invited, representing 23 farming operations, attended the Duck Slough subwatershed grower meeting. The mailing announcement for this meeting included a Duck Slough water quality exceedance chart and blank general survey to return (if outstanding).

In a focused effort to address the issue of multiple chlorpyrifos exceedances throughout the region in the previous year, the Coalition sent out a chlorpyrifos specific mailing to 334 growers in various subwatersheds who either own land adjacent to waterways or grow alfalfa, almond, and/or walnuts. Because some members own parcels in several subwatersheds, Table 2 tallies the number of members reached in each subwatershed. The mailing detailed management practices relevant to chlorpyrifos, provided a past history of chlorpyrifos in the particular watershed, and reminded members of their responsibilities. The mailing went out June 5, 2009 to target the month of July, when most chlorpyrifos applications are made and when the Coalition has experienced the most exceedances in the past.

Coalition members were invited to the Drip and Micro Sprinkler Irrigation Meeting on August 4, 2009, sponsored by East Stanislaus Resource Conservation District, University of California Cooperative Extension (Stanislaus County), and the United States Department of Agriculture-Natural Resource Conservation Service (USDA – NRCS) Modesto Service Center. The meeting focused on maintenance and chemigation uniformity, fertilizer efficiencies, irrigation scheduling, and water management and crop quality including pest management as related to microspray and drip irrigation.

Two hundred seventy-seven growers were invited to the Preventing Sediment Discharges from Lower Sierra Foothill Farms/Ranches Meeting held on August 12, 2009. Discussion topics included sediment management practices and an explanation of recent changes in regulatory actions taken by California Department of Fish and Game/Regional Board against farmers with

fields discharging excessive sediment into local tributaries to the Merced, Stanislaus or Tuolumne Rivers as a result of inadequate storm runoff management practices.

In an effort to make meetings easier to incorporate into growers' schedules, the Coalition hosted its first grower conference call meetings on October 21 and 22, 2009 for the Cottonwood Creek subwatershed. A total of four members participated in a discussion of the ESJWQC Management Plan strategy and status for Cottonwood Creek.

At the 2009 Annual Grower Meetings held on December 15, 17, and 21, 2009, Parry Klassen and MLJ-LLC personnel reviewed the water quality monitoring results, ESJWQC Management Plan strategy and status, as well as Coalition activities including outreach, collaborations and member responsibilities, as well as other administrative business. ESJWQC 2009 Annual Reports were mailed in advance of the meetings and many growers brought the reports with them to the meeting. Several management practice informational handouts and flyers were made available to growers at the meetings. The Coalition recently invested in Turning Interactive Survey Devices, a tool used to poll a meeting audience and receive real time feedback, and employed the new technology at the Annual Meetings. This instantaneous response allows the Coalition to better interact with growers, such that if further elaboration on a topic is needed, a representative can address it within the same meeting. Available polling results are included in Appendix VII. A total of 211 growers attended the three meetings.

## Pest Control Advisors, Agricultural Commissioners, and Registrants

For the Coalition to be most effective in providing recommendations on management practices that will reduce or eliminate discharge, collaboration with County Agricultural Commissioners, PCAs and pesticide registrants is critical. Throughout the October 2008 to December 2009 timeframe, and specifically during the 2009 irrigation season, the Coalition worked with each of these entities as needed to follow-up on exceedances. Coalition representatives spoke at the PCA meetings: Modesto Pesticide Application Professional Association Seminar (November 20, 2008), CAPCA Continuing Education Meeting (February 5, 2009) and the Helena Chemical Company sponsored meetings (February 9, 2009 and March 23, 2009).

Agricultural Commissioners from the various counties are active participants as non-voting members of the ESJWQC Board of Directors.

*Table 42. Table of ESJWQC actions and deliverables dealing with grower notification of exceedances and management practices relevant to the monitoring conducted between October 2008 and December 2009 (sorted by date).*

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| All Counties | October, 2008 | BMP Outreach and Education | BMP Handbook: Management Practices for Protecting Water Quality sent out to all Coalition members (binder of information on Best Management Practices (BMPs). Developed by CURES, funded by Westside Coalition Prop 50 grant. | All constituents | Parry Klassen |
| All Counties | October 2, 2008 | Grower Notification | Mailing to all ESJ Members to announce NRCS funds (through EQIP) are available but deadline for BMP implementation is quickly approaching (Oct. 31). | Pesticides | Parry Klassen |
| Merced | October 7, 2008 | BMP Outreach and Education | Merced Community College Pest Management Update Course: grower, PCA meeting to discuss Coalition results. | All constituents | Parry Klassen |
| Merced | October 21, 2008 | BMP Outreach and Education | Merced Community College Pest Management Update Course: grower, PCA meeting to discuss sprayer calibrations. | All constituents | Parry Klassen |
| Merced | October 28, 2008 | BMP Outreach and Education | Merced Community College Pest Management Update Course: grower, PCA meeting to discuss organophosphates and pyrethroids with regard to orchards. | Organophosphates, pyrethroids | Parry Klassen |
| Dry Creek @ Wellsford subwatershed | October 29, 2008 | Grower Notification | Mailing to all 118 members within Dry Creek subwatershed to announce grower meeting on November 14, 2008; included cover letter, agenda, survey (if outstanding), and exceedances chart for all years and seasons. | All Constituents | Parry Klassen |
| Merced | November 4, 2008 | BMP Outreach and Education | Merced Community College Pest Management Update Course: grower, PCA meeting to discuss organophosphates and pyrethroids with regard to row crops. | Organophosphates, pyrethroids | Parry Klassen |
| Dry Creek @ Wellsford subwatershed | November 12, 2008 | BMP Outreach and Education | Dry Creek Grower Meeting at Fruit Yard Restaurant, Modesto: discussed water quality exceedances, Management Plan requirements, and management practices to reduce agricultural discharge. | All constituents | Parry Klassen, MLJ-LLC |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| Modesto | November 20, 2008 | BMP Outreach and Education | Pesticide Applicator Professional Association grower meeting: discussed Stanislaus County Coalition results and BMPs for OPs and pyrethroids. | Organophosphates, pyrethroids | Parry Klassen |
| All Counties | December 3, 2008 | Grower Notification | Mailing to all growers announcing a deadline extension for membership renewal and the 2008 Annual Meetings. | All constituents | Parry Klassen |
| Stanislaus County | December 16, 2008 | BMP Outreach and Education | 2008 Annual Grower Meeting: discussed ESJ Coalition activities, 2008 monitoring results, priority Management Plans (pesticides drive water quality challenge), and filled out BMP surveys. | All constituents | Parry Klassen, MLJ-LLC |
| Merced County | December 17, 2008 | BMP Outreach and Education | 2008 Annual Grower Meeting: discussed ESJ Coalition activities, 2008 monitoring results, priority Management Plans (pesticides drive water quality challenge), and filled out BMP surveys. | All constituents | Parry Klassen, MLJ-LLC |
| Madera County | December 18, 2008 | BMP Outreach and Education | 2008 Annual Grower Meeting: discussed ESJ Coalition activities, 2008 monitoring results, priority Management Plans (pesticides drive water quality challenge), and filled out BMP surveys. | All constituents | Parry Klassen, MLJ-LLC |
| All Counties | January 30, 2009 | Management Practice Tracking | General survey results linked to parcels and summarized in the ESJWQC General Survey Summary Report. | All constituents | MLJ-LLC |
| Stanislaus County: Dry Creek & Prairie Flower Drain | February 5, 2009 | BMP Outreach and Education | CAPCA Continuing Education meeting: discussed various pest management issues. Included a presentation by Klassen on the Dry Creek and Prairie Flower Drain MP status and BMPs for pesticides and nutrients were discussed. | Pesticides, nutrients, sediment | Parry Klassen |
| Stanislaus County: Dry Creek & Prairie Flower Drain | February 9, 2009 | BMP Outreach and Education | Meeting with Helena Chemical Company, Modesto: Coalition representatives discussed the MP status of Dry Creek and Prairie Flower Drain with Staff Managers and Pest Control Advisors (#6 PCAs) as a means to contact more growers. | Pesticides, nutrients | Parry Klassen |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| Stanislaus, Merced Counties | February 28, 2009 | Water Quality Collaborations | Submitted grant proposal to USDA Agricultural Water Enhancement Program for funding to install BMPs on farms located in subwatersheds in Stanislaus and Merced counties with Management Plans. Requested $2 million annually for 5 years ($10 million total). Decision on funding to be made May 15, 2009. | Not Applicable | Parry Klassen/CURES; ESJQWC; Westside San Joaquin River Watershed Coalition; NRCS; West and East Stanislaus Resource Conservation District |
| Waterford | March 2, 2009 | BMP Outreach and Education | Modesto Irrigation District Grower Meeting: Klassen reviewed results from Stanislaus County sites and the MP on Dry Creek and Prairie Flower Drain. 40 growers attended. | All | Parry Klassen |
| Modesto | March 4, 2009 | BMP Outreach and Education | Modesto Irrigation District Grower Meeting: Zipser reviewed results from Stanislaus County sites and the MP on Dry Creek and Prairie Flower Drain. 60 growers attended. | All | Wayne Zipser |
| Merced | March 10, 2009 | BMP Outreach and Education | Merced City College PCA and Grower Meeting: discussed topics related to organic farming including organic inspections, approved materials, OSPs, and an individual grower/PCA's experience with the transition to organic. Klassen presented an update on the Irrigated Lands Program and BMPs for row crops and orchards with runoff of pesticides and nutrients. | All | Parry Klassen |
| Duck Slough site subwatershed | March 10, 2009 | Grower Notification | Mailing to 88 members in Duck Slough to announce grower meeting for the Duck Slough/Mariposa Creek Watershed on March 26, 2009 to discuss recently approved MP for Duck Slough. Mailing included letter, meeting agenda, BMP survey (if outstanding), and exceedance chart. | All | Parry Klassen, Wayne Zipser |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| Merced County: Duck Slough site subwatershed | March 23, 2009 | BMP Outreach and Education | Meeting with Helena Chemical Company, Modesto: Coalition representatives discussed the MP status of Duck Slough with Staff Managers and Pest Control Advisors (#5 PCAs) as a means to contact more growers. | Pesticides, nutrients | Parry Klassen |
| Le Grand, Duck Slough site subwatershed | March 26, 2009 | BMP Outreach and Education | Grower meeting: presentations discussed watershed specific 2009 MP, past exceedances, BMPs for row crops and orchards with runoff of pesticides and nutrients, and Coalition follow-up activities (PUR review, individual grower contacts, BMPs); growers filled out meeting surveys. Growers with properties adjacent to Duck Slough were specifically invited; 43 people attended, representing 23 member farming operations. | All | Parry Klassen, MLJ LLC |
| Dry Creek, Duck Slough, Prairie Flower Drain site subwatersheds | June 4, 2009 | Grower Notification | Mailing to 25 members in high priority site subwatersheds to notify members that individual meetings are required for 100% of growers near or adjacent to the waterways and members are responsible for scheduling individual contact meetings via provided contact information in mailing. Additionally, an email containing the same information was sent to 13 high priority members on June 1, 2009. | All | Parry Klassen, Wayne Zipser |
| CCART(36), DCAGR(32), DCAWR(62), DCARE(19), DSAHN(51), HCHNN(63), LDARA(16), MRSFD(50), MCARR(20), MCAEA(17), PFDCL(6), SDAMD(1), SSAQR(5), WDAVR(8) site subwatersheds | June 5, 2009 | Grower Notification | "Hull Split" mailing to 334 members who grow alfalfa, almond, and/or walnuts and/or operate parcels adjacent to waterways in subwatersheds with 2008 chlorpyrifos exceedances. Mailing included chlorpyrifos discussion letter, Dow AgroScience chlorpyrifos bulletin, subwatershed specific exceedance chart, and state letter explaining Coalition member requirements and potential consequences non-cooperative members. | Chlorpyrifos | Parry Klassen, Wayne Zipser |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| Dry Creek, Duck Slough, Prairie Flower Drain site subwatersheds | June 23, 2009 | Grower Notification | Follow-up mailing to June 4 mailing regarding scheduling individual meetings. Sent to all growers who had not yet scheduled an individual meeting urging members to do so and providing in a supplementary Regional Board letter an explanation of the consequences for members and the Coalition if the meetings are not conducted. | All | Parry Klassen, Wayne Zipser |
| Sierra Foothills area | July 30, 2009 | Grower Notification | Mailing to 277 members who farm in the Sierra Foothills, east of Oakdale between Merced and Stanislaus County lines, to announce a grower meeting to discuss sediment best management practices and explain recent changes in regulatory actions taken by CA. Dept. of Fish and Game/Regional Water Board against fields discharging excessive sediment into local creeks and streams leading to the Merced, Stanislaus or Tuolumne Rivers after storms. | All | Parry Klassen |
| Stanislaus, Merced Counties | July 30, 2009 | Water Quality Collaborations | USDA announced Jul. 30, 2009 an award of $2 million annually over 5 years ($10 million total) funded by the Agricultural Water Enhancement Program (AWEP) created in the 2008 Farm Bill. The money will aid in installation of Management Practices and be directed to farms and dairies with operations bordering waterways within subwatersheds covered by Management Plans in the two county regions. | Not Applicable | Parry Klassen/CURES; ESJQWC; Westside San Joaquin River Watershed Coalition; NRCS; West and East Stanislaus Resource Conservation District |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| All Counties | July 31, 2009 | Grower Notification | Email to members who farm in the Sierra Foothills to announce the Drip and Micro Sprinkler Irrigation Meeting on August 4, 2009 sponsored by East Stanislaus Resource Conservation District, University of California Cooperative Extension, Stanislaus, and the USDA - NRCS Modesto Service Center. Sent to all members on ESJWQC email list and flyer included in mailing to 277 members in Sierra Foothills area. | All | Parry Klassen |
| Dry Creek Site Subwatershed | January - August 2009 | Management Practice Tracking | Individual contact with targeted growers in Dry Creek subwatershed (current management practice evaluation). | All | Parry Klassen, Wayne Zipser |
| Duck Slough (above Hwy 99) Subwatershed | May - August 2009 | Management Practice Tracking | Individual contact with targeted growers in Duck Slough (above Hwy 99) subwatershed (current management practice evaluation). | All | Parry Klassen, Wayne Zipser |
| Sierra Foothills area | August 4, 2009 | BMP Outreach and Education | Drip and Micro Sprinkler Irrigation Meeting to discuss maintenance, chemigation uniformity, fertilizer efficiencies, irrigation scheduling, and water management and crop quality including pest management as related to micro and drip irrigation. | All | Wayne Zipser |
| Dry Creek, Duck Slough, Prairie Flower Drain site subwatersheds | August 6, 2009 | Grower Notification | Mailing to 226 members in high priority subwatersheds announcing that the USDA recently approved $2 million annually in grants over the next 5 years for projects intended to improve water quality of waterways in Stanislaus and Merced counties; includes details of eligibility, requirements, and application process. | All | Parry Klassen |
| Sierra Foothills area | August 12, 2009 | BMP Outreach and Education | Preventing Sediment Discharges from Lower Sierra Foothill Farms/Ranches Meeting: discussed BMPs relevant to preventing soil erosion | All | Parry Klassen, Wayne Zipser |
| Prairie Flower Drain Subwatershed | June - September 2009 | Management Practice Tracking | Individual contact with targeted growers in Prairie Flower Drain subwatershed (current management practice evaluation). | All | Parry Klassen, Wayne Zipser |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| Dry Creek and Prairie Flower Drain site subwatersheds | September 10, 2009 | Grower Notification | Mailing to all members who have not responded to Coalition attempts to contact and schedule an individual meeting. Letter informed those members they have been dropped from the ESJWQC Coalition as of August 31, 2009 and must now seek alternative methods of complying with the ILRP. | All | Parry Klassen, Wayne Zipser |
| Dry Creek, Duck Slough, Prairie Flower Drain site subwatersheds | September 30, 2009 | Grower Notification | Individual survey recap and letter mailed to participants in most recent round of individual contact meetings to provide members with a copy for their records and remind them they will be contacted in spring 2010 to regarding the implementation status of recommended management practices. | All | Parry Klassen, Wayne Zipser |
| All Counties | October 14, 2009 | Grower Notification | Letter mailed to all members with parcels adjacent to Cottonwood Creek announcing two conference call meetings (Oct. 21st @ 11AM and Oct. 22nd @ 4PM) to inform growers about requirements for and initiate the scheduling of individual contact meetings. | All | Parry Klassen, Wayne Zipser |
| Cottonwood Creek area | October 21, 2009 | BMP Outreach and Education | Conference call meeting to inform growers about the Cottonwood Creek Management Plan, specifically requirements for and to initiate the scheduling of individual contact meetings. A total of four members were represented (total includes participants in the 10/22/09 call). | All | Parry Klassen |
| Cottonwood Creek area | October 22, 2009 | BMP Outreach and Education | Conference call meeting to inform growers about the Cottonwood Creek Management Plan, specifically requirements for and to initiate the scheduling of individual contact meetings. A total of four members were represented (total includes participants in the 10/21/09 call). | All | Parry Klassen |
| All Counties | December 3, 2009 | Grower Notification | Annual grower meeting announcement postcard mailed to 2,385 growers. | All | Parry Klassen, Wayne Zipser |

| Area | Date | Category | Details | Constituents Addressed | Who |
|---|---|---|---|---|---|
| Merced County | December 15, 2009 | BMP Outreach and Education | Annual Grower Meeting: discussed and reviewed Coalition activities and monitoring results of the past year, and priority MP status and funding. Annual Report with cover letter and newsletter were handed to all members; BMP information available. Surveyed the audience using Turning Interactive Survey Device. 49 Coalition members had at least one representative in attendance. | All | Parry Klassen, MLJ-LLC |
| Madera County | December 17, 2009 | BMP Outreach and Education | Annual Grower Meeting: discussed and reviewed Coalition activities and monitoring results of the past year, and priority MP status and funding. Annual Report with cover letter and newsletter were handed to all members; BMP information available. Surveyed the audience using Turning Interactive Survey Device. 51 Coalition members had at least one representative in attendance. | All | Parry Klassen, MLJ-LLC |
| Stanislaus County | December 21, 2009 | BMP Outreach and Education | Annual Grower Meeting: discussed and reviewed Coalition activities and monitoring results of the past year, and priority MP status and funding. Annual Report with cover letter and newsletter were handed to all members; BMP information available. Surveyed the audience using Turning Interactive Survey Device. 111 Coalition members had at least one representative in attendance. | All | Parry Klassen, MLJ-LLC |

## Management Plan Status and Special Projects

The ESJWQC established monitoring and management activities as required in the Regional Board's Basin Plan for the Sacramento and San Joaquin River basins as well as the ILRP MRP for Coalition Groups (Order No. R5-2008-0005). The Basin Plan sets forth Total Maximum Daily Load (or TMDL) requirements for dischargers and requires that dischargers comply with the monitoring and management criteria defined in the Basin Plan. In addition, the ILRP MRP requires that a management plan be developed if more than one exceedance of the same parameter at the same location occurs within a three-year period. If an exceedance occurs for a TMDL constituent (i.e. chlorpyrifos, diazinon, salt and boron) a management plan will be required for that constituent and site subwatershed regardless of whether there was a second exceedance.

A management plan resulting from a single exceedance of a TMDL constituent, or from more than one exceedance of a constituent without a TMDL; results in additional focused efforts that take place within subwatersheds. Coalition efforts in all zones will include but not be limited to: (1) continued monitoring during periods when peak pesticide application use occurs, (2) analysis of Pesticide Use Report (PUR) data, (3) Management Plan Monitoring, (4) conducting site subwatershed grower meetings, (5) encouraging and evaluating implementation of management practices, and (6) addressing the seven compliance components described in the Basin Plan in conjunction with dairy operators with irrigated lands and other entities identified as potential sources of discharges. The Coalition addresses toxicity, pesticides, and sediment bound analytes with specific management practices whether or not there is a TMDL in place. A narrative concerning each special monitoring constituent has been documented in the Coalition's Management Plan (submitted on September 30, 2008) as an effort by the Coalition to describe how it is meeting the TMDL requirements for Coalition members. This narrative will be updated in the Management Plan Update Report to be submitted on April 1, 2010 to account for activities that occurred during 2009. TMDL constituents currently include chlorpyrifos, diazinon, dissolved oxygen, salinity/boron and mercury.

The Coalition's Management Plan was approved on November 25, 2008 and describes the Coalitions strategy for intensive outreach and documentation of management practices which are enacted occur throughout the Coalition. As described in the Action Taken section, greater efforts to acquire these details are made at the site subwatersheds that the Coalition has designated as High Priority areas. The Coalition actively informs growers with irrigated crop land about water sampling results and the status of evolving water quality objectives, and obtains information on management practices. Furthermore, the Coalition conducts meetings in adjacent counties to provide growers with information on management practices that address toxicity or exceedances of water quality standards while also performing evaluations of these practices and their suitability for the Coalition's irrigated land.

The 2010 Management Plan Update Report will include an update on the following items:

1. Status of high priority subwatershed performance goals
2. Evaluation of current Management Plan strategy
3. Evaluation of management practices and water quality improvements
4. Status of TMDL constituents and Basin Plan requirements

## Conclusions and Recommendations

The following conclusions and recommendations answer the five key Program questions (ILRP MRP Order No. R5-2008-0005) based on water quality information obtained under the Coalition's MRPP for October 2008 through December 2009.

### QUESTION No.1: Are conditions in waters of the State that receive discharges of wastes from irrigated lands within Coalition Group boundaries, as a result of activities within those boundaries, protective of beneficial uses?

The results of the monitoring program from October 2008 through December 2009 indicate that although there has been substantial improvement in water quality in many areas, water quality is still not protective of beneficial uses across most of the coalition region (Table 43). The most common exceedances of WQTLs involve physical parameters such as DO and SC which resulted in impaired Agricultural and Aquatic Life Beneficial Uses. Other parameters such as *E. coli* and TDS also experienced numerous exceedances which resulted in impaired Recreational and Aquatic Life Beneficial Uses. The most common causes of impairment of the Municipal Beneficial Use were elevated concentrations of arsenic. While discharges from irrigated lands are possible sources of impairments to beneficial uses, natural or existing conditions are more commonly the likely sources of impairment of beneficial uses in waterways monitored by the Coalition

***Table 43. Monitoring sites (October 2008 through December 2009), beneficial uses (BU) associated with the downstream water body, and whether the sites met the WQTLs for the assigned beneficial uses.***

X indicates no sampling occurred during the years specified.

| Monitoring Site | Immediate Downstream Water Body | Beneficial Use Immediate Downstream Water Body | Status 2004-2007 Meets BUs? | Status 2008 Meets BUs? | Status 2009 Meets BUs? |
|---|---|---|---|---|---|
| Howard Lateral @ Hwy 140 | San Joaquin River (Sack Dam to mouth of Merced River) | MUN | X | X | No |
| | | AG | X | X | No |
| | | REC 1 | X | X | No |
| | | AQ Life | X | X | No |
| Lateral 2 ½ near Keyes Rd | San Joaquin River (mouth of Merced River to Vernalis) | MUN | X | X | No |
| | | AG | X | X | No |
| | | REC 1 | X | X | No |
| | | AQ Life | X | X | No |
| Merced River @ Santa Fe | Merced River (McSwain Reservoir to SJ River) | MUN | No | Yes | Yes |
| | | AG | Yes | Yes | Yes |
| | | REC 1 | No | Yes | Yes |
| Highline Canal @ Hwy 99 | San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR) | MUN | No | No | No |
| | | AG | Yes | No | No |
| | | REC 1 | No | No | No |
| | | AQ Life | No | No | No |
| Mustang Creek @ East Ave | San Joaquin River (mouth of Merced River to Vernalis) / Merced River (McSwain Reservoir to SJR) | MUN | No | No | No |
| | | AG | No | No | No |
| | | REC 1 | No | No | No |
| | | AQ Life | Yes | No | No |
| Prairie Flower Drain @ Crows Landing Rd | San Joaquin River (mouth of Merced River to Vernalis) | MUN | No | No | No |
| | | AG | No | No | No |
| | | REC 1 | No | No | No |
| | | AQ Life | No | No | No |
| Ash Slough @ Ave 21 | San Joaquin River (Sack Dam to mouth of Merced River) | MUN | No | Yes | Yes |
| | | AG | Yes | Yes | Yes |
| | | REC 1 | No | Yes | Yes |
| | | AQ Life | No | Yes | No |
| Cottonwood Creek @ Rd 20 | San Joaquin River (Sack Dam to mouth of Merced River) | MUN | No | Yes | Yes |
| | | AG | Yes | Yes | Yes |
| | | REC 1 | No | Yes | No |
| | | AQ Life | No | Yes | Yes |
| Deadman Creek @ Gurr Rd | San Joaquin River (Sack Dam to mouth of Merced River) | MUN | No | No | No |
| | | AG | Yes | Yes | No |
| | | REC 1 | No | No | No |
| | | AQ Life | No | No | No |
| Deadman Creek | San Joaquin River (Sack | MUN | No | Yes | No |

| Monitoring Site | Immediate Downstream Water Body | Beneficial Use Immediate Downstream Water Body | Status 2004-2007 Meets BUs? | Status 2008 Meets BUs? | Status 2009 Meets BUs? |
|---|---|---|---|---|---|
| @ Hwy 59 | Dam to mouth of Merced River) | AG | Yes | Yes | No |
| | | REC 1 | No | Yes | No |
| | | AQ Life | No | Yes | No |
| Duck Slough @ Gurr Rd | San Joaquin River (Sack Dam to mouth of Merced River) | MUN | No | Yes | No |
| | | AG | No | Yes | No |
| | | REC 1 | No | Yes | No |
| | | AQ Life | No | Yes | No |
| Duck Slough @ Hwy 99 | San Joaquin River (Sack Dam to mouth of Merced River) | MUN | No | No | Yes |
| | | AG | Yes | No | Yes |
| | | REC 1 | No | No | Yes |
| | | AQ Life | No | No | No |
| Mootz Drain @ Langworth Rd. | San Joaquin River (mouth of Merced River to Vernalis) | MUN | X | X | No |
| | | AG | X | X | No |
| | | REC 1 | X | X | No |
| | | AQ Life | X | X | No |
| Dry Creek @ Wellsford Rd | Tuolumne River (New Don Pedro Dam to SJ River) | MUN | No | No | No |
| | | AG | No | Yes | Yes |
| | | REC 1 | No | No | No |
| | | AQ Life | No | No | No |

### QUESTION No.2: What is the magnitude and extent of water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition Group boundaries, as determined using monitoring information?

Appendix II includes all tabulated results from October 2008 through December 2009. Exceedances occurred in every zone during 2009 (Table 44).

Exceedances of physical parameters and *E. coli* were more common than exceedances of pesticides or metals (16.7%, 40.7%, 0.6% and 1.5% respectively) (Table 44). And, as described in the Discussion of Results section, the zones differed substantially in the types of exceedances. For example, in Zone 2 (Prairie Flower Drain @ Crows Landing Rd) there were a large number of exceedances of SC, TDS, and nitrate (48 of 76 total samples). Zone 2 is located in the western portion of the Coalition region with shallow salty ground water and a high density of dairy operations. The discharges are most probably a result of intrusion of shallow ground water into Prairie Flower Drain (see response to Question #3 below). Zones 1 and 5 experienced frequent *E. coli* exceedances (19 of 29 samples and 15 of 28 samples, respectively) and are locations within the Coalition region with large numbers of rural dwellings near surface waters.

Some exceedances were more common seasonally. Warm water with little or no flow occurred during summer as did consistent exceedances of the dissolved oxygen (DO) WQTL. Mootz Drain was sampled in a large pond structure with little or no flow and as a result, there were exceedances of the DO WQTL in every month except January and February.

Exceedances of some parameters were limited to a single location. For example, exceedances of the arsenic WQTL occurred only at Deadman Creek @ Gurr Rd suggesting that geologic conditions and/or soils with elevated arsenic were responsible for the exceedances.

Overall, Zones 2 and 3 experienced the greatest percentage of exceedances (12.8 % and 7.7% respectively) while Zones 4 and 6 experienced the lowest percentage (1.9% and 3.5% respectively).

*Table 44. Number of exceedances by constituent group and zone.*

| Analyte Name | Zone 1 | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Zone 6 | | Total Exceed. | Total Samples | Pct Exceed. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exceed. Counts | Samples | Exceed. Counts | Samples | Exceed. Counts | Samples | Exceed. Counts | Samples | Exceed. Counts | Samples | Exceed. Counts | Samples | | | |
| **Physical Parameters** | 23 | 121 | 38 | 108 | 15 | 91 | 8 | 103 | 20 | 148 | 2 | 62 | 106 | 633 | **16.7%** |
| ***E. coli*** | 19 | 28 | 10 | 24 | 2 | 13 | 2 | 22 | 15 | 28 | 2 | 8 | 50 | 123 | **40.7%** |
| **Carbamates** | 0 | 78 | 0 | 54 | 0 | 24 | 0 | 42 | 0 | 97 | 0 | 6 | 0 | 301 | **0.0%** |
| **Organochlorines** | 0 | 36 | 0 | 18 | 1 | 18 | 0 | 48 | 0 | 48 | 0 | 0 | 1 | 168 | **0.6%** |
| **Organophosphates** | 3 | 160 | 1 | 109 | 1 | 51 | 1 | 181 | 1 | 258 | 0 | 12 | 7 | 772 | **0.9%** |
| **Group A Pesticides** | 0 | 66 | 1 | 33 | 0 | 0 | 1 | 88 | 0 | 0 | 0 | 0 | 2 | 187 | **1.1%** |
| **Herbicides** | 1 | 90 | 0 | 60 | 0 | 30 | 0 | 44 | 0 | 106 | 0 | 16 | 1 | 346 | **0.3%** |
| **Metals** | 0 | 142 | 0 | 90 | 3 | 52 | 1 | 182 | 6 | 258 | 1 | 8 | 11 | 732 | **1.5%** |
| **Nutrients** | 1 | 56 | 21 | 48 | 3 | 26 | 1 | 44 | 4 | 56 | 0 | 16 | 30 | 246 | **12.2%** |
| **Water Column Toxicity** | 1 | 39 | 2 | 31 | 0 | 17 | 1 | 21 | 6 | 47 | 0 | 15 | 10 | 170 | **5.9%** |
| **Sediment Toxicity** | 0 | 2 | 1 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 1 | 1 | 10 | **10.0%** |
| **Count per Zone** | **48** | **818** | **74** | **577** | **25** | **323** | **15** | **777** | **52** | **1048** | **5** | **144** | **219** | **3688** | |
| **Pct Exceed. per Zone** | **5.9%** | | **12.8%** | | **7.7%** | | **1.9%** | | **5.0%** | | **3.5%** | | **5.9%** | | |

### QUESTION No.3: What are the contributing source(s) from irrigated agriculture to the water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition Group boundaries?

For many parameters, it is not clear to what extent WQTL exceedances are from agricultural activities that result in off-site movement of farm inputs and sediment into waterways. Source identification of constituents that are not farm inputs is difficult especially for non-conserved constituents. There are numerous non-conserved constituents that can not be traced upstream, e.g. dissolved oxygen. For example, locations at the west side of the coalition region (Zone 2) experienced numerous exceedances of SC and TDS. The construction of drains such as Prairie Flower Drain occurred in the late 1800s as a means of lowering the shallow ground water table to a level that allowed crops to be grown. The shallow ground water is very salty and although indirectly a result of agriculture, the water in Prairie Flower Drain for a large portion of the year is not discharged by agriculture. Also, as discussed several times in previous semi-annual reports, *E. coli* source tracking analysis identified the coliform bacteria in the system as originating predominantly from human sources. Nitrate is a major cause of impairment of the Municipal Beneficial Use but may not be a result of fertilizer runoff into waterways. High nitrate is often a result of dairy operations but unless sophisticated isotopic analytical techniques are performed, it is not possible to distinguish nitrate from inorganic fertilizers applied to crop land from nitrate originating from dairy operations.

Many exceedances of currently labeled pesticides are the result of agricultural applications and enter surface waters as a result of spray drift or runoff in either storm water or irrigation return flows. Legacy pesticides no longer legal to use also continue to be found in Coalition sampling. The Coalition is continuing to identify sources of WQTL exceedances of currently registered pesticides through PUR, assessment of water quality data and evaluation of current management practices. The Coalition's sourcing strategy is further described in the Coalition's Management Plan.

### QUESTION No.4: What are the management practices that are being implemented to reduce the impacts of irrigated agriculture on waters of the State within the Coalition Group boundaries and where are they being applied?

The Coalition conducts outreach and education regarding management practices known to be effective in reducing impact of irrigated agriculture on waters of the State through grower meetings, management practice handouts and booklets and through individual grower visits in high priority subwatersheds. The section Actions Taken to Address Water Quality Exceedances includes documentation of outreach activities.

The Coalition has obtained management practice information from members through General Surveys which have been mailed to members in the Coalition region since 2007. The Coalition submitted a General Survey Summary Report in January 2009 tabulating management practices

documented through those surveys on a subwatershed level and is used by the Coalition as an overall baseline of management practices.

The Coalition has prioritized Management Plan sites and constituents and is focusing on obtaining management practice information from priority subwatersheds. A schedule of subwatershed prioritization is included in the Coalition's Management Plan. In high priority subwatersheds, the Coalition conducts individual visits with growers to discuss current management practices and the potential for implementing additional management practices.

Information on management practices provided by the Coalition to growers is tailored to the individual grower and typically involves the elimination of spray drift and/or surface runoff and switching to inputs or farming practices that do not pose a risk to water quality.

The management practices recommended determined by previous analyses and farm visits. For locations with the potential for spray drift, the following practices are recommended:

1. Shut off outside nozzles when spraying outer rows; and/or
2. Spray areas close to water bodies when the wind is blowing away from them; and/or
3. When using orchard air blast sprayers, making applications when the wind is between 3-10 mph and upwind of a sensitive site

For locations with the potential for surface runoff, recommended practices include:

1. Controlling the timing of pumping/draining into the waterway,
2. Planting vegetation in the ditches and
3. Constructing drainage basins/sediment ponds
4. Using farm inputs or practices that do not pose a risk to water quality.

Details on these specific management practices will be provided in the Management Plan Update Report to be submitted on April 1, 2010. The monitoring results are examined to determine if the pattern of exceedances with respect to timing and concentration are indicative of runoff or drift. Growers that are possible contributors to exceedances are identified and individual visits are scheduled. During the visit, the Coalition representative tours the farming operation and determines if surface runoff or drift are possible. After identifying the most probable source of contamination, the Coalition representative discusses the appropriate management practices with the grower and assesses whether the grower can implement additional practices.

Growers in the first three priority watersheds were visited last spring and early summer and additional contacts are occurring now to determine if practices recommended to the growers are being implemented. That assessment will be provided in the Management Plan Update Report (April 1, 2010). However, monitoring data indicate that the number of exceedances of

pesticides and metals (e.g. chlorpyrifos and copper) decreased during 2009 relative to previous years indicating an improvement in water quality, most likely a result of the implementation of management practices.

### QUESTION No.5: Are water quality conditions in waters of the State within Coalition Group boundaries getting better or worse through implementation of management practices?

Monitoring data indicate that the number of exceedances of pesticides and metals decreased relative to in previous years most notably in the three high priority site subwatersheds. These three locations were prioritized first due to the frequency and magnitude of pesticide exceedances from 2004 to 2008, in particular chlorpyrifos and overall poor water quality Monitoring results from the summer of 2009 indicate that visits from Coalition representatives and the presumed implementation of management practices are resulting in improved water quality.

Overall, there were fewer exceedances of metals and pesticides across the coalition region in 2009 compared to 2008. In the case of metals, the reduction in exceedances is a result of the Coalition's testing for dissolved metals rather than total metals. When testing for total metals, a calculation was performed to convert total metal to dissolved metal and the conversion resulted in numerous exceedances. The lack of exceedances when analyzing for dissolved metals indicates the conversion may not be accurate and it is not known if the improvement in water quality is a result of the inaccurate conversion or a reduction in the concentration of metals in surface waters. The Coalition will perform an analysis of the data and provide the results in the Management Plan Update to be submitted on April 1, 2010. The metals causing the greatest number of exceedances were copper with 6 exceedances in 77 samples (7.8%) and arsenic with 5 exceedances in 33 samples (15%). As mentioned above, all of the arsenic exceedances occurred at a single site, and the 6 copper exceedances occurred at 4 sites suggesting that arsenic was a result of site-specific factors and copper exceedances were a result of similar conditions across the Coalition region. For copper, it is difficult to determine if these conditions are the result of agricultural practices. However, Coalition representatives are discussing management practices with growers that should result in reductions of dissolved copper if copper exceedances are the result of applications of copper-based pesticides.

There were fewer pesticide exceedances in 2009 compared to past years. If legacy pesticides are eliminated from consideration, chlorpyrifos remains the most problematic pesticide applied in the Coalition region with 7 exceedances from October 2008 to December 2009. The only other currently registered pesticide that caused an exceedance was diuron.

Water column toxicity occurred in 10 of 170 samples (5.9%) in 2009 compared to 37 samples that experienced toxicity in 2008. Of the 37 toxic samples in 2008, 35 were toxic to *Selenastrum* and 2 were toxic to *Ceriodaphnia*. In 2009, 5 samples were toxic to *Selenastrum*, 3

to *Pimephales*, and 2 to *Ceriodaphnia* indicating a significant decline in Selenastrum toxicity. Monthly monitoring during the winter and spring should identify at least as many diuron exceedances as in previous years if those exceedances were occurring. The other area with notable improvement was sediment toxicity. In the past, sediment toxicity occurred at between 40 and 60% of the samples. Toxicity in samples from the two events collected in 2009 was only 10% (1 of 10 samples), a significant improvement over previous years. For example, in 2008, sediment toxicity occurred in 24 samples.

The conclusions from these data are that 1) individual grower visits are an effective method of communicating with members, and 2) implementation of management practices is improving water quality in the Coalition region.