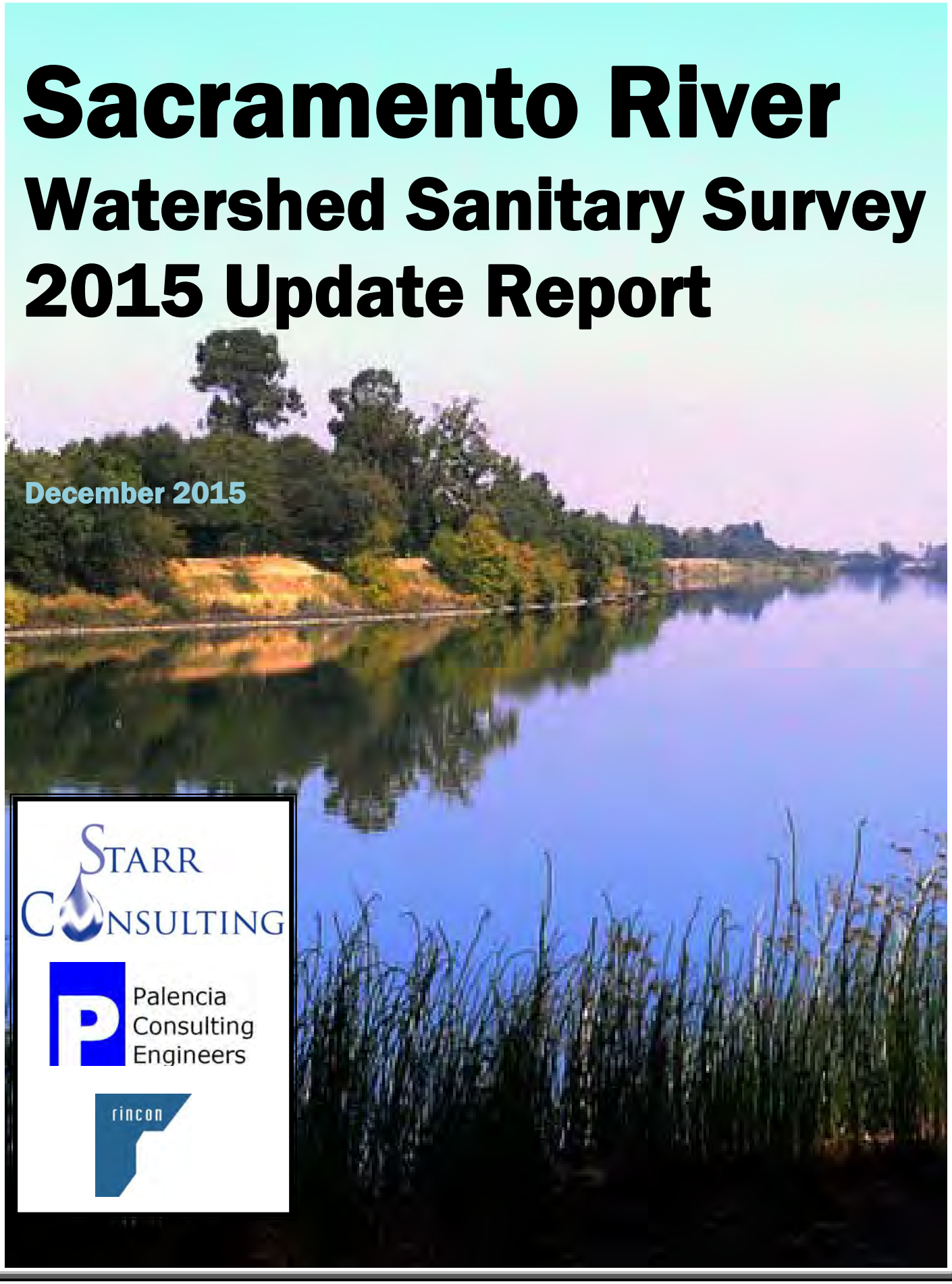
Sacramento River
Watershed Sanitary Survey
2015 Update Report



December 2015

STARR CONSULTING

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SACRAMENTO RIVER WATERSHED SANITARY SURVEY
2015 UPDATE REPORT

DECEMBER 2015

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1995 Survey – Sacramento River Watershed Sanitary Survey, December 1995
2000 Update – Sacramento River Watershed Sanitary Survey, December 2000
2010 Update – Sacramento River Watershed Sanitary Survey 2010 Update
2015 Update – Sacramento River Watershed Sanitary Survey 2015 Update

AAL – Archived Advisory Level
ACH – Aluminum Chlorohydrate
ACLC – Administrative Civil Liability Complaint
ACP – Agricultural Civil Penalty
AFB – Air Force Base
AFO – animal feeding operation
Air Force – US Department of the Air Force
APG – Adaptation Planning Guide
ARGET – American River Groundwater Extraction and Treatment
AWAF – Abandoned Watercraft Abatement Fund
AWWA – American Water Works Association

BDCP – Bay Delta Conservation Plan
BKS – Betts-Kismat-Silva
BMP – best management practice
BNR – biological nutrient removal
BS1 – Butte Slough

CAAP – concentrated aquatic animal production
CAC – County Agricultural Commissioner
$CaCO_3$ – calcium carbonate
CAFO – concentrated animal feeding operation
CalFIRE – California Department of Forestry and Fire Protection
Cal OES – California Office of Emergency Services
Caltrans – California Department of Transportation
Campaign – Boating Clean and Green Campaign
CAP – *Cryptosporidium* Action Plan
CA Water Fix – California Water Fix
CBD – Colusa Basin Drain
CBD1 – Colusa Basin Drain near Knights Landing
CBD5 – Colusa Basin Drain near Highway 20
CCBN – California Clean Boating Network
CCC – California Coastal Commission
CCL4 – Contaminant Candidate List 4
CCR – Consumer Confidence Report
CDO – Cease and Desist Order
CEDEN – California Environmental Data Exchange Network
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFE – combined filter effluent
cfs – cubic feet per second
CIWQS - California Integrated Water Quality System

CRC – California Rice Commission
CREAT – Climate Resiliency Evaluation and Awareness Tool
CRRIC – California Rangelands Research and Information Center
CRWL – California Rangelands Watershed Laboratory
CRWU – Climate Ready Water Utilities
CS – collection system
CSO – Combined Sewer Overflow
CSS – Combined Sewer System
CT – disinfection contact time
CUPA – Certified Unified Program Agency
CV-SALTS – Central Valley Salinity Alternatives for Long-Term Sustainability
CWA – Clean Water Act
CWTP – Combined Wastewater Treatment Plant
cysts/L – cysts per liter

D/DBP Rule – Disinfectants/Disinfection By-Products Rule
DBP – disinfection by-product
DBW – California State Parks, Division of Boating and Waterways
DDD – p,p'-Dichlorodiphenyl dichloroethane
DDE – p,p'-Dichlorodiphenyl dichloroethylene
DDW – State Water Resources Control Board, Division of Drinking Water
DOC – dissolved organic carbon
DOD – US Department of Defense
DPR – California Department of Pesticide Regulation
DQAP – Dairy Quality Assurance Program
DSC – Delta Stewardship Council
DTSC – Department of Toxic Substances Control
DWR - California Department of Water Resources
DWR CMP – DWR Sacramento Watershed Coordinated Monitoring Program
DWR MWQI – DWR Municipal Water Quality Investigations

E. coli – *Escherichia coli*
EIR – Environmental Impact Report
EIS – Environmental Impact Statement
EBMUD – East Bay Municipal Utility District
EOC – Emergency Operations Center
EOS – End of September
ERA – Exceedence Response Actions
EW – Extraction Well

°F – degree Fahrenheit
FRWA – Freeport Regional Water Authority
FSA – Farm Service Agency
FSC – Folsom South Canal

GAC – Granular Activated Carbon

GCM – global circulation model
GET – groundwater extraction and treatment
GHG – greenhouse gas
GIS – geographic information system
GKWTP – George Kristoff Water Treatment Plant
gpm – gallons per minute
gpm/sf – gallons per minute per square foot
GRAP – Grazing Regulatory Action Project
GWTS – groundwater treatment system

HA – Health Advisory
HAA5 – haloacetic acids
HBSL – Health Based Screening Level
HHBP – Human Health Benchmark for Pesticides

IFE – individual filter effluent
IESWTR – Interim Enhanced Surface Water Treatment Rule
ILRP – Irrigated Lands Regulatory Program
IPCC – Intergovernmental Panel on Climate Change
IRIS – Integrated Risk Information System

JFP – Joint Federal Project

KOWC – Keep Our Waters Clean

LID – Low Impact Development
LRAA – locational running annual average
LT1ESWTR – Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR – Long Term 2 Enhanced Surface Water Treatment Rule

MAF – million acre feet
MCL – maximum contaminant level
MEP – maximum extent practicable
mg – million gallons
mg/L – milligrams per liter
mgd – million gallons per day
mm - millimeter
MOU – Memorandum of Understanding
MPN/100 mL – most probable number per 100 milliliters
MRAA – maximum running annual average
MRP – Monitoring and Reporting Program
MS4 – Municipal Separate Storm Drain System
MUN – Municipal and Domestic Water Supply
MW – monitoring well

NA – Not Available

NAL – Numeric Action Level
NAWQA – National Ambient Water Quality Assessment Program
ND – non-detect
NDMA – N-nitrosodimethylamine
NEL – Numeric Effluent Limitation
ng/L – nanograms per liter
NIMS – National Incident Management System
NL – Notification Level
NMWC – Natomas Mutual Water Company
N/O – Not operational
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
NPS – Non-Point Source
NRCS – Natural Resources Conservation Service
NTU – nephelometric turbidity unit

OAL – Office of Administrative Law
oocysts/L – oocysts per liter
OU – operating unit

PAC – polyaluminum chloride
PCE – tetrachloroethylene
PCWA – Placer County Water Agency
PHG – Public Health Goal
POA – Principles of Agreement
POTW – Publicly Owned Treatment Work
PRG – preliminary remediation goal

QSE – qualifying storm event

RAA – running annual average
RD – reclamation district
RDEIR/SDEIS – Recirculated Draft EIR/Supplemental Draft EIS
RDM – robust decision making
Regional Board – Central Valley Regional Water Quality Control Board
Regional Plant – Regional San Regional Wastewater Treatment Plant
Regional San – Sacramento Regional County Sanitation District
RIMS – Response Information Management System
RLECWD – Rio Linda/Elverta Community Water District
RMAC – Rangeland Management Advisory Committee
RMP – Regional Monitoring Plan
ROD – Record of Decision
ROWD – Report of Waste Discharge
RPA – reasonable potential analysis
RPP – Rice Pesticide Program
RWQMP – Rangeland Water Quality Management Program

RWTF – Regional Water Treatment Facility

Sacramento CMP – Sacramento Coordinated Monitoring Program
SASD – Sacramento Area Sewer District
SCADA – system control and data acquisition
SCWA – Sacramento County Water Agency
SDWA – Safe Drinking Water Act
Second Update – Sacramento River Watershed Sanitary Survey Second Update
SEMS – Standardized Emergency Management System
SEWG – Storm Event Work Group
SMARTS – Stormwater Multiple Application and Report Tracking System
SMD – Sewer Maintenance District
SOC – synthetic organic compound
SQIP – Stormwater Quality Improvement Plan
SR1 – Sacramento River at Village Marina
SRR – Sacramento River Water Treatment Plant intake
SRSWPP – Sacramento River Source Water Protection Program
SRRWRP – Sacramento River Regional Water Reliability Project
SRWTP – Sacramento River Water Treatment Plant
SSB – Sacramento Slough Bridge near Karnak
SSMP – Sanitary Sewer Management Plan
SSO – Sanitary Sewer Overflow
SSQP – Sacramento Stormwater Quality Partnership
State Board – State Water Resources Control Board
sVGP – Small Vessel General Program
SVWQC – Sacramento Valley Water Quality Coalition
SWAMP – Surface Water Ambient Monitoring Program
SWMP – Stormwater Management Plan
SWPPP – Stormwater Pollution Prevention Plan
SWTR – Surface Water Treatment Rule

TAF – thousand acre feet
TC – Technical Committee
TCE – trichloroethylene
TMDL – Total Maximum Daily Load
TOC – total organic carbon
TSS – Total Suspended Solids
TTHM – total trihalomethanes

UC Davis – University of California at Davis
UCCE – University of California Cooperative Extension
UCMR3 – Unregulated Contaminant Monitoring Rule 3
µg/L – micrograms per liter
UPRR – Union Pacific Railroad
US – United States
USACE – US Army Corps of Engineers

USBLM – US Bureau of Land Management
USBR – US Bureau of Reclamation
USDA – US Department of Agriculture
USEPA – US Environmental Protection Agency
USFS – US Forest Service
USGS – US Geological Survey
UV – ultraviolet light
UVA – UV absorbance
UV254 – ultraviolet light at 254 nanometers

VGP – Vessel General Permit
VOC – volatile organic compound
VSWTP – Vineyard Surface Water Treatment Plant
VTIP – Vessel Turn-In Program

WCM – Water Control Manual
WDCWA – Woodland-Davis Clean Water Agency
WDRs – waste discharge requirements
WQMH – Water Quality Management Handbook
WQMP – Water Quality Management Plan
WPCP – Water Pollution Control Plant
WSR – George Kristoff Water Treatment Plant intake
WTP – water treatment plant
WWTF – Wastewater Treatment Facility
WWTP – Wastewater Treatment Plant
WWTRF – Wastewater Treatment and Reclamation Facility

Drinking water utilities that use surface water are required by the State Water Resources Control Board, Division of Drinking Water (DDW) to conduct a watershed sanitary survey for that source, under the California Surface Water Treatment Rule (SWTR), and then update that study every five years. This 2015 Update to the Sacramento River Watershed Sanitary Survey (2015 Update) is the fourth update and covers the period January 2010 through December 2014. This report presents the information collected and the evaluations conducted, highlights key changes over the past five years, identifies key findings, and presents recommendations for source and treated water protection.

OBJECTIVES OF THE 2015 UPDATE

The primary objective of this 2015 Update is to assess the source water quality of the Sacramento River to ensure the ability of the existing water treatment plants in the vicinity of the Sacramento metropolitan area to continue to provide their customers with drinking water that meets all drinking water standards. This 2015 Update also presents information on the new and potential future diversions, for the respective participating water agencies, to use in selecting and planning treatment facilities.

This 2015 Update also accomplishes some other specific objectives including:

- Comply with the regulatory requirements of the SWTR and its subsequent amendments.
- Identification of significant changes within the last five years that may affect source water quality.
- Review and evaluation of selected constituents of interest to identify potential water quality or treatment issues at each water treatment plant or potential future diversion site. Assess the ability of the existing water treatment plants to meet standards based on current regulatory framework, as well as comment on the appropriate level of treatment for pathogens, specifically for *Giardia*, viruses, and *Cryptosporidium*.
- Review and evaluation of selected watershed contaminant sources to identify potential impacts on source water quality.
- Development of reasonable recommendations that are feasible and within the authority of the participating water agencies to implement. Watershed contaminant sources are targeted that may have the most impact on source water quality and could benefit from additional preventative efforts, such as activities located in the near intake protection zones or activities that are predominant in the watershed.

PARTICIPATING WATER AGENCIES

The City of West Sacramento and City of Sacramento (Cities) jointly conducted the 1995 Survey and the 2000 Update. The Second Update was conducted by the Cities as well as Placer County Water Agency (PCWA), the City of Roseville, Sacramento County Water Agency (SCWA), and East Bay Municipal Utility District (EBMUD). PCWA and

the City of Roseville participated in anticipation of a potential future diversion from the Sacramento River to supply western Placer County. The 2010 Update was conducted by the Cities, PCWA, the City of Roseville, SCWA, and EBMUD, as well as the Woodland-Davis Clean Water Agency (WDCWA). WDCWA participated in anticipation of a new diversion from the Sacramento River for the cities of Woodland and Davis, as well as the University of California at Davis. This 2015 Update is being conducted by the same water agencies as the 2010 Update. Together this group is herein referred to as the participating water agencies. The diversions and facilities included in this 2015 Update include, from upstream to downstream:

- The potential future Sacramento River Regional Water Reliability Project (SRRWRP) water diversion for western Placer and northern Sacramento counties is expected to utilize the Natomas Mutual Water Company (NMWC) Sankey Road and Pritchard Lake pumping plants, located approximately at River Miles 79 and 75, respectively.
- The new water diversion for WDCWA is located approximately at River Mile 70.5 just upstream of the I-5 Bridge crossing at Veteran's Bridge.
- The City of West Sacramento diverts water to its George Kristoff Water Treatment Plant (GKWTP), formerly known as the Bryte Bend Water Treatment Plant, from the Sacramento River approximately two miles upstream of the confluence with the American River, near River Mile 62.5.
- The City of Sacramento diverts water to its Sacramento River Water Treatment Plant (SRWTP) from the Sacramento River just downstream of the American River confluence, near River Mile 60.
- The water diversion for Freeport Regional Water Authority (FRWA) is located near River Mile 47, approximately 13 miles downstream of the American River confluence and upstream of the Freeport Bridge. This is the supply for SCWA's Vineyard Surface Water Treatment Plant (VSWTP) and a source water supply for EBMUD.

SACRAMENTO RIVER SOURCE WATER PROTECTION PROGRAM

The City of Sacramento, City of West Sacramento, and SCWA sponsor the Sacramento River Source Water Protection Program (SRSWPP). This partnership provides joint follow-up source water protection efforts based on recommendations from the Sacramento River Watershed Sanitary Survey Updates. Joint work is conducted using expert support, and some work is also conducted by individual agencies and shared with the group. This program is also coordinated with EBMUD and WDCWA. The Sacramento River Source Water Protection Program seeks to preserve and protect the source water quality of the Sacramento River drinking water supply for current and future generations.

There are several key focus areas of the program:

- Pesticides, including proactive stakeholder efforts on the rice herbicide thiobencarb and other stakeholder efforts to support protection of the Sacramento River water supply from current, increased use, and new pesticides of potential importance for drinking water public health and aesthetics.
- Agricultural discharge, including active stakeholder participation in the Irrigated Lands Regulatory Program for the Rice Waiver and Sacramento Valley orders.
- Industrial National Pollutant Discharge Elimination System (NPDES) permits, including review and comment on revised permits and direct coordination and networking with regulators and dischargers.
- Voluntary Spill Notification Program, including direct notification from upstream participating agencies and development of tools to assist with spill notification and response. EBMUD and WDCWA participate in this program.

During the study period, the program received the American Water Works Association (AWWA) California/Nevada Section's 2010 Exemplary Source Water Protection Award. In addition, the City of Sacramento received the 2012 AWWA Exemplary Source Water Protection Program award for metropolitan-sized system on behalf of the program.

SIGNIFICANT CHANGES SINCE 2010 UPDATE

During the past five years, new information has been generated that was used to evaluate source water quality, treatment capabilities, and watershed contaminant sources, and has been summarized in **Section 6**. Some key changes and continued efforts include:

- The scope of interest for this 2015 Update includes the potential future SRRWRP diversion. This project is in the early stages of planning, but expects to utilize two existing NMWC intake structures on the Sacramento River near Pritchard Lake and Sankey Road and treat water at a central Regional Water Treatment Plant east of Sacramento International Airport.
- The new WDCWA diversion and associated Regional Water Treatment Facility (RWTF) is under construction with operations expected to begin in June 2016.
- The City of West Sacramento's GKWTP did not undergo any changes but a new 3 million gallon (mg) storage tank and associated pump station were constructed in the distribution system.
- The City of Sacramento's SRWTP is currently undergoing a plant remodeling project to replace one of the flocculation/sedimentation basins as well as eight old filters. In addition, sludge dewatering was added to help with solids handling, the high service pump station was replaced, and vortex breakers were added to the intake structure to assist with pump cavitation under low flow scenarios.

- The FRWA intake became operational in September 2011 to supply SCWA's VSWTP and EBMUD's raw water supply system.
- There has been a significant quantity of water quality data collected by the participating water agencies and by other ambient monitoring programs. There was limited pathogen data (*Giardia* and *Cryptosporidium*), but substantial organics, total organic carbon (TOC), and metals data to evaluate. These data allow for a more comprehensive assessment of source and treated water quality.
- The Sacramento Coordinated Monitoring Program (Sacramento CMP), implemented locally by permitted discharge agencies, ceased ambient monitoring on the Sacramento River in 2015. Future sampling is uncertain at this time. Future data of interest may be available from the Delta Regional Monitoring Program (RMP).
- Data indicate that there is a significant increase in TOC levels in the Sacramento River between Colusa and Verona. Agricultural drains entering in this reach of the river have higher levels of TOC than the mainstem. TOC levels in the source water appear to be increasing over time. Treated water TOC levels at the water treatment plants has increased since 2012.
- The City of Sacramento had a higher than normal TTHM level at one location associated with the SRWTP that triggered Operational Evaluations for two quarters under the Stage 2 Disinfectants/Disinfection By-Products (D/DBP) Rule.
- Data indicate that iron, aluminum, and manganese levels in the Sacramento River can exceed the secondary MCLs. Similar to TOC, the levels increase between Colusa and Verona and agricultural drains have higher levels than the mainstem.
- The Central Valley Regional Water Quality Control Board (Regional Board) has adopted a new, long-term management program for agricultural drainage; the Irrigated Lands Regulatory Program (ILRP). This includes issuance of two coalition group orders in the Sacramento Valley: one for rice crops and one for all other irrigated crops.
- There was an increase in the acreage of rice grown in the Sacramento Valley during the study period, and an increase in the amount of pesticides applied. During the 2013 and 2014 rice growing seasons there were more frequent detections of thiobencarb in agricultural drains and at higher concentrations than the previous study period. There were also low detections at the GKWTP intake in 2011 and 2013 as part of the special rice season monitoring program; all were below levels of human health concern and below the secondary drinking water standard.
- There was also an increase in the acreage of orchards planted in the Sacramento Valley during the study period. There is a broader spectrum of pesticides used on a wide variety of crops. Few pesticides were detected in the Sacramento River watershed upstream of Freeport, and those detects were generally very low and sporadic.

- The livestock population in the Sacramento River watershed continued to decrease during the study period. In addition, regulation and management efforts increased for both rangeland and dairy livestock.
- Public education related to recreation has continued through “Keep Our Waters Clean” and the “Pups in the Park” campaigns.
- The homeless population has stabilized in the near intake protection zone and strong management programs in both Sacramento and Yolo counties continue efforts to assist unsheltered homeless.
- Urban runoff management expanded under the Phase 2 National Pollutant Discharge Elimination System (NPDES) permit program, as well as updates to the Phase 1 NPDES permits, and a new Industrial Stormwater NPDES permit.
- Two industrial NPDES dischargers located in the near intake protection zone, both under the California Department of General Services, ceased discharging and their permits were rescinded.
- Two municipal wastewater treatment plants (WWTP) ceased discharging during the study period, five were upgraded or replaced, another ceased discharging in July 2015, and two plan to convert to land disposal by 2018.
- There was a reduction in the volume of untreated wastewater discharged into the river system from sanitary sewer overflows (SSOs) during the study period.
- The new California Office of Emergency Services (Cal OES) Oil by Rail program provides information on and management of Bakken Crude oil shipments into California via railroad.
- Population growth in the watershed has slowed again. Over the past five years most growth occurred in or near the Sacramento metropolitan area. Increases in population may lead to an increasing urbanization of the watershed as well as land use changes.
- Regional Board programs and policies are increasingly addressing the Municipal and Domestic Water Supply (MUN) beneficial use, but may not be sufficiently addressing long-term, downstream protections.
- There are several key activities underway that may have the potential to impact how the Central Valley water supply system is operated. Any operational modifications to reservoir storage and river flows have a high likelihood of impacting the source water quality of the Sacramento River.

KEY FINDINGS AND CONCLUSIONS

The key findings and conclusions for this report are organized as they pertain to river water quality, treatment and water quality regulatory compliance, watershed contaminant sources, and impact of agency source water protection activities and are presented in **Section 6**. Highlights of these findings and conclusions are presented below.

River Water Quality

Overall, the Sacramento River continued to provide good quality raw water. The raw water can currently be treated to meet all drinking water standards using conventional water treatment processes. There are no long-term constituent trends prevalent in the raw water that necessitate special treatment processes at this time. Key findings for each of the constituents of interest are presented below.

Turbidity

The turbidity levels are seasonally variable, with the highest levels occurring during the wet season, typically in January and February. Turbidity appears to be related to high river flow, caused by upstream sources as well as local precipitation, for the existing water treatment plants as well as at the ambient monitoring sites. The turbidity levels at SRWTP are generally lower than GKWTP, likely due to the influence of the Lower American River. Turbidity data at the Veteran's Bridge monitoring site are comparable to the data provided for WDCWA and GKWTP, therefore the potential future SRRWRP diversion is likely to have similar turbidity levels. Turbidity data at VSWTP is lower than the other water treatment plants, likely due to sedimentation occurring at the FRWA intake and in the 13 mile transmission pipeline to the water treatment plant site.

Coliform

Average and median *Escherichia coli* (*E. coli)* levels increase downstream. The large difference between the median and average values at each site indicates that there are high outlying values, or peak events. Elevated levels of coliform occur during the winter months at all monitoring sites. The highest levels occur during high precipitation events, which are the periods of high flow from the main stem river and tributaries as well as local discharges from precipitation events. Overall, the *E. coli* levels have remained on the same order of magnitude over the past ten years; with median values at all existing water treatment plants around 15 most probable number per 100 milliliters (MPN/100 mL). In almost all cases, the monthly medians at GKWTP, SRWTP, and VSWTP are less than 200 MPN/100 mL.

Giardia/Cryptosporidium

During the study period available *Giardia* and *Cryptosporidium* data included only 26 samples for each protozoan at the WDCWA diversion. Less than eight percent of samples were presumptively positive for *Cryptosporidium*, with an average concentration of 0.014 oocysts per liter (oocysts/L). Fifty percent of *Giardia* samples were presumptively positive, with an average concentration of 0.076 cysts per liter (cysts/L). The data reports did not allow for assessment of confirmed protozoa species. The relatively low frequency of confirmed detections is consistent with historical data and indicates that the presence of these protozoa is most likely low. When detected, concentrations are near detection limits. No correlations or trends were identified.

Total Organic Carbon

Only the new WDCWA diversion had a median raw water TOC value greater than 2 milligrams per liter (mg/L) during the study period. The average values of TOC were higher than the median values at all sites. Raw water TOC levels at SRWTP and VSWTP have lower levels than the GKWTP, likely due to the influence of the Lower American River on the Sacramento River water downstream of the confluence of the rivers. TOC levels are seasonally variable, with the highest levels during the wet season (late fall to early spring). The Department of Water Resources Coordinated Monitoring Program (DWR CMP) data show that there are significant increases in TOC along the Sacramento River between Colusa and Verona, where three large agricultural drains enter the river (Butte Slough, Colusa Basin Drain, and Sacramento Slough). The highest levels were seen in the Colusa Basin Drain, with a median value of 7.2 mg/L. Raw water levels at GKWTP are lower during this study period than the 2010 Update, but raw water levels at SRWTP and ambient sampling through the Sacramento CMP at Veteran's Bridge, Discovery Park, and Freeport have seen significant increases since the 2010 Update.

Volatile and Synthetic Organic Compounds

Other than the low level detection of the rice herbicide thiobencarb at the GKWTP in the special rice season monitoring program, there were no other reported detections of any volatile organic compounds (VOCs) or synthetic organic compounds (SOCs) in the raw water at the existing water treatment plants or in the monitoring conducted for the new WDCWA diversion. There were a few detects of other VOCs and SOCs in ambient samples from the Sacramento CMP and US Geological Survey (USGS) monitoring at Freeport, however all but one were below respective drinking water standards or Notification Levels.

Aluminum/Iron/Manganese

Raw water levels of iron and aluminum can be well above their respective secondary MCLs in the Sacramento River. Average and median values are near, or greater than, the secondary MCL for aluminum and iron at all monitoring locations, except for Discovery Park on the Lower American River. The DWR CMP collected quarterly samples during the study period along the Sacramento River, and the data shows that aluminum and iron levels increase between Hamilton City and Colusa, and then again between Colusa and Verona. Stony Creek is a tributary entering downstream of Hamilton City that could be contributing metals to the Sacramento River. Butte Slough, Colusa Basin Drain, and Sutter Bypass all enter downstream of Colusa and have recorded very high levels of aluminum and iron. Another increase from Verona to WDCWA is not well understood, but could be related to the Natomas Cross Canal or Reclamation District (RD) 1000 discharges into the Sacramento River.

Total manganese levels in raw water can also be found above its secondary MCL. WDCWA has the most extensive data set of the participating water agencies, and the

average and median were similar and just below the secondary MCL. Peaks were seen as high as 200 micrograms per liter (µg/L). The DWR CMP also collected data for manganese and the same trend was seen for manganese as iron and aluminum, so the same sources are likely contributing manganese as well, but at lower overall levels.

Treatment and Water Quality Regulatory Compliance

The GKWTP, SRWTP, and VSWTP are currently in compliance with all existing drinking water regulations. All participating water agencies implement conventional filtration processes and meet all current drinking water standards, including MCLs and treatment technology requirements. The water treatment plant at the potential future SRRWRP diversion will be, and new WDCWA RWTF has been, designed to meet all drinking water standards. Below is a summary of the key treatment and regulatory compliance topics.

Giardia/Virus/Cryptosporidium Reduction Requirements

Monthly median *E. coli* values are less than 200 MPN/100 mL in almost all cases at all three existing water treatment plants, and presumed *Giardia* detects have concentrations near the detection limits; therefore, the source water microbial data support that 3/4-log reduction requirements for *Giardia* and viruses continue to be appropriate. The water treatment plants achieve excellent suspended solids removal with average combined filter effluent turbidities of less than 0.04 nephelometric turbidity units (NTU) and at least 99.6 percent solids removed. Treated water turbidity at GKWTP, SRWTP, and VSWTP meets the Interim Enhanced Surface Water Treatment Rule (IESWTR) standards, and all plants have a 2-log reduction credit for *Cryptosporidium*. Existing data for *Cryptosporidium* levels, collected as part of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), have put SRWTP, GKWTP, VSWTP, and the new WDCWA diversion in the Bin 1 classification. Therefore, all water treatment plants should continue to, or plan to, provide 3/4/2-log reduction for *Giardia*/virus/*Cryptosporidium*.

Total Organic Carbon

The treated water TOC levels at both GKWTP and SRWTP were increasing during the study period, especially after May 2012 when the treated water has not been able to be reduced to less than 1 mg/L as it historically was. The cause of this is unknown, but it likely indicates an increased presence of dissolved organic carbon (DOC) as it is not removed by conventional filtration and would pass through to the treated water. The City of West Sacramento did not meet enhanced coagulation requirements in two months during the study period, but the running annual average (RAA) was always in compliance with the regulations.

Disinfection By-Products

Distribution system levels for TTHM and haloacetic acids (HAA5) are less than 80 and 60 µg/L, respectively, for both RAA and LRAA, for GKWTP, SRWTP, and VSWTP. A distribution system site associated with the SRWTP had a higher than normal TTHM result in one quarter that triggered an Operational Evaluation on two occasions in 2014; the City of Sacramento conducted the Operational Evaluations. The City of Sacramento saw its highest peaks of TTHM and HAA5 during the study period in 2014, coincident with the increasing treated water TOC levels.

Source Water/Watershed Contaminant Sources

There are numerous types of contaminant sources in the watershed. Eight activities were selected for evaluation in this report based on constituents of interest, proximity to protection zones, and/or predominance in the watershed. The key findings for each of these activities are provided below.

Agricultural Drainage

The acreage of irrigated agriculture in the Sacramento Valley decreased slightly, two percent, in the past five years to approximately 1.89 million acres. The acreage of rice production accounts for nearly 30 percent of that land, and it saw an increase of six percent between 2007 and 2012. Orchards account for a similar percentage, and have seen an 18 percent increase between 2007 and 2012. Pastureland accounts for less than 15 percent, and has seen a 12 percent decrease in acreage over the five year period. The remaining acreage is row crops and wetlands.

As part of a special rice season monitoring program associated with the Rice Pesticide Program (RPP), there were low level detections of the rice herbicide thiobencarb at the GKWTP intake in 2011 and 2013, but these did not exceed the secondary drinking water standard. There was an increasing number and level of thiobencarb detections in the agricultural drainages in 2013 and 2014, well above the Performance Goal of 1.5 µg/L. Pesticide use on rice increased slightly during this study period, as compared with the last five year period. The RPP has continued with generally the same management measures, with efforts to address the increased levels in the agricultural drains.

The Regional Board adopted the long-term ILRP, issuing orders to two coalition groups formed in the Sacramento Valley – one for rice, the Sacramento Valley Rice Growers order (replacing the conditional Rice Waiver Program), and one for all other irrigated agriculture, the Growers within the Sacramento River Watershed that are Members of a Third-Party Group (replacing the conditional Sacramento Valley Water Quality Coalition [SVWQC]). The Rice Waiver Program investigated a broader suite of constituents than the RPP. There were detectable levels of propanil, clomazone, and triclopyr, which have no drinking water standards, in agricultural drains. High turbidity and TOC levels were found in the rice drainage during the irrigation season. The SVWQC monitored for a wide suite of constituents in the Sacramento River watershed. There was only one

pesticide detected in the watershed upstream of Freeport above the drinking water standards, simazine, and the detections were isolated events. Other pesticides were detected, but were generally well below any human health thresholds. Data for TOC shows similar levels to rice drainage, which is comprised of mostly non-humic, dissolved carbon.

Livestock

The overall population of cattle decreased again in the watershed over the past five years, by 7 percent. The number of dairy cattle in the watershed account for only six percent of the total watershed cattle population, primarily in Glenn, Tehama, and Yuba counties. The State Water Resources Control Board (State Board) continues to work on a statewide approach for regulating forest activities on public lands, including grazing. This resulted in a new US Forest Service Water Quality Management Handbook being adopted in May 2011 to improve water quality protections.

The Regional Board issues individual NPDES and general order NPDES permits to dairies, depending on size. There are four individual NPDES permits and 58 general Order permits in the Sacramento River watershed. Both order programs specifically prohibit discharges to surface waters and address manure handling, management, and application. The Dairy Quality Assurance Program (DQAP) has been incorporated into the Dairy Orders as an elective education program for dairies on protecting water quality.

River Corridor and River Recreation

Extensive recreation occurs in the river and within the river corridor along the Lower Sacramento and American Rivers. It is not possible to quantify the number of users, or the type of recreation that specifically occurs. There are still 12 marina facilities located in the protection zones. Various participating water agencies have continued to sponsor the public education campaigns “Keep Our Waters Clean”, to encourage use of restrooms and sewage pumpouts, and “Pups in the Park”, to encourage use of pet waste pickup bags. The cities of Sacramento and West Sacramento and Sacramento County have continued enforcement of derelict boat removal. Sacramento County, the City of Sacramento, and the City of West Sacramento all require a permit and inspection for boats moored/anchored for extended periods of time. Water quality studies conducted by the Regional Board at Discovery Park on the Lower American River showed elevated levels of *E. coli* during recreational periods, but low or non-detectable levels of actual pathogens.

Homeless/Illegal Camping

Homeless populations in the Sacramento metropolitan area and the City of West Sacramento have remained relatively stable over the study period. Illegal camping still occurs in the river corridor along the Lower American River Parkway and in West Sacramento in the Lighthouse Marina area, but the numbers have remained lower due

to enforcement of no-camping ordinances in Sacramento and West Sacramento. Sacramento City and County, as well as the City of West Sacramento and Yolo County, have made progress towards creating housing for the homeless and have reduced the number of unsheltered homeless.

Urban Runoff

The urbanization of the watershed upstream of the Sacramento metropolitan area continued during this study period. Small cities and urban areas continue to be regulated under the Phase II Stormwater Program. Under the Phase II Program, Stormwater Management Plans (SWMP) were implemented with specific best management practices (BMPs) to minimize pollution, including implementation of treatment BMPs in new development. Monitoring was not required for any Phase II permittees in the Sacramento River watershed.

In the Sacramento River watershed there are two NPDES Stormwater Phase I permits; the Sacramento Stormwater Quality Partnership (SSQP) and the Statewide California Department of Transportation (Caltrans). The SSQP continued its extensive monitoring program, and this data continues to show the potential water quality impact that urban runoff can have on ambient water quality. Levels of contaminants in urban tributaries and in the urban runoff discharges can be higher than some of the respective water quality objectives, including *E. coli*, organic carbon, and iron. Studies show that new development areas have discharges with significantly lower levels of pollutants than older development areas. The SSQP implements an extensive pollution reduction program that addresses constituents of interest for source water protection, including illegal discharges, fecal waste, sediment, TOC, and pesticides. A new NPDES permit for the SSQP will revise how monitoring is conducted and may result in less available local ambient data. However, there may be data of interest available in the future from the Delta RMP.

Caltrans also implements a statewide SWMP to reduce the impacts of highway runoff on local receiving waters. An inventory of the Construction Stormwater Program resulted in identification of 484 sites, ranging from less than one to 3,320 acres. An inventory was conducted to identify the Industrial Stormwater Permittees in the watershed, resulting in 571 permits. There are only 41 industrial permitted facilities in the reach of the near intake protection zones that are larger than 50 acres, and these facilities are generally in compliance with the permit requirements.

Industrial NPDES Dischargers

There were 40 Industrial NPDES permitted facilities identified and six of these were prioritized for discussion, including: Empire Mine, Original Sixteen to One Mine, Sterling Caviar, Former McClellan Air Force Base (AFB), Aerojet Rocketdyne (both treated groundwater and stormwater), and Sliger Mine.

Empire Mine installed a new treatment system in 2011 and the facility has shown a dramatic decrease in arsenic, iron, and manganese. The Original Sixteen to One Mine finally was issued a new NPDES permit in 2015, as well as interim limits to allow time for implementation and compliance. Sterling Caviar has still not implemented any action to meet its interim effluent limits, which have now been extended until 2017. McClellan AFB and Aerojet Rocketdyne are under current NPDES permits and performing relatively well; both have ongoing issues with specialty constituents that warrant close tracking by the applicable participating water agencies. Sliger Mine is located in El Dorado County and owned by the US Bureau of Reclamation (USBR). This facility is in disrepair and not meeting effluent limits on its current permit. A Notice of Violation was issued to the USBR by the Regional Board, and a new NPDES permit is expected in 2015.

Wastewater Facilities

There are 33 NPDES permitted wastewater facilities in the watershed at or upstream of Freeport. There was only one expansion of 3 million gallons per day (mgd). Five facilities were replaced or upgraded, three facilities were closed, and two will soon be discharging to land. A review of enforcement orders shows generally good compliance, with violations related to pH, coliform, chlorine residual, disinfection byproducts, and nitrate.

Collection system spills, known as SSOs, can occur in any collection system and contain raw sewage. The spills of greatest concern are those that reach the receiving water and have substantial volume. During the study period, there were 270 Category 1 SSOs in the watershed, for a total volume of 1.2 mg. This is less than the September 2007 through December 2009 period. The Sacramento Area Sewer District (SASD) had 53 SSOs greater than 1,000 gallons and 22 SSOs greater than 5,000 gallons that reached surface water.

The City of Sacramento's combined sewer system (CSS) has continued to have fewer incidences of combined sewer overflows (CSOs). There was only one untreated CSO discharge in December 2012 from the CSS, of 3.8 mg. The Sacramento Regional County Sanitation District (Regional San) operates the Regional Wastewater Treatment Plant (Regional Plant). Discharge is still prohibited during negative downstream flow times, in addition to discharge only when minimum dilution of 14:1 (or river flow of 1,300 cubic feet per second [cfs]) is met. The Regional San discharge permit was renewed in 2010, and subsequently amended four times. The new permit will require the Regional Plant be modified to add tertiary treatment and implement seasonal disinfection requirements.

There were 10 *E. coli* monitoring results in the raw water at the SRWTP or VSWTP that potentially correlate to a wastewater discharge or spill event.

Watershed Spills

Cal OES continues operation of the Response Information Management System (RIMS). The purpose of RIMS is to provide a single point for statewide tracking of the status and progress of hazardous materials spills information. This can be accessed on-line to view information on current and archived hazardous materials spills.

Cal OES created the Oil by Rail program to address the safety of the increasing amount of Bakken Crude oil entering California via railroad.

The Sacramento River Source Water Protection Program (SRSWPP) has continued to implement a voluntary spill notification and response program to help ensure timely direct notification of hazardous spills upstream of the water treatment plants.

RECOMMENDATIONS

Table ES-1 presents the recommendations developed for this 2015 Update, listed by subject area and not by priority. Development of recommendations for watershed management actions that are economically feasible and within the authority of the participating water agencies to implement is critical. Of importance is to target watershed contaminant sources that may be most likely to affect source water quality, such as activities located in the near intake protection zones or activities that are predominant in the watershed. Some recommendations provide for information tracking, which will facilitate updating management actions as needed. Recommendations apply to all participating water agencies, unless noted, and may be implemented by the participating water agencies as they have resources available. These recommendations could be implemented by individual agencies, or as part of the SRSWPP.

Table ES-1
2015 Update Recommendations

Recommendation	Notes
Water Quality and Treatment	
Continue to optimize treatment and distribution, especially during times of reduced source water quality (i.e. storms, high river flows, and unusual reservoir release patterns).	Only applicable to WDCWA (once RWTF is operational), West Sacramento, Sacramento, SCWA, and EBMUD.
Ensure that *Giardia* and *Cryptosporidium* are analyzed as part of the second round of LT2ESWTR monitoring.	Only applicable to WDCWA, West Sacramento, Sacramento, SCWA, and EBMUD.
If water quality issues arise, consider: 1. Monitoring for DOC. 2. Source water monitoring of *E. coli* more frequently than monthly. 3. Source water monitoring for aluminum, iron, manganese, and TOC during same quarters (or approximate timing) as the DWR CMP monitoring (February, May, August, November).	Only applicable to: 1. WDCWA (once RWTF is operational), West Sacramento, and Sacramento. 2. WDCWA (once RWTF is operational) and SCWA. 3. WDCWA (once RWTF is operational), West Sacramento, Sacramento, and SCWA.
Consider verification/further evaluation of other sources of organic carbon and metals between Verona and WDCWA intake (i.e., the Natomas Cross Canal and RD1000 discharges), such as through the SRWPP.	
Consider requesting DWR add Natomas Cross Canal to their CMP, such as through the SRSWPP.	
If the Sacramento CMP or Delta RMP do not conduct Sacramento River monitoring between Verona and Freeport in the future, consider WTP-coordinated special study during selected events for TOC/DOC, selected metals (total and dissolved), and phosphorus.	

Table ES-1 Cont'd
2015 Update Recommendations

Recommendation	Notes
Watershed Contaminant Sources	
Move Livestock and Homeless evaluations to 10 year frequency in watershed sanitary survey.	
If source water *Cryptosporidium* monitoring results in Bin 2 classification under the LT2ESWTR, consider use of Implementation Plan from the Regional Board's Drinking Water Policy for Surface Waters of the Delta and Its Upstream Tributaries.	
Continue to, or consider, supporting the Keep Our Waters Clean.	Continue to be applicable to: Roseville, West Sacramento, Sacramento, and SCWA. Consider applicability to: WDCWA and EBMUD
Continue to, or consider, supporting the Pups in the Park campaign.	Continue to be applicable to: Sacramento and SCWA. Consider applicability to: EBMUD
Continue participation in the Sacramento River Voluntary Spill Notification Program.	Only applicable to WDCWA, West Sacramento, Sacramento, SCWA, and EBMUD.
Through the Sacramento River Source Water Protection Program, or individual agency activities, continue to, or consider: 1. Participate as a stakeholder in the Regional Board management programs (i.e. MUN Designation programs, CV-SALTS, ILRP, RPP, etc.) 2. Track water system operational programs to identify potential drinking water quality impacts (i.e., CA WaterFix, DWR Reoperation Study, Folsom Joint Federal Project, US Bureau of Reclamation Basin Study). 3. Track selected NPDES dischargers (i.e., McClellan AFB) and act as an active stakeholder for permitting.	Continue to be applicable to: West Sacramento, Sacramento, and SCWA. Consider applicability to: WDCWA and EBMUD 1. All agencies listed above. 2. All agencies listed above. 3. Only applicable to Sacramento, SCWA, and EBMUD
Continue to track Aerojet and act as an active stakeholder for permitting.	Only applicable to Sacramento, SCWA, and EBMUD.
Continue to coordinate with SRCSD and City of Sacramento on operations agreements and notifications.	Only applicable to SCWA and EBMUD.

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This report presents the findings of the 2015 Update to the Sacramento River Watershed Sanitary Survey (2015 Update). This study covers the period January 2010 through December 2014. The initial watershed sanitary survey was completed in 1995 (1995 Survey), the first update was completed in 2000 (2000 Update), the second update was completed in 2006 (Second Update), and the third update was completed in 2010 (2010 Update) in accordance with the California Surface Water Treatment Rule (SWTR).

For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the Report.

OBJECTIVES OF THE 2015 UPDATE

The overall objective of this 2015 Update is to assess the source water quality of the Sacramento River to ensure the ability of the existing water treatment plants in the vicinity of the Sacramento metropolitan area to continue to provide their customers with drinking water that meets all drinking water standards. This 2015 Update also presents information on the planned diversions for the respective participating water agencies to use in selecting and planning treatment facilities.

A watershed sanitary survey focuses on the first barrier to contamination of the drinking water supply, namely source water protection. Evaluating source water quality and watershed contaminant sources provides key information to aid in understanding how to maintain and possibly improve the first barrier. In order to fully assess the ability of the participating water agencies to treat Sacramento River source water, some evaluation of treatment plant capabilities and treated water quality is also necessary. Therefore certain aspects of the second (water treatment plant) barrier are also evaluated in relationship to water quality.

This 2015 Update is intended to accomplish the following objectives:

1. Fulfillment of the California SWTR and the Interim Enhanced Surface Water Treatment Rule (IESWTR) requirements that surface water agencies conduct a sanitary survey of the source watershed once every five years. Any significant changes within the last five years that affect source water quality are to be identified in each update. In addition, it is required to comment on the appropriate level of treatment for pathogens, specifically for *Giardia*, viruses, and *Cryptosporidium*.
2. Review and evaluation of selected constituents of interest to identify potential water quality or treatment issues at each water treatment plant or future/planned diversion site. Assess the ability of the existing water treatment plants to meet standards based on current and future regulatory framework. Development of recommendations for treatment plant actions to address water quality or treatment issues and/or address planning needs to meet expected future regulations.

3. Review and evaluation of selected potential contaminating activities to identify impacts on source water quality. Identify whether it may be useful to conduct additional monitoring to further assess contaminant levels in the source water or contaminants from a particular watershed source.
4. Identification of appropriate watershed management actions to protect and possibly improve source water quality. Development of recommendations for source water protection efforts that are economically feasible and within the authority of the participating agencies to implement is critical. Of importance is to target contaminant activities that are most likely to affect source water quality, such as activities located in the protection zones or activities that are predominant in the watershed.

PARTICIPATING WATER AGENCIES

The City of West Sacramento and City of Sacramento (Cities) jointly conducted the 1995 Survey and the 2000 Update. The Second Update was conducted by the Cities as well as Placer County Water Agency (PCWA), the City of Roseville, Sacramento County Water Agency (SCWA), and East Bay Municipal Utility District (EBMUD). PCWA and the City of Roseville participated in anticipation of a potential diversion from the Sacramento River to supply western Placer County. The 2010 Update was conducted by the Cities, PCWA, the City of Roseville, SCWA, and EBMUD, as well as the Woodland-Davis Clean Water Agency (WDCWA). WDCWA participated in anticipation of a new diversion from the Sacramento River for the cities of Woodland and Davis, as well as the University of California at Davis. This 2015 Update is being conducted by the same water agencies as the 2010 Update, with PCWA, the City of Roseville, and the City of Sacramento participating for a potential future water diversion described below. Together this group is herein referred to as the participating water agencies. The diversions and facilities included in this 2015 Update include, from upstream to downstream:

- The potential future Sacramento River Regional Water Reliability Project (SRRWRP) water diversion for western Placer and northern Sacramento counties is expected to utilize the Natomas Mutual Water Company (NMWC) Sankey Road and Pritchard Lake pumping plants, located approximately at River Miles 79 and 75, respectively.
- The new water diversion for WDCWA is located approximately at River Mile 70.5 just upstream of the I-5 Bridge crossing at Veteran's Bridge.
- The City of West Sacramento diverts water to its George Kristoff Water Treatment Plant (GKWTP) from the Sacramento River approximately two miles upstream of the confluence with the American River, near River Mile 62.5.
- The City of Sacramento diverts water to its Sacramento River Water Treatment Plant (SRWTP) from the Sacramento River just downstream of the American River confluence, near River Mile 60.

- The water diversion for Freeport Regional Water Authority (FRWA) is located near River Mile 47, approximately 13 miles downstream of the American River confluence and upstream of the Freeport Bridge. This is the supply for SCWA's Vineyard Surface Water Treatment Plant (VSWTP) and a source water supply for EBMUD.

SACRAMENTO RIVER SOURCE WATER PROTECTION PROGRAM

The City of Sacramento, City of West Sacramento, and SCWA sponsor the Sacramento River Source Water Protection Program (SRSWPP). This partnership provides joint follow-up source water protection efforts based on recommendations from the Sacramento River Watershed Sanitary Survey Updates. Joint work is conducted using expert support, and some work is also conducted by individual agencies and shared with the group. This program is coordinated with EBMUD and WDCWA. The Sacramento River Source Water Protection Program seeks to preserve and protect the source water quality of the Sacramento River drinking water supply for current and future generations.

There are several key focus areas of the program:

- Pesticides, including proactive stakeholder efforts on the rice herbicide thiobencarb and other stakeholder efforts to support protection of the Sacramento River water supply from current, increased use, and new pesticides of potential importance for drinking water public health and aesthetics.
- Agricultural discharge, including active stakeholder participation in the Rice Pesticides Program and the Irrigated Lands Regulatory Program for the Rice Waiver and Sacramento Valley orders.
- Industrial National Pollutant Discharge Elimination System (NPDES) permits, including tracking and review of various revised permits and direct coordination with regulators and dischargers.
- Voluntary Spill Notification Program, including direct notification from participating water agencies and development of tools to assist with spill notification and response. EBMUD and WDCWA are participants in this program.

During the study period, the program received the American Water Works Association (AWWA) California/Nevada Section's 2010 Exemplary Source Water Protection Award. In addition, the City of Sacramento received the 2012 AWWA Exemplary Source Water Protection Program award for metropolitan-sized system on behalf of the program.

CONSTITUENTS AND TOPICS COVERED IN THE 2015 UPDATE

Several water quality constituents were selected for evaluation as part of the 2015 Update. **Table 1-1** presents a summary of the water quality constituents selected and the reason for selection.

Table 1-1
Water Quality Constituents Selected for Evaluation as Part of the 2015 Update

Constituent	Reason for Inclusion in 2015 Update
Turbidity	Turbidity is a measurement of suspended solids in water. Treated water turbidity levels are regulated in the SWTR and the IESWTR.
Fecal Coliform	Source water fecal coliform is a surrogate for fecal contamination.
Escherichia coli (E. coli)	USEPA believes that source water *E. Coli* may be the best surrogate to determine treatment requirements in lieu of actual pathogen and virus data.
Giardia	*Giardia lamblia* is infectious to humans. Source water levels of *Giardia* are used to determine treatment requirements under the SWTR.
Cryptosporidium	*Cryptosporidium parvum* is infectious to humans. Actual source water levels of *Cryptosporidium* are used to determine treatment requirements as part of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).
Total Organic Carbon	Total organic carbon (TOC) is a surrogate measure of disinfection by-products (DBP) precursor material in water. TOC levels in either source or treated water are used to determine treatment requirements in the Stage 1 Disinfectant/Disinfection By-Product Rule (D/DBP Rule).
Total Trihalomethanes	Total trihalomethanes (TTHM) are disinfection by-products formed in treated water. Treated water levels are regulated by the Stage 1 D/DBP Rule and further regulated under the Stage 2 D/DBP Rule.
Haloacetic Acids	Haloacetic acids (HAA5) are disinfection by-products formed in treated water. Treated water levels are regulated by the Stage 1 D/DBP Rule and further regulated under the Stage 2 D/DBP Rule.
Detectable Volatile and Synthetic Organic Compounds	Volatile and synthetic organic compounds (VOCs and SOCs) are formulated for, or are by-products from, industrial, agricultural, and urban use. Pesticides are a main subgroup of the SOCs used for agriculture and urban application, including the rice herbicide thiobencarb. Many of these constituents have been regulated by the Phase I, II, and V regulations.
Aluminum, Iron, and Manganese	Aluminum, iron, and manganese are trace metals found in surface water supplies that have secondary drinking water standards; in addition, aluminum has a primary drinking water standard higher than the secondary standard. These metals can be contributed naturally and by a variety of contaminant sources.

Eight potential contaminating activities were selected for review as part of the 2015 Update: agricultural drainage (rice and other irrigated agriculture, including pastureland), livestock (dairy and rangeland), river corridor and river recreation, homeless/illegal camping, urban runoff, industrial NPDES permitted dischargers, wastewater, and spills. Each of these activities can contribute at least one of the constituents identified in **Table 1-1** to the source water.

Three special topics are also included briefly in the 2015 Update:

- An update on the growth and urbanization trends occurring in the watershed that may impact the type, magnitude and location of potential contaminating activities.
- An update of selected Central Valley Regional Water Quality Control Board's policies and management programs, including; the Drinking Water Policy for Surface Water of the Delta and its Upstream Tributaries (Drinking Water Policy), the Municipal and Domestic Supply (MUN) Beneficial Use Project, and the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS).
- An update on potential future Central Valley water system operational impacts and modifications, such as climate change impacts, the 2013 Department of Water Resources Water Plan, and other Delta management programs.

DESCRIPTION OF HOW THE 2015 UPDATE WAS CONDUCTED

The project team consisted of a Technical Committee (TC) comprised of representatives from all participating water agencies and the consulting team of Starr Consulting, Palencia Consulting Engineers, and Rincon Consultants, Inc. The TC participated in developing the scope of work and reviewed identification and development of key findings and recommendations. The State Water Resources Control Board, Division of Drinking Water (DDW) reviewed the proposed report outline.

The consulting team obtained information from the existing water treatment plants, the new diversion facility, as well as the planned diversion site through an agency survey that addressed each treatment plant's processes, including a discussion of treatment challenges and changes since the 2010 Update. Participating water agencies provided raw and treated water data as well as information on their actions relevant to recommendations from the 2010 Update.

The consulting team obtained additional source water quality data from the United States Geological Survey (USGS), Sacramento Coordinated Monitoring Program (Sacramento CMP), Department of Water Resources Sacramento Watershed Coordinated Monitoring Program (DWR CMP), Department of Water Resources Municipal Water Quality Investigations (DWR MWQI), and the California Department of Pesticide Regulation (DPR).

The consulting team collected information on contaminant sources in the watershed through literature reviews, Internet searches, and discussions with various agencies' staff. A list of agency contacts and a bibliography are provided in **Appendix A**.

REPORT ORGANIZATION

Section 1 - Introduction

This section describes the objectives of the 2015 Update, identifies the participating water agencies that funded the study, introduces the SRSWPP and its activities, lists the main topics and constituents covered in the 2015 Update, describes how the 2015 Update was conducted, and includes a description of the basic report organization. **Appendix A** provides a list of references.

Section 2 - The Watershed and Water Supply Systems

This section is largely descriptive and provides (1) a brief overview of the physical, hydrologic, and land use characteristics of the watershed, (2) a description of the three existing water supply systems, (3) a description of the newly constructed WDCWA diversion facility, and (4) a description of the potential future SRRWRP diversion. The watershed description includes a definition of the protection zones for all the diversion sites. For more detailed descriptive information on watershed characteristics, the reader is referred to the 1995 Survey.

Section 3 - Sacramento River Water Quality Review

This section contains three parts. The first part is a brief regulatory context to highlight the constituents selected for evaluation and the framework for those evaluations. **Appendix B** provides the detailed Regulatory Framework for the water quality evaluations. The second part provides an overall review of the available source, or raw, water quality data in the focus area of the Sacramento River for this study. The focus area includes the Sacramento River from the Feather River confluence to Freeport and the American River at the confluence with the Sacramento River. The third part provides a review of the constituents of interest, including an explanation for their selection and a summary of the data obtained for the period of study, for each constituent. Tables and graphs developed for the water quality review are provided in **Appendix C**.

Section 4 - Watershed Contaminant Sources Review

This section describes pertinent characteristics of each of the eight potential contaminating activities that were reviewed as part of this update. Also included is information on the other three special topics. **Appendix D** presents selected materials related to Watershed Contaminant Sources and from several source water protection activities implemented by the participating water agencies.

Section 5 - Individual Intake Location Compliance Evaluations

This section contains an evaluation of the existing water treatment plants' treated water quality, as well as an evaluation of each existing or planned treatment plant's ability to meet the SWTRs as well as other existing and near-term regulations. A detailed Regulatory Framework was developed to guide the evaluations and is presented in **Appendix B**.

Section 6 - Findings and Recommendations

This section consists of key findings and a list of recommendations. Significant changes since the 2010 Update are summarized at the beginning of this section.

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This section provides an overview description of the watershed, which summarizes physical, hydrologic, and land use characteristics. Major watershed characteristics have changed little since the original 1995 Survey. For a more detailed account of this information, the reader is referred to the 1995 Survey. This section also provides a brief description of the existing City of West Sacramento, City of Sacramento, and Freeport Regional Water Authority (FRWA) Sacramento River diversions and water supply systems, as well as the new Woodland-Davis Clean Water Agency (WDCWA) diversion and treatment facility. The water treatment plants are further described in **Section 5**. These descriptions include a summary of significant changes since the 2010 Update. In addition, a description of the potential future Sacramento River Regional Water Reliability Program (SRRWRP) is provided. The water supply facilities included as part of the watershed sanitary survey include diversion and water treatment plant facilities. This report does not include evaluation of distribution system physical facilities.

For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the Report.

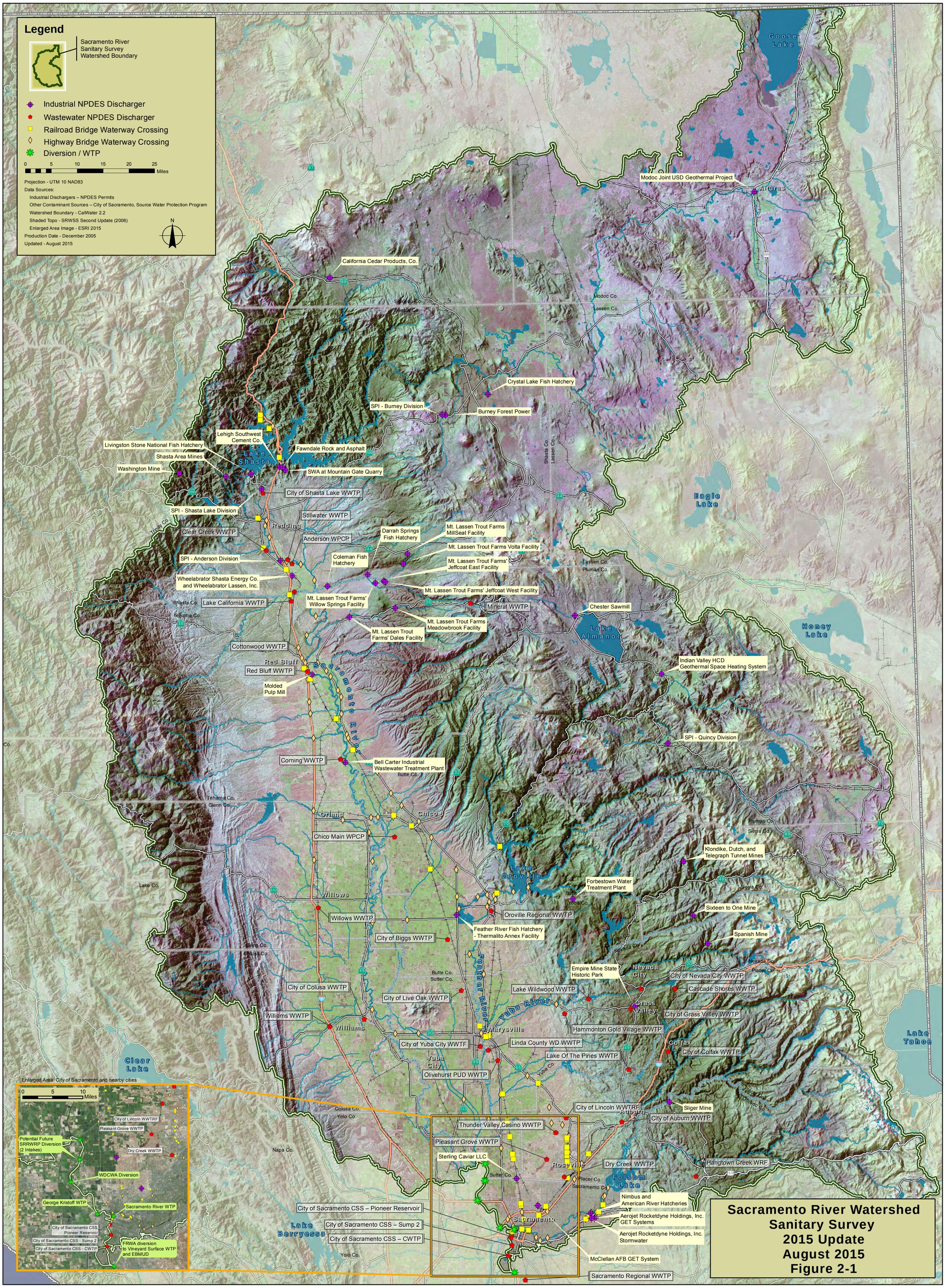
THE WATERSHED

The Sacramento River is California's largest river. The entire watershed encompasses nearly 25,000 square miles. The river is heavily regulated by the operation of dams, including Shasta Dam on the main stem, Oroville Dam on the Feather River, Folsom Dam on the American River, and numerous other dams on both major and minor tributaries. River flow is heavily dependent on releases from the dams and precipitation from winter storms.

The weather throughout the watershed is characterized by hot, dry summers and rainy winters, with snow falling and accumulating at the higher elevations in the watershed. Most precipitation occurs between October and April.

The watershed consists of three major areas: the upper watershed, the Sacramento Valley, and the Sacramento metropolitan area. An updated Watershed Map has been developed which delineates the watershed boundary upstream of the FRWA diversion, as well as identifies the existing and planned diversions and the protection zones (see **Figure 2-1)**. Several features of the map were updated in this Report, including; railroad and highway bridge crossings, industrial National Pollutant Discharge Elimination System (NPDES) permitted facilities, and municipal wastewater NPDES permitted facilities.

On the Sacramento Valley floor, a network of flood control facilities and irrigation canals and drains creates a maze-like pattern of water flow. The highly developed system of flood control basins, levees, channels, and bypasses serve as auxiliary channels to the Sacramento River during the wet season. The nearest flood control facility to the cities' intakes is the Sacramento Weir, just upstream of the City of West Sacramento's George Kristoff Water Treatment Plant (GKWTP), which directs flood flow into the Yolo Bypass to relieve flood conditions in the Sacramento metropolitan area. The river levees are part of the flood control system; the river system is levied throughout the protection


Legend
Sacramento River Sanitary Survey Watershed Boundary
Industrial NPDES Discharger
Wastewater NPDES Discharger
Railroad Bridge Waterway Crossing
Highway Bridge Waterway Crossing
Diversion / WTP
0 5 10 15 20 25 Miles
Projection - UTM 10 NAD83
Data Sources:
Industrial Dischargers – NPDES Permits
Other Contaminant Sources – City of Sacramento, Source Water Protection Program
Watershed Boundary - CalWater 2.2
Shaded Topo - SRWSS Second Update (2006)
Enlarged Area Image - ESRI 2015
Production Date - December 2005
Updated - August 2015
N
Goose Lake
Modoc Joint USD Geothermal Project
Alturas
California Cedar Products, Co.
Siskiyou Co.
Shasta Co.
Modoc Co.
Lassen Co.
Crystal Lake Fish Hatchery
SPI - Burney Division
Burney Forest Power
Lehigh Southwest Cement Co.
Livingston Stone National Fish Hatchery
Fawndale Rock and Asphalt
Shasta Area Mines
Lake Shasta
Washington Mine
SWA at Mountain Gate Quarry
City of Shasta Lake WWTP
SPI - Shasta Lake Division
Stillwater WWTP
Redding
Trinity Co.
Clear Creek WWTP
Anderson WPCP
Darrah Springs Fish Hatchery
Mt. Lassen Trout Farms MillSeat Facility
Mt. Lassen Trout Farms Volta Facility
SPI - Anderson Division
Coleman Fish Hatchery
Mt. Lassen Trout Farms' Jeffcoat East Facility
Lassen Co.
Plumas Co.
Wheelabrator Shasta Energy Co. and Wheelabrator Lassen, Inc.
Mt. Lassen Trout Farms' Jeffcoat West Facility
Mt. Lassen Trout Farms' Willow Springs Facility
Shasta Co.
Lake California WWTP
Tehama Co.
Mineral WWTP
Chester Sawmill
Mt. Lassen Trout Farms Meadowbrook Facility
Mt. Lassen Trout Farms' Dales Facility
Lake Almanor
Honey Lake
Cottonwood WWTP
Red Bluff
Red Bluff WWTP
Molded Pulp Mill
Sacramento River
Indian Valley HCD Geothermal Space Heating System
SPI - Quincy Division
Corning WWTP
Bell Carter Industrial Wastewater Treatment Plant
Butte Co.
Tehama Co.
Glenn Co.
Orland
Chico
Chico Main WPCP
Plumas Co.
Sierra Co.
Klondike, Dutch, and Telegraph Tunnel Mines
Lake Oroville
Forbestown Water Treatment Plant
Lake Co.
Willows
Butte Co.
Yuba Co.
Sixteen to One Mine
Willows WWTP
Oroville Regional WWTP
Feather River Fish Hatchery - Thermalito Annex Facility
Spanish Mine
City of Biggs WWTP
Glenn Co.
Colusa Co.
Nevada Co.
Placer Co.
Empire Mine State Historic Park
Nevada City
City of Nevada City WWTP
Butte Co.
Sutter Co.
Cascade Shores WWTP
City of Colusa WWTP
Lake Wildwood WWTP
City of Live Oak WWTP
Grass Valley
Feather River
Yuba River
City of Grass Valley WWTP
Williams WWTP
Williams
Marysville
Hammonton Gold Village WWTP
City of Yuba City WWTF
Linda County WD WWTP
Colfax
Lake Tahoe
Lake Of The Pines WWTP
City of Colfax WWTP
Yuba City
Olivehurst PUD WWTP
Yuba Co.
Placer Co.
El Dorado Co.
Clear Lake
Enlarged Area: City of Sacramento and nearby cities
0 5 10 Miles
City of Lincoln WWTRF
Pleasant Grove WWTP
Potential Future SRRWRP Diversion (2 Intakes)
Dry Creek WWTP
WDCWA Diversion
George Kristoff WTP
Sacramento River WTP
City of Sacramento CSS Pioneer Reservoir
City of Sacramento CSS - Sump 2
City of Sacramento CSS - CWTP
FRWA diversion to Vineyard Surface WTP and EBMUD
Colusa Co.
Yolo Co.
Napa Co.
Thunder Valley Casino WWTP
Pleasant Grove WWTP
Sterling Caviar LLC
Roseville
Sutter Co.
Placer Co.
Sacramento Co.
Folsom Lake
Dry Creek WWTP
Hangtown Creek WRF
Auburn
City of Lincoln WWTRF
City of Auburn WWTP
Sliger Mine
Nimbus and American River Hatcheries
Aerojet Rocketdyne Holdings, Inc. GET Systems
Aerojet Rocketdyne Holdings, Inc. Stormwater
City of Sacramento CSS – Pioneer Reservoir
City of Sacramento CSS – Sump 2
City of Sacramento CSS – CWTP
Lake Berryessa
Sacramento
McClellan AFB GET System
Sacramento Regional WWTP
Sacramento River Watershed Sanitary Survey 2015 Update August 2015 Figure 2-1

zones and for a considerable distance upstream. Along with the flood control system, there is a highly developed system of agricultural canals and drains. River water is diverted for irrigation and then restored to the river as agricultural drainage. Water for agricultural irrigation is primarily used during the spring, summer, and early fall months.

The contributory area near the GKWTP, the City of Sacramento's Sacramento River Water Treatment Plant (SRWTP), and FRWA diversion is an urban area which includes the presence of natural waterways, such rivers and creeks, as well as an engineered stormwater collection system and a combined sewer system.

The watershed for the potential future SRRWRP and the new WDCWA diversions includes the upper watershed and the Sacramento Valley upstream of the respective diversion locations. The watershed for the GKWTP includes the upper watershed, the Sacramento Valley upstream of the intake, and a portion of the Sacramento metropolitan area. The watershed for the SRWTP includes the upper watershed, the Sacramento Valley upstream of the intake, the American River watershed, and a portion of the Sacramento metropolitan area. The watershed for the FRWA diversion includes the upper watershed, the Sacramento Valley and American River watershed upstream of the diversion, as well as the majority of the Sacramento metropolitan area. None of the participating water agencies own or control a significant amount of land or land use in the watershed.

The Upper Watershed

The upper watershed consists of four distinct geomorphic provinces: the Sierra Nevada, the Cascade Range, the Coast Ranges, and the Modoc Plateau. At the upper elevations of the Sierra Nevada, Cascade, and Coast Ranges, there are coniferous forests. At lower elevations, the land supports grasses, oaks, and chaparral. The Modoc Plateau is an arid semi-desert scrubland in the rain shadow of the Pacific Divide.

There is one source of water that does not naturally contribute to the Sacramento River watershed, but has been modified by constructed facilities to import water into the watershed. As part of the Central Valley Project, Lewiston Dam was constructed on the Trinity River in the late 1950's and early 1960's. Water is diverted from the Trinity River into the Clear Creek Tunnel and then imported over the ridge into Whiskeytown Reservoir. Whiskeytown Reservoir is located west of Redding and is contributory to the Sacramento River downstream of Redding, via Spring Creek.

The United States Bureau of Reclamation (USBR) operates the facilities and controls the flow and volume of water transferred from the Trinity River. A Record of Decision now requires operation of the facilities to account for water year type. Since 2004 there are now five annual operating scenarios for the Trinity River Diversion - extremely wet year, wet year, normal year, dry year, and critically dry year. The volume of water exported from the Trinity River into the Sacramento River Basin varied during the study period from nearly no flow to as high as 3,500 cubic feet per second (cfs). During the study period the amount of water transferred into the Sacramento River basin ranged from less than 350,000 acre-feet annual (2010) to over 800,000 acre-feet annual

(2013), and averaged nearly 600,000 acre-feet annual. It should also be noted that although there are low flows provided throughout the year, the most significant contributions during the study period occurred between June and November.

USBR staff at both Shasta and Weaverville indicated that the Trinity River watershed is very rural with minimal contamination risk (limited grazing, recreation, and historical mining). The water quality is considered very high quality with no major concerns on this fork. Similar to the previous watershed sanitary surveys, the study area has been largely limited to downstream of the major reservoirs, including Whiskeytown Reservoir, and for this reason no discussions are related to this imported water source.

Upper watershed land uses include recreation, timber harvesting, mining, agriculture in mountain meadows, and rangeland livestock grazing.

The Sacramento Valley

The Sacramento Valley is a flat-floored, northwest trending trough filled with sedimentary deposits. Elevation in the valley ranges from about 20 feet at the south end of the valley to 470 feet in Redding, at the north end of the valley. Agricultural crops have replaced much of the native vegetation in the valley. There are some areas of preserved or re-created riparian vegetation, native grasslands, and wetlands.

Irrigated agriculture is the primary land use in the Sacramento Valley, and rice is the largest single crop grown. There are also orchards along some of the river corridors and various row and grain crops. Other land uses include livestock grazing on pastureland and other livestock operations such as dairies.

The largest population center is around Sacramento, although growth is occurring throughout the watershed centered on smaller urban centers. The southeastern portion of the Sacramento Valley, between Lincoln and Oroville, continues to see significant population growth. There is considerable use of the river system for recreation.

The Sacramento Metropolitan Area

The Sacramento metropolitan area is a developed urban area that lies at an elevation of about 20 to 40 feet above sea level. Both banks of the river are fully levied and most drainage is pumped into the river.

The left bank is the City of Sacramento urban area. There have been few changes since this was a heavily developed urban area previously. The contributory area consists of two distinct and separate drainage systems. The combined sewer system (CSS) serves downtown, Land Park and east Sacramento, and collects both urban runoff and wastewater in a single collection system. Typically this is routed to the Sacramento Regional County Sanitation District (Regional San) Regional Wastewater Treatment Plant (Regional Plant) for treatment. If a storm event exceeds the conveyance capacity to the Regional Plant, the CSS system is designed to store some excess volume. If storage is exceeded, the City of Sacramento has two primary

treatment plants with disinfection that can discharge to the Sacramento River. During extreme high volume events that exceed conveyance, storage, and treatment capacities, raw wastewater discharges from the CSS into the Sacramento River can occur. The stormwater system is a separate system containing urban runoff, located north, south, and east of the downtown area. Typically, urban runoff is collected through pipelines, creeks, and canals, sent to sumps, and then discharged to either the Sacramento or American rivers.

The right bank is the City of West Sacramento urban area. Although there have been significant changes in land use over the past ten years as growth has occurred, the contributory area is limited due to topography. The drainage only includes urban runoff from two small drainage basins within the City of West Sacramento limits, Raley and Lighthouse pump stations. Similar to the City of Sacramento, urban runoff is collected through pipelines, creeks, sent to sumps, and then discharged to the Sacramento River.

There are several marinas and parks located within the levee that have recreation associated with them, primarily non-body contact.

The Protection Zones

In the 2000 Update, the protection zones for GKWTP and SRWTP were formally defined. In the Second Update near-intake zones were defined for the potential future SRRWRP and FRWA diversion locations. In the 2010 Update the near intake zone for the proposed WDCWA diversion was defined. The protection zone provides the focus for the source water quality review and the watershed contaminant sources review. Contaminants added to the river further upstream on the valley floor may be mitigated by distance (due to fate and transport factors) and dilution. In the upper watershed, above the major reservoirs, contaminants are mitigated by reservoir settling and residence time as well as distance and dilution. Contaminants added in or near the protection zones have less opportunity for mitigation and may be of higher concern at the water treatment plants. There is less time for the water treatment plants to respond to spills in the protection zone than spills that occur further upstream.

The protection zones for the potential future SRRWRP diversion, the new WDCWA diversion, GKWTP, SRWTP, and FRWA diversion are described in **Table 2-1**.

Table 2-1
Protection Zones

Water Treatment Plant Or Diversion Location	Protection Zone
Potential Future SRRWRP Diversion (River Mile 75 and 79)	Sacramento River: The area within the levees on the Sacramento River from the diversion locations to River Mile 85. Feather River: The area within the levees on the Feather River from the confluence with the Sacramento River to River Mile 5.
WDCWA Diversion (River Mile 70.5)	Sacramento River: The area within the levees on the Sacramento River from the diversion location to River Mile 82. Feather River: The area within the levees on the Feather River from the confluence with the Sacramento River to River Mile 2.
George Kristoff WTP (River Mile 62.5)	The area within the levees on the Sacramento River from the GKWTP to the confluence with the Feather River at River Mile 80.
Sacramento River WTP (River Mile 60)	Sacramento River: The area within the levees on the Sacramento River from the SRWTP to the confluence with the Feather River at River Mile 80. American River: The area within the levees on the American River from the confluence with the Sacramento River to Folsom Dam.
FRWA Diversion (River Mile 47)	Sacramento River: The area within the levees on the Sacramento River from the diversion site to the confluence with the Feather River at River Mile 80. American River: The area within the levees on the American River from the confluence with the Sacramento River to Folsom Dam.

Note: discharges conveyed through the levees include urban runoff and agricultural drains. These discharges are evaluated as watershed contaminant sources.

THE WATER SUPPLY SYSTEMS

A brief discussion of the water supply systems for each diversion location is presented below. The major modifications completed in the past five years are highlighted.

Potential Future SRRWRP Diversion Location

The potential future SRRWRP is a multi-agency project to enhance water supply and reliability for the region. The potential future SRRWRP diversion and water treatment facility would provide additional treated water from the Sacramento River to PCWA and the cities of Roseville and Sacramento, as well as potentially several other local water agencies. The Planning Phase I was completed in August 2015 and included

conceptual level alternatives for the water supply diversion and treatment facilities. As currently proposed, the SRRWRP would expand the existing Natomas Mutual Water Company's existing Pritchard Lake (near River Mile 75) and Sankey (near River Mile 79) intake facilities. All diverted water will be sent to a central water treatment facility.

The central water treatment facility will be located east of the Sacramento International Airport, to avoid waterfowl attraction to the flight path to the airport and reduce the travel time of treated water to the retail systems to prevent degradation of treated water quality. Preliminary design of the water treatment facility is planned to be included in the Planning Phase IV, projected to be completed in 2018. Treated water will then be distributed to the various participating water agencies for their respective water supply systems.

WDCWA Diversion Location

The new WDCWA diversion will provide additional treated water from the Sacramento River to the cities of Woodland and Davis, as well as the University of California at Davis (UC Davis).

This diversion is located just north of the Interstate 5 Bridge (Veterans Bridge) crossing near River Mile 70.5. It will provide a new surface water supply project for the cities and UC Davis. The water will be treated at a regional water treatment facility. This facility is currently in construction and is expected to be completed in the spring of 2016 and operational by June 2016.

WDCWA received a Bin 1 classification under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), so the water treatment facility is designed to provide at least 3-log *Giardia,* 4-log virus, and 2-log *Cryptosporidium* reduction. The water treatment facility is a conventional filtration plant with an initial capacity of 30 million gallons per day (mgd). It can be expanded up to 34 mgd. The City of Woodland will receive up to 18 mgd and the City of Davis and UC Davis will collectively receive up to 12 mgd.

Information on the water treatment facility's design, operations, intake, chemical additions, and unit processes were obtained using an agency survey. The treatment facilities consist of grit removal, flocculation and sedimentation via sand-ballasted clarification, intermediate ozonation, biologically active granular carbon filtration, and disinfection with chlorine.

George Kristoff Water Treatment Plant

The GKWTP was constructed in 1988 as a conventional plant with a capacity of 24 mgd. In 2003, the plant underwent major expansion efforts that resulted in new process selection and an increase in capacity to 58 mgd. This included installation of Actiflo® for pretreatment and eight new deep-bed granular activated carbon (GAC) filters. Information on the plant's design, operations, intake, chemical additions, and unit processes were obtained using an agency survey.

The plant operates on a twenty-four hour basis, twelve months per year. The plant intake is located on the Sacramento River upstream of the American River confluence at River Mile 62.5. The intake structure and water treatment plant are gated, and access is restricted. Emergency situations within the plant are programmed into and monitored by the plant control system. An alarm system alerts plant staff. The plant has backup equipment and standby power.

Between 2010 and 2014 there were no major changes at the GKWTP. However, a new 3 million gallon (mg) storage reservoir and pump station was constructed in the distribution system in 2013.

The GKWTP provides 3-log *Giardia,* 4-log virus, and 2-log *Cryptosporidium* reduction through the conventional treatment removal credit and inactivation by maintaining a free chlorine residual necessary to achieve the overall reduction required.

Sacramento River Water Treatment Plant

The SRWTP was constructed in 1924 and has since undergone several upgrade projects. In 2003, a new intake facility was constructed and the SRWTP was expanded to increase capacity. The replacement intake structure is located approximately 1,000 feet south of the previous intake structure and is located further out in the river channel. The SRWTP has a permitted capacity of 160 mgd, but currently has a sustainable capacity of 135 mgd due to hydraulics limitations. Engineering work is underway to bring the plant capacity to 160 mgd, and is expected to be completed by 2016. The SRWTP provides conventional treatment in three treatment process trains; Trains 1, 2 and 3. Information on the plant's design, operations, intake, chemical additions, and unit processes were obtained using an agency survey.

The plant operates on a continuous basis throughout the year. The plant intake is located on the Sacramento River downstream of the American River confluence at River Mile 60. The water at the existing intake is, therefore, a mixture of Sacramento and American River water with the ratio varying considerably depending on river flows. The exterior of the new intake structure is open for public access, but the plant is gated and access is restricted. Emergency situations within the plant are alarmed to the plant system control and data acquisition (SCADA) system, which is monitored by the operators. The plant has backup equipment, including standby power and spare equipment.

Between 2010 and 2014, a plant remodeling project was initiated at the SRWTP and intake modifications are underway as follows:

- Update the sludge dewatering process by adding three centrifuge pumps and related equipment to help expedite sludge drying and removal.
- Replace the High Service Pump Station.
- Install eight new filters to replace 16 filters that were built in the 1920's and 1930's.

- Add vortex breakers to the intake structure to help reduce pump cavitation during low river levels.
- Train 2 was taken out of service and is being replaced with a newly constructed train, similar to existing Train 3.

The SRWTP provides 3-log *Giardia,* 4-log virus, and 2-log *Cryptosporidium* reduction through the conventional treatment removal credit and inactivation by maintaining a free chlorine residual necessary to achieve the overall reduction required.

FRWA Diversion Location

FRWA is a joint-powers authority formed by the Sacramento County Water Agency (SCWA) and the East Bay Municipal Utility District (EBMUD) to operate an untreated water delivery system from the Sacramento River at Freeport. FRWA has a 185 mgd intake at River Mile 47.

SCWA receives up to 100 mgd at its Vineyard Surface Water Treatment Plant (VSWTP), located at an 80-acre site at the intersection of Florin Road and Knox Road, 13.5 miles of pipeline from the intake. The VSWTP has a capacity of 50 mgd, with provisions for expansion to 100 mgd. This facility has been designed to provide 3-log *Giardia,* 4-log virus, and 2-log *Cryptosporidium* reduction through the conventional treatment (flocculation/sedimentation and dual media filtration) removal credit and inactivation by maintaining a free chlorine residual necessary to achieve the overall reduction required. The facility construction was completed in 2011 and it was operational in September 2011.

EBMUD receives up to 100 mgd of untreated water at the Folsom South Canal (FSC), approximately 17 miles from the intake. The amount of water diverted varies throughout the year, and depends on water availability. EBMUD pumps the equivalent volume of water out of the FSC near the terminus, approximately 12 miles downstream, for discharge into the Mokelumne Aqueducts. EBMUD blends this water into its raw water supply system in Bay Area terminal reservoirs for treatment at its surface water treatment plants.

SECTION 3 – SACRAMENTO RIVER WATER QUALITY REVIEW

This section provides a brief regulatory context, an overall review of the Sacramento River water quality data available within the focus area of this study, and a detailed review of selected constituents of interest. The focus area includes the Sacramento River from the Feather River confluence to Freeport and the American River at the confluence with the Sacramento River. Primarily, this data review includes all of the source (raw) water data collected by the participating water agencies. In addition to those data sets, the Sacramento Coordinated Water Quality Monitoring Program (Sacramento CMP), the Department of Water Resources Sacramento Watershed Coordinated Monitoring Program (DWR CMP), the Department of Water Resources Municipal Water Quality Investigations (DWR MWQI), and the United States Geological Survey (USGS) had relevant ambient water quality data in the study area and study period. The review of the constituents of interest includes an explanation for their selection and a summary of the data obtained for the study period, which is 2010 through 2014.

For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the Report.

REGULATORY CONTEXT

Appendix B provides the detailed Regulatory Framework used as the basis for evaluation and contains a summary of each of the contaminants currently regulated in drinking water by both the United States Environmental Protection Agency (USEPA) and the State Water Resources Control Board, Division of Drinking Water (DDW).

Drinking water regulations cover a wide variety of topics. Since the watershed sanitary survey focuses on source water quality and treatment compliance, the regulations discussed and utilized in this evaluation are those focused on water quality compliance. This includes all existing regulations that establish a primary or secondary drinking water standard, both from the USEPA and DDW, and notification or archived advisory level, from DDW. Also included are regulatory programs that cover source water quality, such as the Drinking Water Source Assessment and Protection Program. In addition, programs that evaluate constituents for potential future regulatory determination are included, like the Contaminant Candidate Lists or Unregulated Contaminant Monitoring Rules. Anticipated regulations were limited to those currently in development and projected to be implemented within the next five years. A review of these regulations, in coordination with knowledge of watershed contaminant sources and historical source water quality, was used to identify the constituents of interest to be included in the detailed review.

OVERALL WATER QUALITY REVIEW

The review of overall water quality is largely based on comparison of the participating water agencies' intake water (also called raw water) to drinking water standards for the constituents currently regulated in California. This includes all constituents with primary and secondary Maximum Contaminant Levels (MCLs) and unregulated constituents that

have Notification Levels or Archived Advisory Levels. In general, it is assumed that if the raw water is below these limits, then the treated water (also called finished water) will also be below these limits. The point of compliance for MCLs, Notification Levels, and Archived Advisory Levels varies based on the specific regulation, but many are based on treated water sample results.

Overall, the Sacramento River provides good quality raw water. The raw water can currently be treated to meet all drinking water standards using conventional filtration processes. There are no long-term constituent trends prevalent in the raw water that necessitate implementation of special treatment processes at this time. The individual water treatment plant (WTP) intake evaluations for treated water and regulatory compliance are presented in **Section 5**.

Table 3-1 shows the participating water agencies and ambient monitoring programs for which 2010 through 2014 data was collected for this review. The frequency of data collection varies by constituent and monitoring program. **Figure 3-1** provides a schematic of the approximate location of the monitoring sites. **Appendix C** contains a summary of the data provided by each of the participating water agencies and ambient monitoring program data used for this review.

The Sacramento CMP is a cooperative voluntary program initiated and implemented by the Sacramento Regional County Sanitation District (Regional San), the City of Sacramento, and the County of Sacramento Department of Water Resources. These three public agencies are responsible for the management of most municipal wastewater and stormwater in the Sacramento urban area within Sacramento County. The Sacramento CMP was established in July 1991 through a Memorandum of Understanding (MOU) between these entities. The Sacramento CMP is managed under a more recent MOU, between the Regional San and its partners comprised of the Sacramento Stormwater Quality Partnership (SSQP) agencies. The fundamental purpose of the Sacramento CMP is to develop high-quality data to aid in the development and implementation of water quality policy and regulations in the Sacramento area. Monitoring sites of interest to this study are Veterans Bridge and Freeport on the Sacramento River, and Discovery Park (just above confluence of Sacramento River) on the Lower American River. Additionally, episodic storm events are sampled in coordination with the SSQP which conducts dry and wet weather river monitoring as required by their National Pollutant Discharge Elimination System (NPDES) stormwater permit for the City and County of Sacramento, and the cities of Folsom, Citrus Heights, Elk Grove, Galt, and Rancho Cordova through the Sacramento CMP.

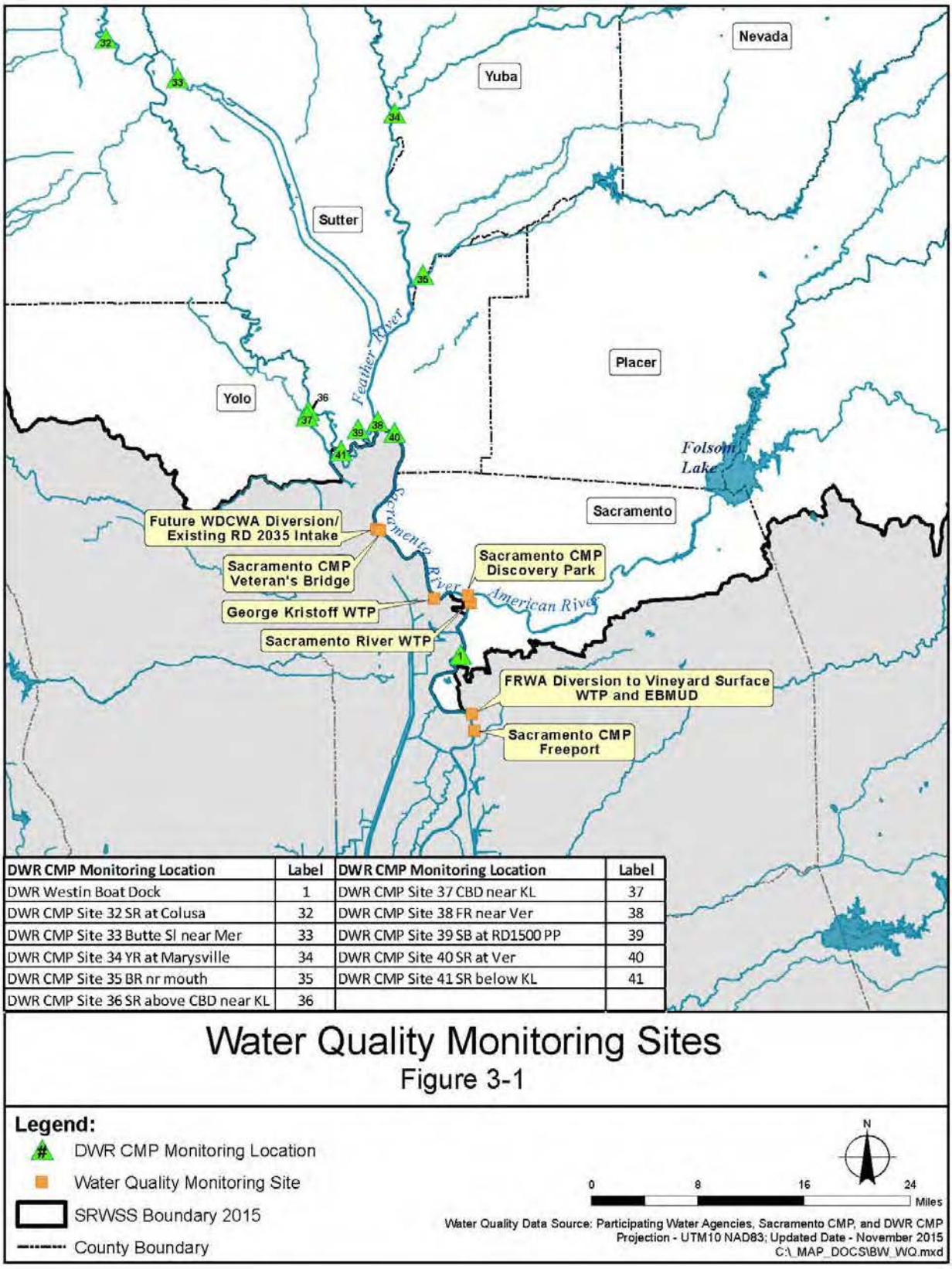
As discharger permits are amended, the Central Valley Regional Water Quality Control Board (Regional Board) is encouraging discharger participation in the Delta Regional Monitoring Program in place of existing requirements for ambient monitoring programs in the Delta and tributary waters. This has resulted in discontinuation of the Sacramento CMP Sacramento and American River ambient sample collection program. As of August 1, 2015 the Delta Regional Monitoring Program is intended to replace the

Sacramento CMP; however, initial monitoring by that program is limited to pathogens and pesticides. These self-monitoring reductions are currently covered by a short-term NPDES permit for the SSQP, which is effective only through October 2016. The scope of the Delta Regional Monitoring Program is expected to grow over time.

In addition to the municipal dischargers, agricultural dischargers, water supply interests, regulators, and "coordinated monitoring" are represented on the Delta Regional Monitoring Program Steering Committee.

Table 3-1
Summary of Water Quality Data Sources

Agency	Data Collected	Sampling Location	Period of Record
City of West Sacramento	Title 22 Regulated and Unregulated Constituents, Total Organic Carbon (TOC), DBPs, Coliform,	Sacramento River – George Kristoff Water Treatment Plant	2010-2014
City of Sacramento	Title 22 Regulated and Unregulated Constituents, TOC, DBPs, Coliform	Sacramento River – Sacramento River Water Treatment Plant	2010-2014
Freeport Regional Water Authority – Sacramento County Water Agency	Title 22 Regulated and Unregulated Constituents, TOC, DBPs, Coliform,	Sacramento River – FRWA Diversion for all constituents except turbidity which is sampled at VSWTP intake	2011-2014
Woodland-Davis Clean Water Agency	Title 22 Regulated and Unregulated Constituents, TOC, Coliform, *Giardia*, *Cryptosporidium*	Sacramento River - Existing Reclamation District (RD) 2035 Intake/Future WDCWA Diversion near Veterans Bridge	2010-2014
Sacramento Coordinated Monitoring Program (Sacramento CMP)	Inorganics, Organics (Volatile and Synthetic), Dissolved Organic Carbon (DOC), TOC, Coliform	Sacramento River – Veterans Bridge and Freeport American River – Discovery Park	2010-2014
Sacramento Watershed Coordinated Monitoring Program (DWR CMP)	Inorganics, DOC, TOC, Ultraviolet Light at 254 nm (UV254), *E. coli*	Sacramento River from Balls Ferry to Verona	2010-2014
U.S. Geological Survey - National Ambient Water Quality Assessment Program	Selected Inorganics, Selected Organics (Volatile and Synthetic), TOC	Sacramento River at Freeport	2010-2014
DWR MWQI Program	Minerals, Nutrients, DOC, TOC, Ultraviolet Light Absorbance (UVA), turbidity, bromide	Sacramento River – West Sac WTP Intake (George Kristoff WTP)	2010-2014
DWR MWQI Program	Minerals, Nutrients, DOC, TOC, UVA, bromide	Sacramento River - Westin Boat Dock	September 2013-December 2014
EBMUD	Aluminum, Iron, Manganese, TOC, *E. coli*, turbidity	FRWA Intake, Clay Station PP. Lafayette Aqueduct	April 2014



DWR CMP Monitoring Location	Label	DWR CMP Monitoring Location	Label
DWR Westin Boat Dock	1	DWR CMP Site 37 CBD near KL	37
DWR CMP Site 32 SR at Colusa	32	DWR CMP Site 38 FR near Ver	38
DWR CMP Site 33 Butte Sl near Mer	33	DWR CMP Site 39 SB at RD1500 PP	39
DWR CMP Site 34 YR at Marysville	34	DWR CMP Site 40 SR at Ver	40
DWR CMP Site 35 BR nr mouth	35	DWR CMP Site 41 SR below KL	41
DWR CMP Site 36 SR above CBD near KL	36		

Figure 3-1. Water Quality Monitoring Sites

The DWR CMP is a coordinated monitoring effort, for selected constituents, between the DWR Northern District and the Regional Board. This program began monitoring in November 2008. However, DWR has monitored water quality at sites in the Northern Sacramento River Watershed since its formation in 1956. Despite state budget cuts, the DWR CMP is able to maintain a focused monitoring network in the Sacramento River watershed. The purpose of the DWR CMP is to implement comprehensive statewide water quality monitoring, which is conducted quarterly. The primary objective is to provide information to the State Water Resources Control Board (State Board) and Regional Board to enable effective management of the State's water resources. The DWR CMP focuses primarily on sites along the Sacramento River above the Feather River confluence; however, there are one or two sites at or below this point, depending on constituent.

The USGS Sacramento River Basin National Water Quality Assessment (NAWQA) Program began the second decadal cycle of their program in 2004. In this second monitoring cycle, the emphasis shifts from status of water quality to trends in water quality, and focus on understanding natural and anthropogenic impacts. For the second monitoring cycle, USGS selected only two surface water sites for ongoing monitoring in the Sacramento River basin: Sacramento River at Freeport and Arcade Creek near Del Paso Heights.

In all data reviews, samples reported as non-detect (ND) were considered to be zero for statistical evaluations. Any calculated average or median less than the reporting limit is shown as ND, or less than the reporting limit.

Participating Water Agency Intake Data

Selected data from the three existing intakes; George Kristoff Water Treatment Plant (GKWTP), Sacramento River Water Treatment Plant (SRWTP), and the Freeport Regional Water Authority (FRWA) Diversion for the Vineyard Surface Water Treatment Plant (VSWTP), has been summarized and is included in the summary tables below. The Woodland-Davis Clean Water Agency (WDCWA) also has collected ambient water quality monitoring data at RD 2035's intake, which is a short distance upstream of the new intake that is currently under construction. **Tables 3-2** through **3-5**, show the statistics for each selected constituent. **Tables 3-6** and **Table 3-7** contain data for selected constituents collected by East Bay Municipal Utility District (EBMUD) at the FRWA Intake and at two locations along the Folsom South Canal. Statistics for this data were not developed, due to limited samples. Raw water summary data for all monitored constituents can be found in **Appendix C.**

Table 3-2
Raw Water Quality Summary for Selected Constituents
Woodland-Davis Clean Water Agency, 2010-2014

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity	NTU	0.69	240	17.3	8.9	60.0
E. coli	MPN/100mL	2	1700	117	17	490
Cryptosporidium (Presumptive)[1]	# oocysts/L	0	0.272	0.014	0.0	0.071
Giardia (Presumptive)[1]	# cysts/L	0	0.285	0.076	0.037	0.2
Thiobencarb	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
TOC	mg/L	1.1	7.8	2.46	2.1	4.2
Alkalinity	mg/L-CaCO3	45	88	68.9	71	86

[1] USEPA Method 1623 used for analysis. Presumed values used Immunofluoresence assay for detection. See page 3-17 for discussion.

Table 3-3
Raw Water Quality Summary for Selected Constituents, 2010-2014
City of West Sacramento – George Kristoff WTP

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity[1]	NTU	3.9	84.8	19.4	12.3	68.4
E. coli	MPN/100mL	<1	1,414	45.5	7.9	205.4
Thiobencarb[2]	µg/L	<0.10	0.16	<0.1	<0.10	<0.1
TOC	mg/L	0.8	6.3	2.0	1.7	3.7
Alkalinity	mg/L-CaCO3	38	94	64.9	64	86.2

[1] Monthly average was used for statistic
[2] Data presented from special rice season monitoring program

Table 3-4
Raw Water Quality Summary for Selected Constituents, 2010-2014
City of Sacramento – Sacramento River WTP

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity[1]	NTU	4.0	116.1	16.8	10.0	63.9
E. coli	MPN/100mL	<1.8	3,400	114	14	578
Thiobencarb[2]	µg/L	<0.10	<0.1	<0.1	<0.10	<0.1
TOC	mg/L	1.1	6.1	1.9	1.6	3.3
Alkalinity	mg/L-CaCO3	34	81	52	51	68

[1] Monthly average was used for statistics
[2] Data presented from special rice season monitoring program

Table 3-5
Raw Water Quality Summary for Selected Constituents
Freeport Regional Water Authority, 2011-2014[1]

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity[2]	NTU	2.6	33.5	10.0	8.3	25.0
E. coli	MPN/100mL	ND	2,000	78.5	13	300
Thiobencarb	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
TOC	mg/L	0.7	8.0	1.8	1.5	2.4
Alkalinity	mg/L-CaCO3	49	96	66.5	68	83

[1] September 2011 - December 2014
[2] Sample from VSWTP Influent, monthly average was used for statistics

Table 3-6
Raw Water Quality Summary for Selected Constituents
EBMUD at FRWA Intake, 2012-2014

Parameter	Units	11/6/2012	7/23/2013	9/26/2013	10/21/2014
Turbidity	NTU	3.5	12	No sample	8.6
E. coli	MPN/100mL	6.8	23	No sample	790
TOC	mg/L	2.3	1.3	No sample	1.2
Aluminum	µg/L	399	1,410	9,160	1,230
Iron	µg/L	404	1,120	6,610	991
Manganese	µg/L	17.8	37	210	44

Table 3-7
Raw Water Quality Summary for Selected Constituents
EBMUD at Folsom South Canal Connection, 2014

Parameter	Units	Lafayette Aqueduct 4/16/2014	Clay Station PP 5/22/14-7/31/14
Turbidity	NTU	2.1	No sample
E. coli	MPN/100mL	No sample	<1.8 - 19
TOC	mg/L	2.4	No sample
Aluminum	µg/L	140	11.4 – 49.8
Iron	µg/L	123	33.5 – 48.9
Manganese	µg/L	6.0	9.1 – 11.6

Folsom South Canal water has lower concentration of many constituents than the water pumped from the Sacramento River at FRWA Intake because of the substantial settling of particulates and natural die-off of coliform that occurs through the transmission pipelines and in the Folsom South Canal. According to EBMUD, turbidity is typically reduced by one order of magnitude and coliform concentration decreased by two to three orders of magnitude.

Ambient Data

Data for selected constituents from various ambient monitoring programs was obtained for use in this study and is included in the summary tables below. **Table 3-8** shows the statistics for each constituent. Data summary tables were not made for the DWR CMP and the USGS data for the following discussion, since relevant data focused on total organic carbon (TOC), trace metals and detected organics, which will be discussed under selected constituent review. Raw water summary data for all monitored constituents can be found in **Appendix C.**

Table 3-8
Water Quality Summary for Selected Constituents, 2010-2014
Sacramento Coordinated Monitoring Program

Veterans Bridge (Sacramento River at Interstate 5 Crossing)

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity	NTU	3.4	120	21.3	16	44
Fecal Coliform	MPN/100mL	4.5	1,300	97.8	22.5	198
E. coli	MPN/100mL	4.5	1,300	91	17	188.5
TOC	mg/L	2.8	9.0	5.3	5.1	8.43
Aluminum (total)[1]	µg/L	220	1,600	610	480	1,360
Iron (total)	µg/L	190	1,500	707	630	1,500

[1]Only 8 samples, aluminum was not monitored after 2011

Discovery Park (American River at Confluence with Sacramento River)

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity	NTU	1.5	20	7.3	5.6	16.2
Fecal Coliform	MPN/100mL	4	16,000	1,804	47.5	9,540
E. coli	MPN/100mL	4	5,400	741	47.5	4,070
TOC	mg/L	2.4	12.0	4.5	3.6	6.9
Aluminum (total)[1]	µg/L	4.3	97	56.8	62.5	94.2
Iron (total)	µg/L	51	350	150	150	318

[1]Only 8 samples, aluminum was not monitored after 2011

Freeport (Sacramento River near FRWA Intake)

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
Turbidity	NTU	2	76	14.7	11.5	34.2
Fecal Coliform	MPN/100mL	4	800	108.3		515
E. coli	MPN/100mL	2	800	67.3	20	201.5
TOC	mg/L	2.1	8.3	4.9	4.6	7.9
Aluminum (total)[1]	µg/L	47	3,700	806	445	2,678
Iron (total)	µg/L	120	1,600	525	420	1,360

[1]Only 8 samples, aluminum was not monitored after 2011

SELECTED CONSTITUENT REVIEW

This section contains a general discussion of selected water quality constituents and the reasons why they were selected for further evaluation. The constituents selected for further review in this section include turbidity, microbiological constituents (fecal coliform, *Escherichia coli* (*E. coli)*, *Cryptosporidium*, *Giardia*), TOC, detectable volatile organic compounds (VOCs) and synthetic organic compounds (SOCs), and other detectable Title 22 constituents of interest (iron, aluminum, and manganese). The constituents' general characteristics, seasonal and historical trends, and significance with respect to existing and potential future regulations are presented, along with data analysis and review. Additional evaluation of these constituents, with respect to treated water quality and regulatory compliance, is presented in **Section 5**.

The constituents selected for further review were selected based on several criteria including existing or upcoming regulatory standards, critical operational evaluation parameters, and relevance to significant potential contaminating activities. These items are discussed in the background section for each constituent. **Table 3-9** shows the relationship between potential contaminating activities and water quality constituents.

Table 3-9
Relationship Between Potential Contaminating Activities and Water Quality

Activity	Turbidity	Microbiological Constituents	TOC	VOCs/ SOCs	Aluminum/ Iron/ Manganese
Agricultural Drainage	√	√	√	√	√
Livestock	√	√	√		
River Corridor and Recreation	√	√	√	√	
Homeless/Illegal Camping	√	√	√	√	√
Urban Runoff	√	√	√	√	√
Industrial NPDES Dischargers				√	√
Wastewater	√	√	√	√	√
Watershed Spills	√	√	√	√	

Turbidity

General Characteristics and Background

Turbidity is the measurement of light scatter in water and provides a measure of the degradation of clarity in water. Clarity is typically degraded by suspended colloids and fine suspended solids such as clay, organic particulates, and microorganisms such as *Giardia* and *Cryptosporidium*, if present. Turbidity is measured to evaluate the efficiency of the treatment process at removing these particles and also to comply with regulatory requirements.

Turbidity was selected for further evaluation since most utilities, including GKWTP, SRWTP and VSWTP, optimize pretreatment processes to maximum turbidity removal in

order to reduce the potential for pathogens, such as *Giardia* and *Cryptosporidium*, in treated drinking water. The future water treatment plant associated with the WDCWA diversion will also optimize for turbidity removal. Turbidity is monitored throughout each of the water treatment plants to ensure that particles are removed. Turbidity has been assumed to be an indicator for the presence of *Giardia* and C*ryptosporidium*. However, turbidity alone may be a poor predictor of microbiological quality.

Current drinking water regulations require that the combined filtered effluent be less than 0.3 nephelometric turbidity units (NTU) in 95 percent of measurements and that the turbidity never exceed 1 NTU. Continuous turbidity monitoring for individual filters is required, and performance triggers exist for them. Turbidity has also been indirectly regulated in drinking water as part of the Filter Backwash Rule. This rule requires that recycled waste streams return to the plant headworks upstream of all chemical feed systems and recommends return at a controlled, small percentage of total flow (less than 10 percent) to ensure that chemical feed is adjusted for blended water quality, including potential increases in turbidity caused by recycle streams.

High turbidity levels in surface water sources, such as rivers and lakes, are typically the result of erosion and sediment transport during precipitation and high flow events, and are undesirable because high turbidity can mask the presence of harmful particulates. The principal source of turbidity is general watershed runoff, and can also be contributed by other potential contaminating activities such as agricultural drainage, urban runoff, and wastewater. It is common for turbidities to vary seasonally as a result of precipitation and flow. It has also been found that the presence of suspended matter can interfere with disinfection of microorganisms.

Evaluation

Turbidity has been selected for evaluation not only because it is a regulated constituent, but also because it is commonly used as an indicator of general water quality and overall plant performance. The range, average, and median have been summarized for each water treatment plant or ambient monitoring program in **Table 3-10**. Data collected by the participating water agencies is shaded. These data do not represent the same sampling frequency and are therefore difficult to compare.

Time-series plots have been developed for raw water turbidity and Sacramento River flow over the reporting period for GKWTP and SRWTP (**Figure 3-2**). This figure shows that there is a correlation between river flow and raw water turbidity, therefore supporting the finding that turbidity levels in the river increase during the wet season (late fall to early spring). In addition, raw water turbidity also peaks during high precipitation, as illustrated in **Figure 3-3**.

Table 3-10
Turbidity Summary Statistics, NTU, 2010-2014

Monitoring Site	Range	Average	Median
WDCWA[1]	0.69 - 240	17.3	8.9
Sacramento CMP - Veterans Bridge	3.4 – 120	21.4	16
GKWTP[2]	3.9 – 84.8	19.4	12.3
DWR MWQI at West Sac Intake	3 - 161	14.8	7.0
SRWTP[2]	4 – 116.1	16.8	10.0
Sacramento CMP - Discovery Park	1.5 - 20	7.3	5.6
VSWTP[3]	2.6 – 33.5	10.0	8.3
USGS - Freeport	<2.0 - 97	14.7	8.8
Sacramento CMP - Freeport	2 - 76	14.7	11.5

[1] Individual data used for statistics
[2] Monthly average of peak daily influent used for statistics
[3] Monthly average of peak daily influent used for statistics, based on data collected from September 2011 to December 2014

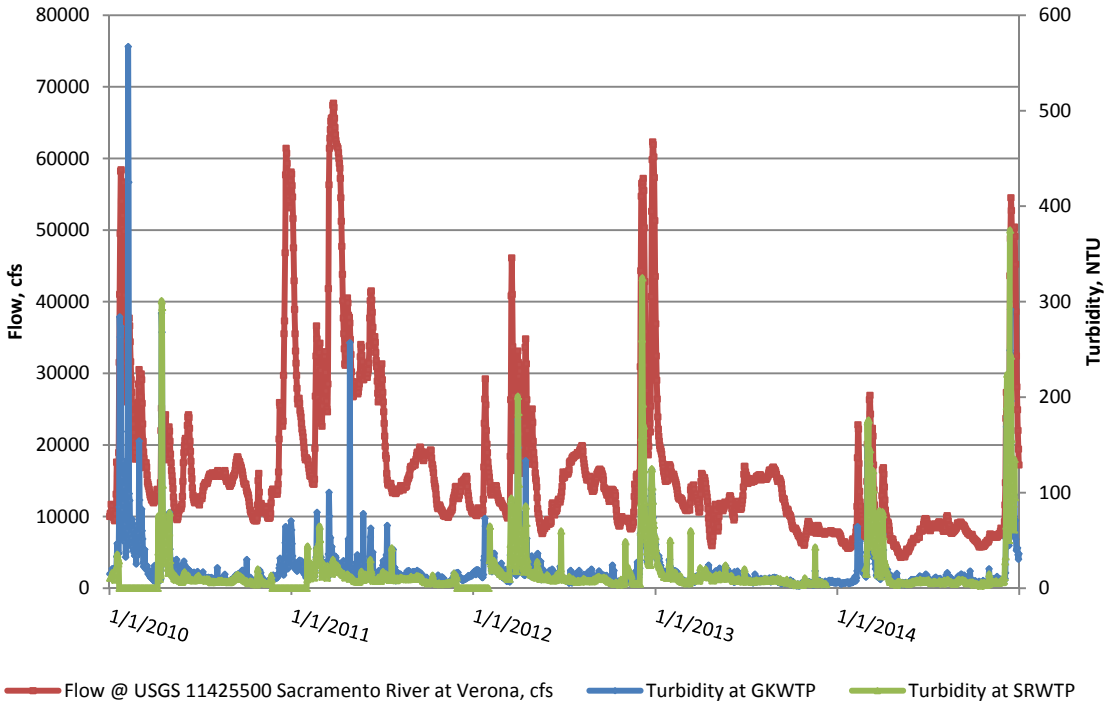


Figure 3-2. Sacramento River Flow at Verona vs. Turbidity at GKWTP and SRWTP, 2010-2014

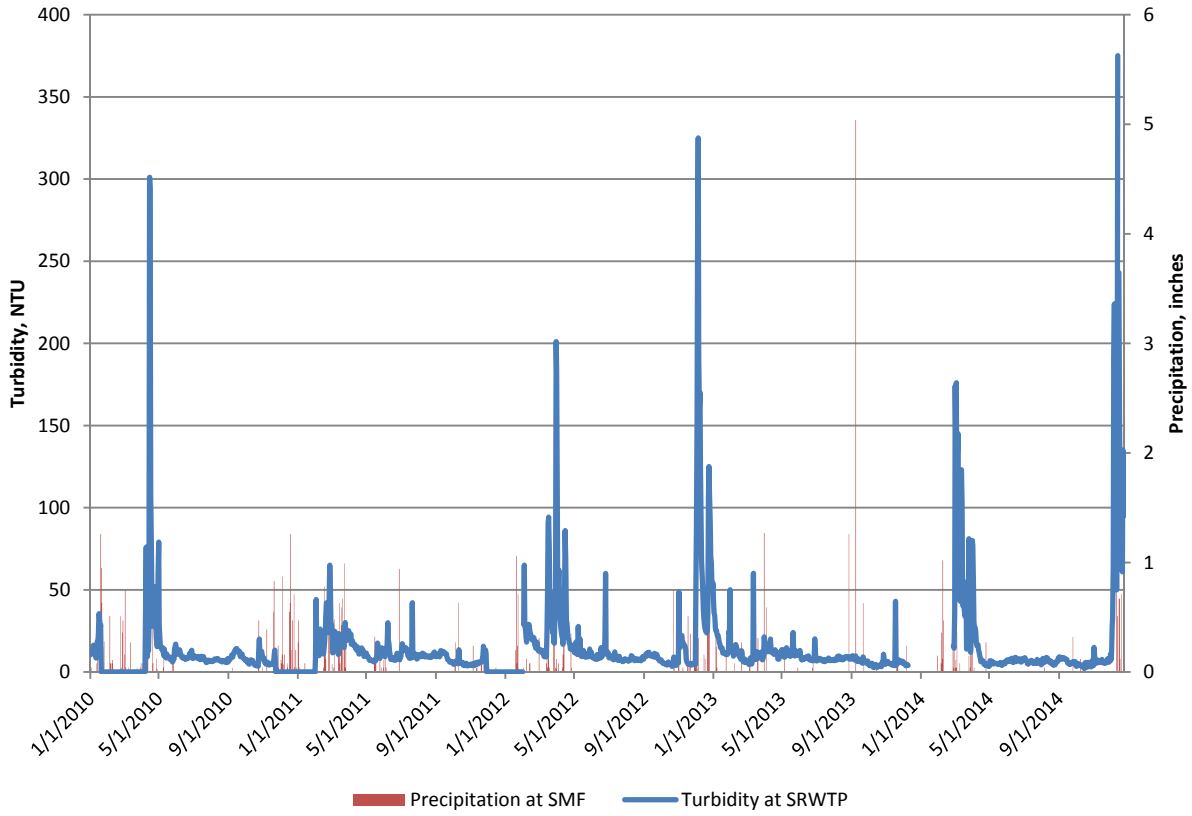


Figure 3-3. Precipitation and Raw Water Turbidity at SRWTP

The median raw water turbidities at GKWTP and SRWTP were 12.3 and 10.0 NTU, respectively. According to the monthly average daily data that was provided, the raw water turbidity levels at GKWTP exceeded 10 NTU approximately 63 percent of the time and never exceeded 84.8 NTU. Similarly, monthly average raw water turbidity levels at SRWTP exceeded 10 NTU approximately 51 percent of the time, and never exceeded 116.1 NTU. The highest monthly average at GKWTP was 84.8 NTU in December 2014, and the highest monthly average at SRWTP was 116.1 NTU in December 2014.

Turbidity was sampled on a weekly basis near the new WDCWA intake. The median raw water turbidity was 8.9 NTU, and ranged from 0.69 to 240 NTU. The turbidity reading of 240 NTU occurred on December 5, 2012 and was likely storm related, as rainfall measured at the Sacramento International Airport totaled 2.7 inches over a three day period from November 30 to December 2, 2012. Monthly average daily data was provided for the Sacramento County Water Agency's (SCWA) VSWTP from September 2011 to December 2014. The median raw water turbidity was 8.3 NTU, ranging from 2.6 to 33.5 NTU. The turbidity levels at VSWTP are lower than samples collected at Freeport by the Sacramento CMP and the USGS. This is because the VSWTP influent sample is collected at the end of the 13 mile pipeline transporting water from the FRWA Intake on the Sacramento River to the VSWTP, and substantial sedimentation has occurred.

The Sacramento CMP monitored turbidity levels at three sites that were used for this analysis: Veterans Bridge, Freeport on the Sacramento River, and Discovery Park on the American River. The Sacramento CMP's Veterans Bridge sampling site is upstream of GKWTP, and the Sacramento CMP's Discovery Park site on the American River is upstream of SRWTP. When comparing the Sacramento CMP data for Veterans Bridge to the raw water collected at the GKWTP, as shown in **Table 3-10**, the statistics for turbidity are very similar, with Sacramento CMP data only slightly higher.

When performing the same comparison between the Sacramento CMP data at Discovery Park and the SRWTP, the statistics for turbidity display a different characteristic. Levels at SRWTP are higher than levels at Discovery Park, with the median turbidity at SRWTP being 10.0 NTU and the Discovery Park median level at 5.6 NTU. It is typical for turbidity levels in the Lower American River to be lower than those in the Sacramento River, due to the low turbidities coming out of Folsom Dam. Since the SRWTP is just downstream of the confluence of the two river systems, the water treatment plant diverts water that may not be fully mixed with the Sacramento River making the SRWTP turbidity levels lower than the GKWTP and Veterans Bridge levels upstream.

Summary of Results

- The average raw water turbidity level was 19.4 NTU at GKWTP and 16.8 NTU at SRWTP. The average raw water turbidity at Freeport was 10.0 NTU based on SCWA VSWTP influent data and 14.7 NTU based on Sacramento CMP data.
- Generally, raw water turbidity falls in the 10 to 100 NTU range.
- Turbidity spikes occur in winter months, typically January and February.
- WDCWA highest monthly reading (individual sample) was December 2012 at 240 NTU.
- GKWTP highest monthly average was 84.8 NTU in December 2014.
- SRWTP highest monthly average was 116.1 NTU in December 2014.
- VSWTP highest monthly average was 33.5 NTU in December 2014.
- The median turbidity levels at SRWTP are generally lower than GKWTP, due to the influence of the lower turbidity Lower American River.
- Peak raw water turbidity levels are related to high river flow, likely caused by both upstream sources (such as reservoir releases) and precipitation.

Microbiological Constituents

General Characteristics and Background

The major microbiological constituents of concern include fecal coliform, *E. coli*, *Giardia lamblia*, and *Cryptosporidium parvum*. Generally speaking, pathogenic organisms

carried by mammalian species may be infectious to humans although this depends on the species of microorganism. Pathogens infecting other types of animals, such as birds and reptiles, are usually not infectious to humans. However, some types of animals, such as birds, may be vectors for human pathogens. Each of these constituents was identified for further evaluation because they are currently regulated. The presence of these constituents in the raw water governs the overall treatment requirements for the water treatment plants, though detected pathogens and pathogen indicators may not be capable of infecting humans.

Fecal coliform and *E. coli* have been used to indicate the potential presence of pathogenic microorganisms in source waters. Although coliform levels do not correlate well with pathogenic microorganisms, they continue to be used as indicators due to the lack of affordable and reliable direct analytical methods for detecting pathogens. Potential sources of coliform bacteria in the Sacramento River watershed include general watershed runoff, agricultural drainage, livestock, recreation, wastewater, urban runoff, homeless populations, and watershed spills. Coliform levels in treated water are currently regulated directly through the Total Coliform Rule, to ensure the effectiveness of the disinfection process throughout the distribution system.

Giardia lamblia is a species of the protozoa genus *Giardia* that infects humans and can cause the gastrointestinal disease giardiasis. *Giardia* is found in the environment as a cyst from the feces of humans and animals; both wild and domestic animals may be hosts. Sources close to waterbodies have the most potential to introduce viable cysts to the source water. Cysts may be destroyed naturally in the environment by desiccation and/or heat. The cysts are effectively inactivated using chlorine disinfection. The detectability of *Giardia* has been greatly improved with USEPA Method 1623, which is better able to establish concentrations, but still does not determine viability. *Giardia* may be carried in urban runoff and wastewater sources or may be contributed directly as a result of body-contact recreation or animal defecation, including both wild and domestic animals.

Giardia lamblia is currently regulated by the Surface Water Treatment Rule (SWTR) and the Interim Enhanced Surface Water Treatment Rule (IESWTR). Surface water supplies must provide for 3-log reduction of *Giardia* through physical removal and chemical inactivation. Additional reduction may be required for impaired water supplies. The DDW guidance provides that 3-log reduction is appropriate when monthly median levels of total coliform are less than 1,000 MPN/100 mL, fecal coliform or *E. coli* levels are less than 200 MPN/100 mL, or when directly measured confirmed *Giardia* levels are less than 0.01 cysts per liter.

Cryptosporidium parvum is a species of the protozoa genus *Cryptosporidium* that infects humans and can cause the gastrointestinal disease cryptosporidiosis. *Cryptosporidium* is found in the environment as an oocyst principally from the feces of domestic animals, although both wild and domestic animals are known to be hosts. Like *Giardia*, *Cryptosporidium* oocysts may be destroyed naturally in the environment by desiccation and/or heat. Once in the source water, however, viable oocysts are very

resistant to traditional chemical inactivation using chlorine. Stronger disinfectants such as ozone or ultraviolet (UV) light are required to inactivate these pathogens. The detectability of *Cryptosporidium* has been greatly improved with USEPA Methods 1622 and 1623, which are able to establish true concentrations, but still do not determine viability. *Cryptosporidium* may be carried in urban runoff and wastewater sources or may be contributed directly as a result of body-contact recreation or animal defecation, including both wild and domestic animals.

Cryptosporidium is currently regulated through the IESWTR and the Long Term 1 ESWTR (LT1ESWTR), which require 2-log reduction, and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) which potentially requires additional log action based on source water monitoring results for *Cryptosporidium*. Under the IESWTR (applicable to public water systems serving at least 10,000 population) and LT1ESWTR (applicable to public water systems serving fewer than 10,000 population) well-operated conventional and direct water treatment plants are granted a 2-log removal credit for *Cryptosporidium* if they meet all treated water turbidity standards. The LT2ESWTR (applicable to all public water systems) further regulates *Cryptosporidium* and requires additional action (treatment or protection) if the source water quality is determined to be impaired based on the required direct *Cryptosporidium* monitoring of the source (as discussed in **Appendix B**), if running annual average presumed levels are greater than 0.075 oocysts per liter.

The DDW also developed the *Cryptosporidium* Action Plan (CAP) in the mid-1990s to address *Cryptosporidium* while Federal regulations were being formed. The CAP identified recommended turbidity limits for settled water, treated water, and recycled water in lieu of treated water *Cryptosporidium* levels. The CAP was developed to help utilities optimize treatment processes to ensure maximum removal of *Cryptosporidium* oocysts and reduce the risk of waterborne illness. This plan was intended for utilities with over 1,000 service connections.

Evaluation for Fecal Coliforms and E. coli

Both GKWTP and SRWTP monitor for *E. coli* on a weekly basis. VSWTP monitors *E. coli* on a monthly basis. During the study period, two years of monitoring fecal coliform and *E. coli* data is available for WDCWA's planned diversion from previous LT2ESWTR and additional sampling conducted from January 2010 to February 2012. All Sacramento CMP sampling sites also test for fecal coliform and *E. coli* levels; however, this sampling is conducted less frequently compared to the participating water agencies. The Sacramento CMP sampling is event-based, with three wet weather samples and one dry weather sample required per year. It is difficult to compare event-based monitoring programs to time-based monitoring programs. The Sacramento CMP aims to capture periods of storm water runoff, which the participating water agencies' data may or may not capture within their time-based monitoring. Another time-based monitoring program is the DWR CMP monitoring program, which collects samples on a quarterly basis (February, May, August, and November). The DWR CMP monitoring

sites located on the Sacramento River are all upstream of the participating water agencies' and Sacramento CMP monitoring sites.

As can be seen from the median and average values in **Tables 3-11** and **3-12,** fecal coliform and *E. coli* levels increase slightly downstream. Median levels at Colusa through Below Knights Landing range from 8.5 to 10 MPN/100mL and generally increase slightly downstream. Data collected by the participating water agencies is shaded. For example, the median *E. coli* at GKWTP was 7.9 most probable number per 100 milliliters (MPN/100mL), the median *E. coli* at SRWTP was 14 MPN/100mL, and the median *E. coli* at Freeport (based on SCWA VSTWP) was 13 MPN/100mL. Interestingly, the Sacramento CMP's Discovery Park site has the highest average in the focus area. Overall, median levels of *E. coli* and fecal coliform are low throughout the watershed, with an increase in levels through the Sacramento metropolitan area, potentially contributed by local precipitation and runoff discharges.

There can be significant peaks in coliform levels. *E. coli* data from WDCWA had one occurrence above 1,000 MPN/100mL and five occurrences above 200 MPN/100mL, as shown in **Figure 3-4**. The WDCWA *E. coli* data was more limited than the other participating water agency datasets, with a total of 40 samples. **Figure 3-5** shows that the GKWTP only had one *E. coli* occurrence above 1,000 MPN/100mL, and **Figure 3-6** shows that the SRWTP had five occurrences above 1,000 MPN/100mL. The GKWTP had ten *E. coli* occurrences above 200 MPN/100mL, while the SRWTP had twenty *E. coli* occurrences above 200 MPN/100mL. This explains why the 95th percentile for the GKWTP is 205 MPN/100mL, and the 95th percentile for the SRWTP is much higher, at 578 MPN/100mL. The higher levels at SRWTP could be caused by the influence of the American River and local runoff, discharges, or wastewater spills between GKWTP and SRWTP.

Table 3-11
Raw Water Fecal Coliform Data, MPN/100mL, 2010-2014

Monitoring Site	Number of Samples	Range	Average	Median
WDCWA	40	4.5 – 1,100	113.8	23
Sacramento CMP - Veterans Bridge	20	4.5 – 1,300	97.8	22.5
Sacramento CMP - Discovery Park	20	4 – 16,000	1,804	47.5
Sacramento CMP - Freeport	20	4 – 800	1,083	35

Table 3-12
Raw Water *E. coli* Data, MPN/100mL, 2010-2014

Monitoring Site	Number of Samples	Range	Average	Median
Balls Ferry[1]	20	15.3 – 72.3	28.2	23.8
Bend Bridge[1]	20	10.9 – 38.8	22.3	23.0
Red Bluff[1]	20	9.6 – 35.5	21.8	20.8
Woodson Bridge (Vina)[1]	24	3 – 191.8	37.1	18.3
Hamilton City[1]	20	9.8 – 53.8	24.1	18
Colusa[1]	20	3.1 – 34.5	14.0	8.5
Above CBD[1]	20	3.1 – 64.4	17.3	9.2
Below Knights Landing[1]	20	5.2 - 86	17.5	10.3
Verona[1]	20	7.5 – 39.3	19.8	15.4
WDCWA	40	2 – 1,700	117	17
Sacramento CMP - Veterans Bridge	20	4.5 – 1,300	91	17
GKWTP	194	ND – 1,414	45.5	7.9
Sacramento CMP - Discovery Park	20	4 – 5,400	741	47.5
SRWTP	230	ND – 3,400	114	14
FRWA[2]	167	ND- 2,000	78.5	13
Sacramento CMP - Freeport	20	2 – 800	67.3	20

[1] DWR CMP Monitoring
[2] Based on data collected from September 2011 to December 2014

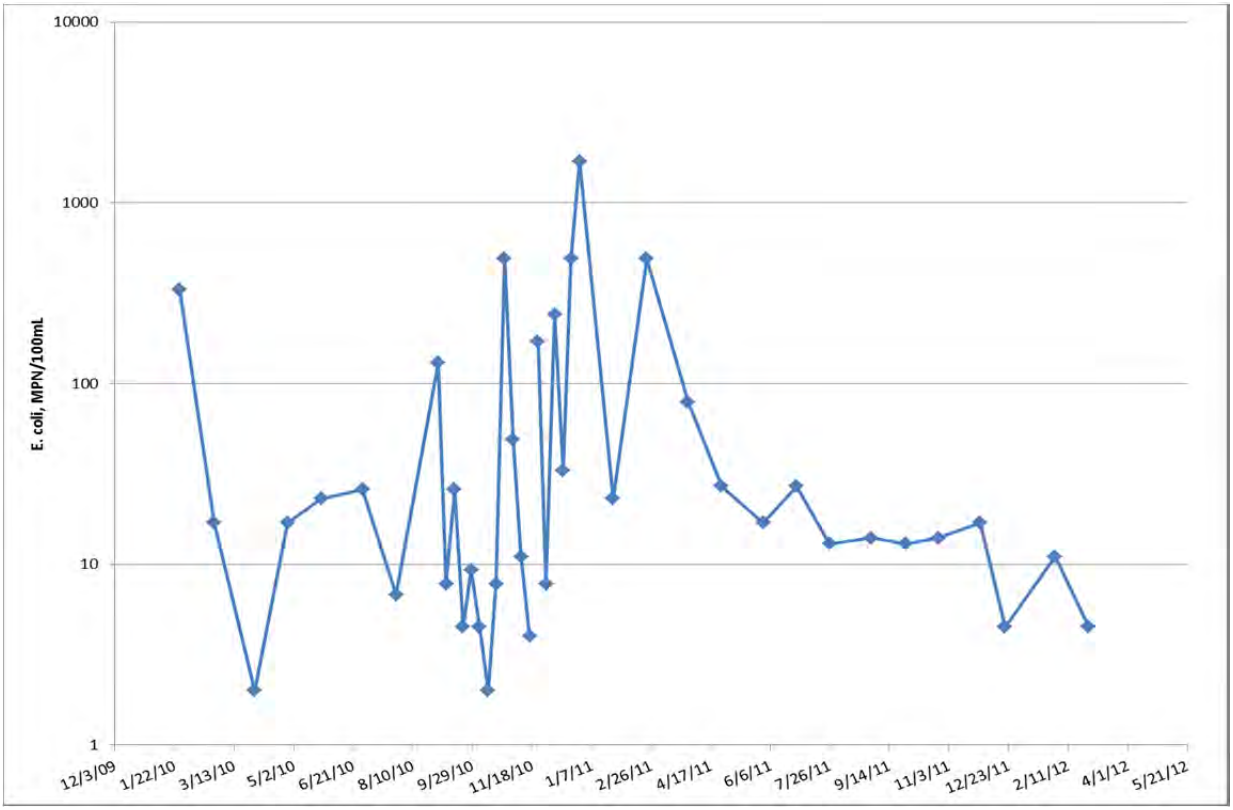


Figure 3-4. *E. coli* Levels at WDCWA, 2010-2012

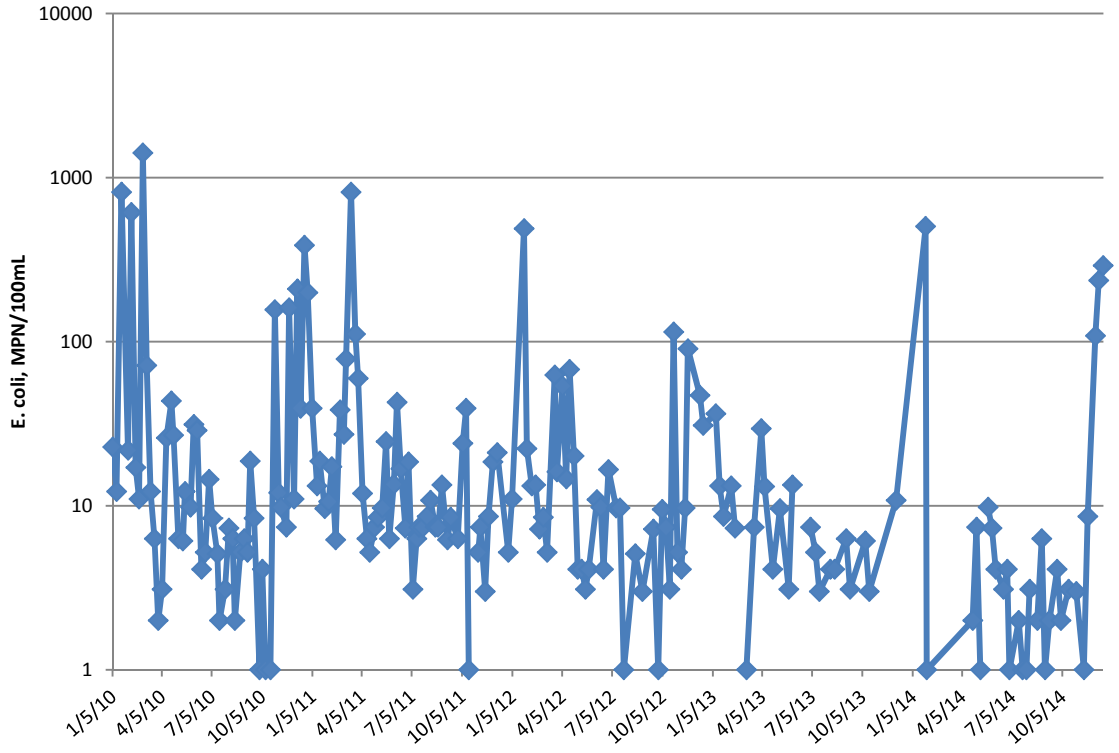


Figure 3-5. *E. coli* Levels at GKWTP, 2010-2014

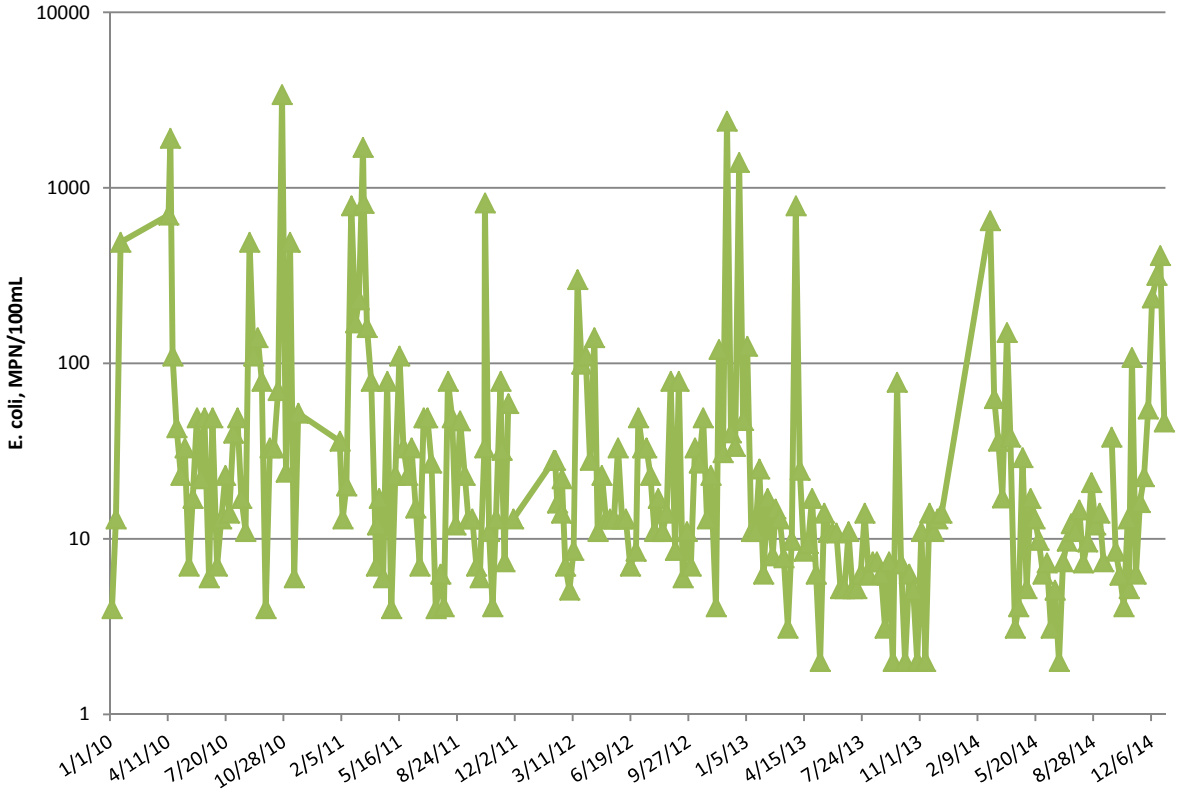


Figure 3-6. *E. coli* Levels at SRWTP, 2010-2014

E. coli data from the FRWA Intake had four occurrences above 1,000 MPN/100mL and 14 occurrences above 200 MPN/100mL, as shown in **Figure 3-7**.

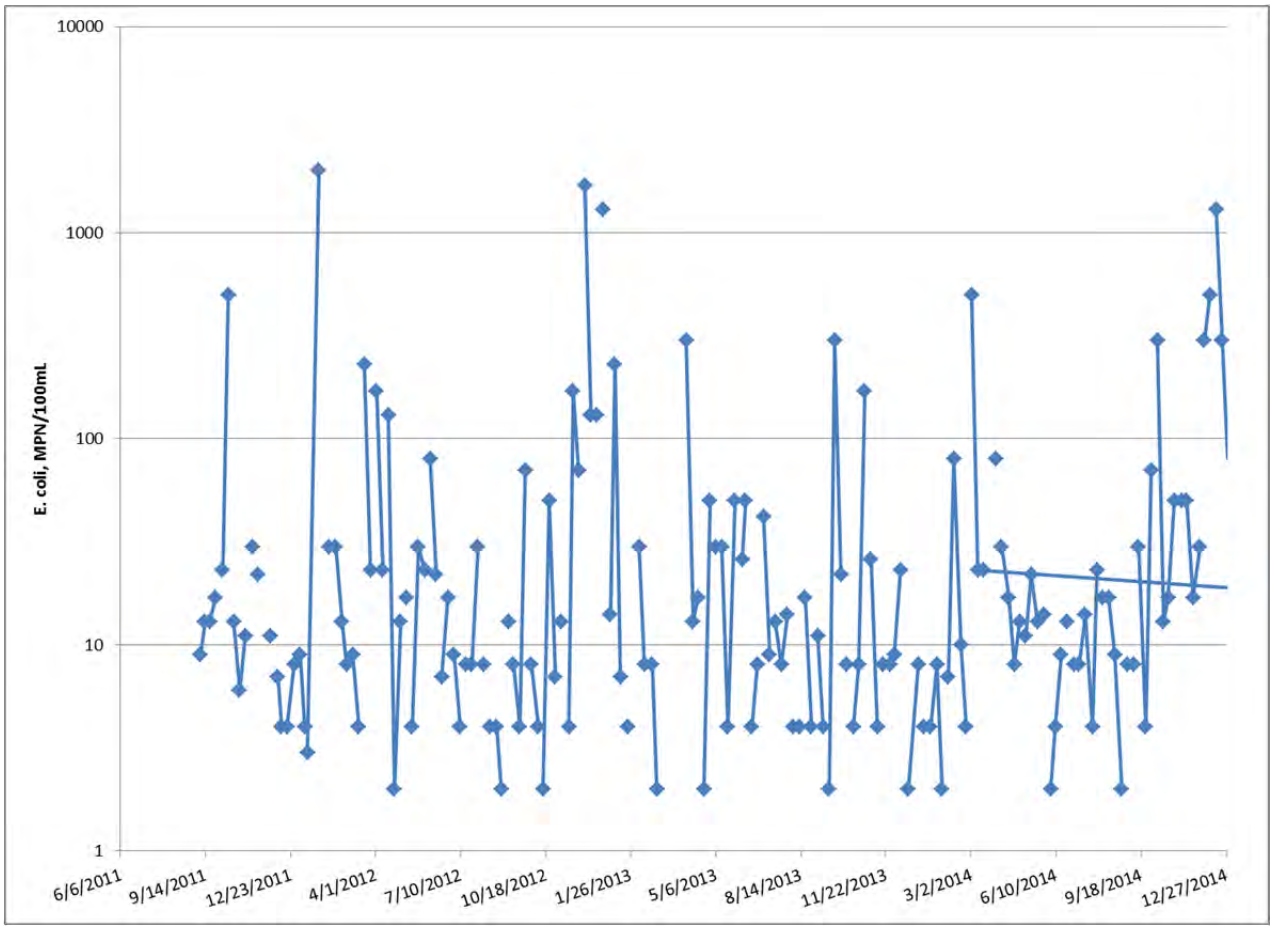


Figure 3-7. *E. coli* Levels at FRWA Intake, 2011-2014

A comparison of *E. coli* levels from the current study period (2010 to 2014) to the previous two watershed sanitary survey study periods (2005 to 2009 and 2000 to 2004) was conducted. **Table 3-13** shows that the medians for all three time periods at all sites are the same order of magnitude. The averages show more variation from 2000 to 2014. This is expected due to peaks in the data. Some of the long-term variability may be attributable to changes in source water quality, or analytical variation.

Table 3-13
Historic and Current *E. coli* Data, MPN/100mL

Monitoring Site	Average			Median		
	2000-2004	2005-2009	2010–2014	2000-2004	2005-2009	2010-2014
Sacramento CMP - Veterans Bridge	34	49	NA	17	13	17
GKWTP	168	48	45.5	13	7	7.9
Sacramento CMP - Discovery Park	254	342	NA	27	27	47.5
SRWTP	176	115	114	17	13	14
FRWA Intake for VSWTP		44.6[1]	78.5[2]		11[1]	13[2]
Sacramento CMP - Freeport	63	124	NA	11	30	20

[1] Data from April 2005 to January 2007
[2] Data from September 2011 to December 2014
NA – Not Available

Monthly medians for *E. coli* were also examined, as DDW can require an additional log reduction for *Giardia* and viruses if the monthly median for fecal coliform or *E. coli* is consistently greater than 200 MPN/100mL. WDCWA had six out of 24 *E. coli* monthly samples at or greater than 200 MPN/100mL, but only one sample was collected per month. **Tables 3-14** through **3-16** provide a summary of the raw water monthly median *E. coli* data for GKWTP, SRWTP, and FRWA Intake. The tables also show that the peaks in *E. coli* occur during the wet season, from winter to early spring. Out of 60 months from 2010 to 2014, there were only two monthly median *E. coli* values at or higher than 200 MPN/100mL at the GKWTP, in January 2010 and December 2014. Out of 52 months (fewer due to operational shutdowns), there were three monthly median *E. coli* values at or higher than 200 MPN/100mL at the SRWTP, in April 2010, March 2011, and December 2014. The FRWA Intake had two *E. coli* medians at or greater than 200 MPN/100mL in December 2012 and December 2014.

Table 3-14
City of West Sacramento – GKWTP
Raw Water Monthly Median *E. coli* (MPN/100mL)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2010	263	19	12	26	8	15	4	6	6	3	11	199
2011	16	14	78	7	9	17	7	9	6	13	7	13
2012	22	13	12	37	4	10	10	4	4	8	7	39
2013	13	7	4	13	10	ND*	5	4	5	5	no data	11*
2014	1*	no data	no data	2*	7	4	1	3	2	3	5	236

*One sample collected for the month

Table 3-15
City of Sacramento – Sacramento River WTP
Raw Water Monthly Median *E. coli* (MPN/100mL)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2010	13	N/O	N/O	405	23	36	14	40	95	52	38	N/O
2011	N/O	28	200	12	23	24	17	47	13	12	46	N/O
2012	N/O	19	54	28	13	11	33	15.5	10	27	27	47
2013	18	11	9	17	9	8	6	7	7	4	11	14
2014	N/O	N/O	50	29	11	5	10	12	12	6	19	236

N/O = Not operational

Table 3-16
Sacramento County Water Agency – FRWA Intake
Raw Water Monthly Median *E. coli* (MPN/100mL)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2011	N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O	13	13	17	6
2012	7	22	16	23	20	20	8	4	11	7	42	715
2013	11	8	no data	17	30	17	13	4	11	8	8	9
2014	4	9	23	15	14	7	8	13	8	34	40	300

N/O = Not operational

Overall, the DDW guidelines are met for the water treatment plants, and the current 3/4-log reduction requirement for *Giardia* and viruses appears to continue to be appropriate.

Summary of Results for Fecal Coliform and E. coli

- Median *E. coli* values range from 7.9 MPN/100mL at GKWTP, to 14 MPN/100mL at SRWTP, and 13 MPN/100mL at FRWA Intake (SCWA).
- Median *E. coli* values range from 17 MPN/100mL at Veterans Bridge to 20 MPN/100mL at Freeport, and 47.5 MPN/100mL at Discovery Park.
- Average and median *E. coli* values generally appear to increase from upstream to downstream. As expected, average *E. coli* values are much higher than the median, indicating the influence of peak events. There is a higher peaking effect seen downstream, when comparing levels at GKWTP and SRWTP.
- The peak levels occur during the wet season, which are also periods of higher flow from upstream and local runoff and discharges.
- A comparison of *E. coli* levels from the current study period (2010 to 2014) to the previous two watershed sanitary survey study periods (2005 to 2009 and 2000 to 2004) was conducted. The median *E. coli* concentration has remained on the same order of magnitude for all sampling sites presented.

- The DDW guidelines are met for the water treatment plants, and the current 3/4-log reduction requirement for *Giardia* and viruses appears to continue to be appropriate.

Evaluation for Giardia and Cryptosporidium

During the period of study, *Giardia* and *Cryptosporidium* data was collected only near the new intake for WDCWA. The City of Sacramento completed their pathogen monitoring for LT2ESWTR and presented that information in the Sacramento River Watershed Sanitary Survey Second Update (Second Update). The City of West Sacramento and SCWA completed monitoring for LT2ESWTR in the 2010 Update. The City of Sacramento began their second round of LT2ESWTR monitoring in April 2015, and SCWA began in May 2015. The City of West Sacramento plans to begin their second round of monitoring in October 2015.

During the study period, WDCWA collected 26 samples from 2010 to 2012. A summary of all the WDCWA data collected during this period is provided in **Table 3-17.** WDCWA received a letter for Bin 1 classification in May 2012 from DDW (for the LT2ESWTR sampling conducted August 2009 through August 2011), and plans to begin the second round of LT2ESWTR monitoring in December 2017.

Table 3-17
***Giardia/Cryptosporidium* LT2ESWTR Data at WDCWA, 2010-2012**

***Giardia* (#cysts/L)**			***Cryptosporidium* (#oocysts/L)**		
Presumed			**Presumed**		
# of Samples	**#Samples Positive**	**Average Conc.**	**# of Samples**	**#Samples Positive**	**Average Conc.**
26	13	0.076	26	2	0.014

[1]Based on data collected from January 2010 to February 2012

All of the *Giardia* and *Cryptosporidium* results were analyzed using USEPA Method 1623. A detection of a protozoan can be reported as either presumptive or confirmed. A presumptive detection is one that results in the detection of an appropriately sized particle that immunofluorescences properly, without identification of specific internal structures. A confirmed detection is one that results in an appropriately sized particle with internal structures identified and dye-stained properly. Method 1623 can provide information on both presumed and confirmed detections. However, the laboratory that conducted the analysis for WDCWA did not provide detailed bench sheet information on the laboratory reports to allow for identification of confirmed detections, only presumptive.

Of the 26 *Giardia* samples collected by WDCWA, 13 samples had presumptive counts, for a detection frequency of 50 percent. Of the 26 *Cryptosporidium* samples collected by WDCWA, two samples had presumptive counts, for a detection frequency of 7.7 percent.

Summary of Results for Giardia and Cryptosporidium

- There continue to be generally low concentrations of presumed *Giardia* and *Cryptosporidium* in the Sacramento River based on WDCWA pathogen data results.
- In the Sacramento River, the detection frequency of presumptive *Giardia* is more frequent compared to the detection frequency of presumed *Cryptosporidium*.

Total Organic Carbon

General Characteristics and Background

Disinfection By-Products (DBPs) are formed when disinfectants added to water react with naturally occurring organic matter or other constituents, such as bromide. Since the Sacramento River upstream of Freeport does not have consistently detectable levels of bromide, total organic carbon (TOC) is the key precursor for DBPs. The most common DBPs are total trihalomethanes (TTHM), which can cause liver, kidney, or central nervous system problems, as well as an increased risk of getting cancer. Other DBPs, including haloacetic acids (HAA5), are suspected mutagens and teratogens. Potential sources of these organic precursors are plant matter, animal matter, and soil, which can be contributed by general watershed runoff (whether direct flows or reservoir releases), agriculture, urban runoff, recreation, and wastewater sources.

The Stage 1 Disinfectants/Disinfection Byproduct (D/DBP) Rule requires varying levels of TOC removal if the source water TOC concentrations exceed 2 milligrams per liter (mg/L) and a utility implements conventional filtration. TOC was a selected constituent for further evaluation due to its importance in the formation of DBPs and also as a general indicator of organic contamination in water.

Evaluation

Raw water TOC data was provided by WDCWA, the cities of West Sacramento and Sacramento, SCWA, and obtained for each of the ambient monitoring programs, including the Sacramento CMP, DWR CMP, and the USGS NAWQA site at Freeport. **Table 3-18** provides a summary of TOC data at the sampling sites included in the focus area. Data collected by the participating water agencies are shaded. It should be kept in mind that there are numerous methods for TOC analysis which can result in reporting variabilities. Standard Method 5310B uses combustion and typically results in higher detected values than Standard Method 5310C, which uses wet oxidation. Both are acceptable methods for analysis. Also, ambient monitoring programs collect samples from different depths in the river than intake monitoring programs. Verification of analytical method and sample depth were not within the scope of this survey, but could account for some disparity in levels between the monitoring programs.

Table 3-18
Raw Water TOC Levels (mg/L), 2010-2014

Monitoring Site	# of Samples	Range	Average	Median	95th percentile
WDCWA	101	1.1 – 7.8	2.46	2.1	4.2
Sacramento CMP - Veterans Bridge	20	2.8 – 9.0	5.3	5.1	8.43
GKWTP	60	0.8 – 6.3	2.01	1.7	3.7
DWR MWQI at West Sac	61	< 0.5 – 6.9	2.2	1.9	4.2
Sacramento CMP - Discovery Park	20	2.4 - 12	4.5	3.6	6.9
SRWTP	51	1.1 – 6.1	1.9	1.60	3.3
DWR MWQI at Westin Boat Dock[1]	32	1.3 – 8.8	2.6	1.9	8.2
SCWA[2]	30	0.7 – 8.0	1.8	1.5	2.4
USGS - Freeport	90	1.3 – 6.8	2.2	1.9	3.8
Sacramento CMP - Freeport	20	2.1 – 8.3	4.9	4.6	7.9

[1] Based on data collected from September 2013 to December 2014
[2] Based on data collected from September 2011 to December 2014

Figure 3-8 shows TOC at the plant influent for the GKWTP, SRWTP, and VSTWP, as well as data from WDCWA from 2005 to 2014. There does not appear to be an increasing trend over time at these locations. However a closer examination of the TOC data collected by the Sacramento CMP monitoring program shown in **Figure 3-9** shows an increasing TOC trend at Veterans Bridge, Discovery Park, and Freeport over 10 years, from 2005 to 2014. Since the Sacramento CMP dataset used in the evaluation is more focused on capturing storm events than dry weather conditions, the increase in observed concentrations may be related to a wet weather bias in the dataset. The recent drought condition may be contributing to higher concentrations of TOC during storm events, as more contaminants are accumulated on the ground during extended dry periods. It is likely that these wet weather TOC peaks are not fully captured in the participating water agency data, since sample timing is pre-assigned and not event based.

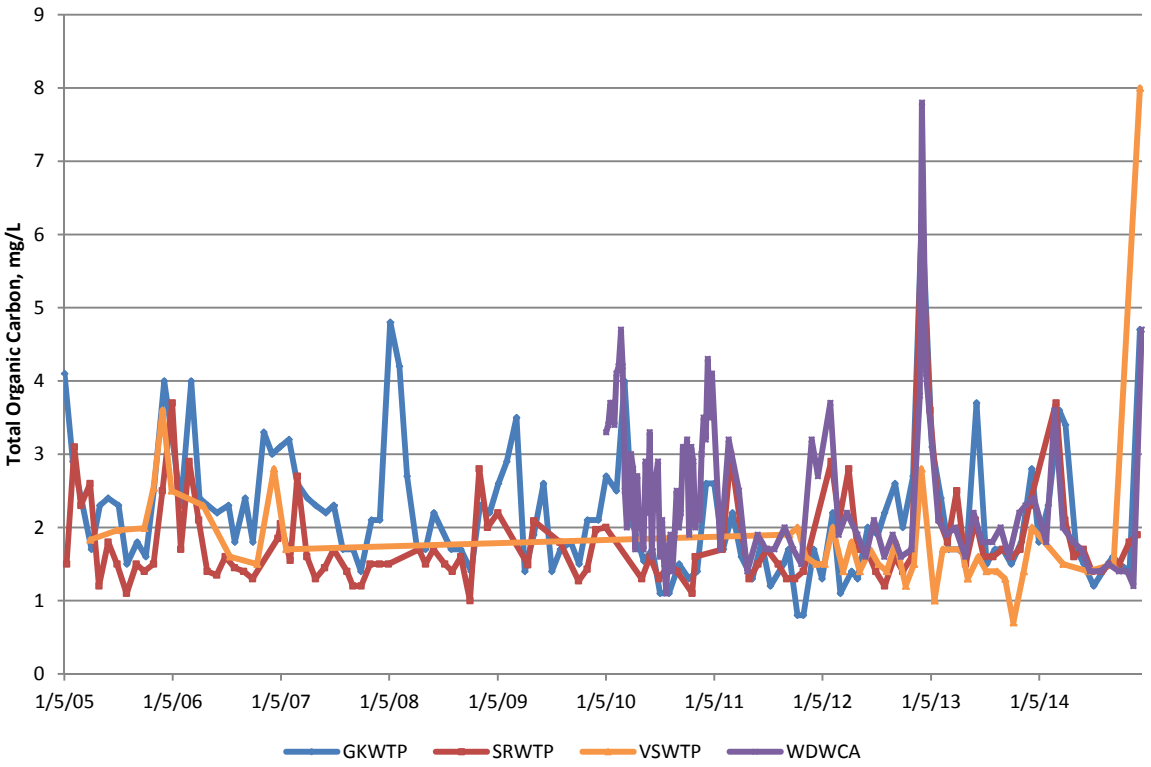


Figure 3-8. TOC in Sacramento River for WDCWA, GKWTP, SRWTP, and VSWTP, 2005-2014

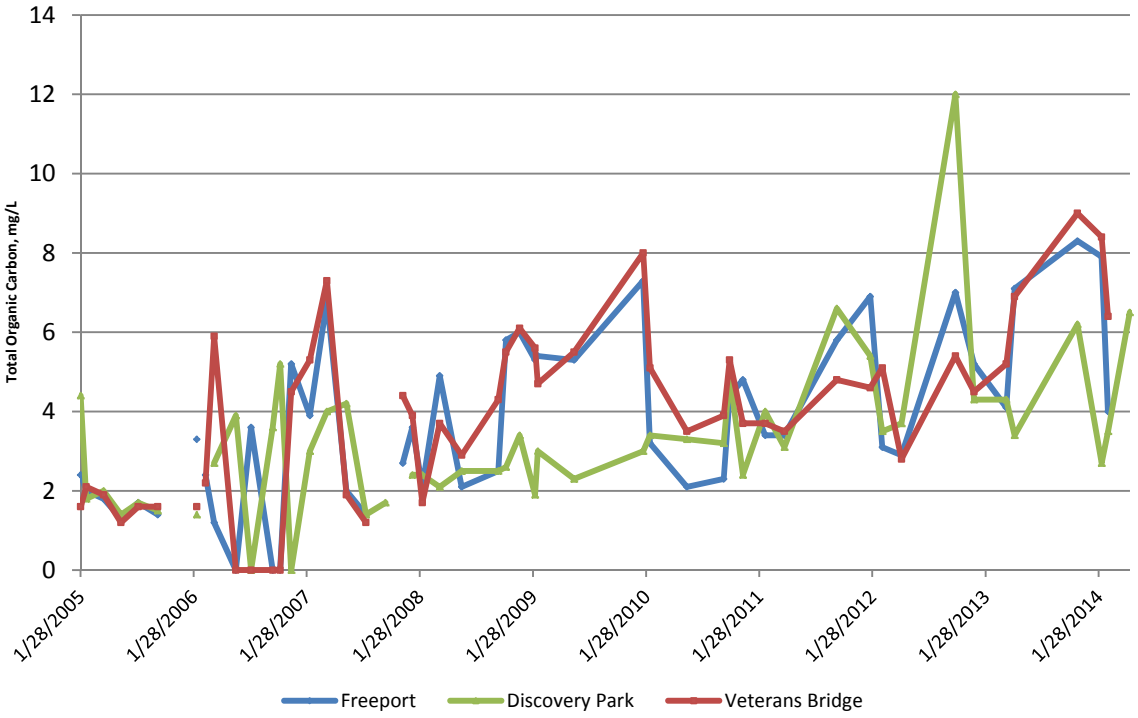
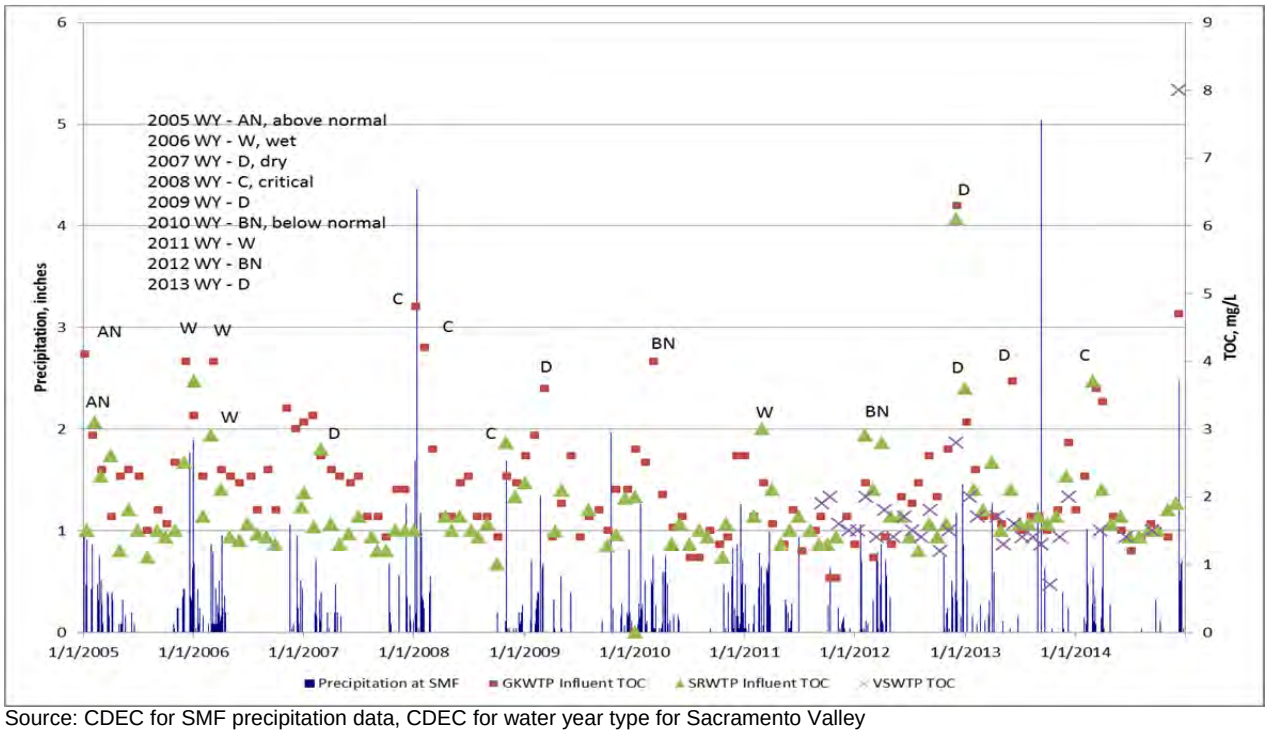


Figure 3-9. TOC in Sacramento River at Veterans Bridge, Sacramento CMP Data, 2005-2014

As discussed in previous watershed sanitary surveys, TOC peaks do occur during periods of precipitation and periods of higher flow, as shown in **Figures 3-10** and **3-11,** respectively.

As shown in **Figure 3-10**, the water year classification was labeled for the ten highest TOC peaks for both the SRWTP and GKWTP. There was not a stronger correlation of TOC peaks occurring during wet or above normal years, compared to dry and critical years. However, only three out of the past ten years have been classified as either wet or above normal. TOC peaks correlate better with precipitation events, compared to water year classification. **Figure 3-10** shows peak TOC levels occurring during the wet season. The highest GKWTP TOC concentration was 6.3 mg/L in December 2012, and the highest SRWTP TOC concentration was 6.1 mg/L in December 2012. **Figure 3-11** shows all TOC concentrations above 4 mg/L at the GKWTP and SRWTP occurred during a period of high Sacramento River flow.



Source: CDEC for SMF precipitation data, CDEC for water year type for Sacramento Valley

Figure 3-10. Precipitation versus TOC Levels at GKWTP, SRWTP, and VSWTP, 2005-2014

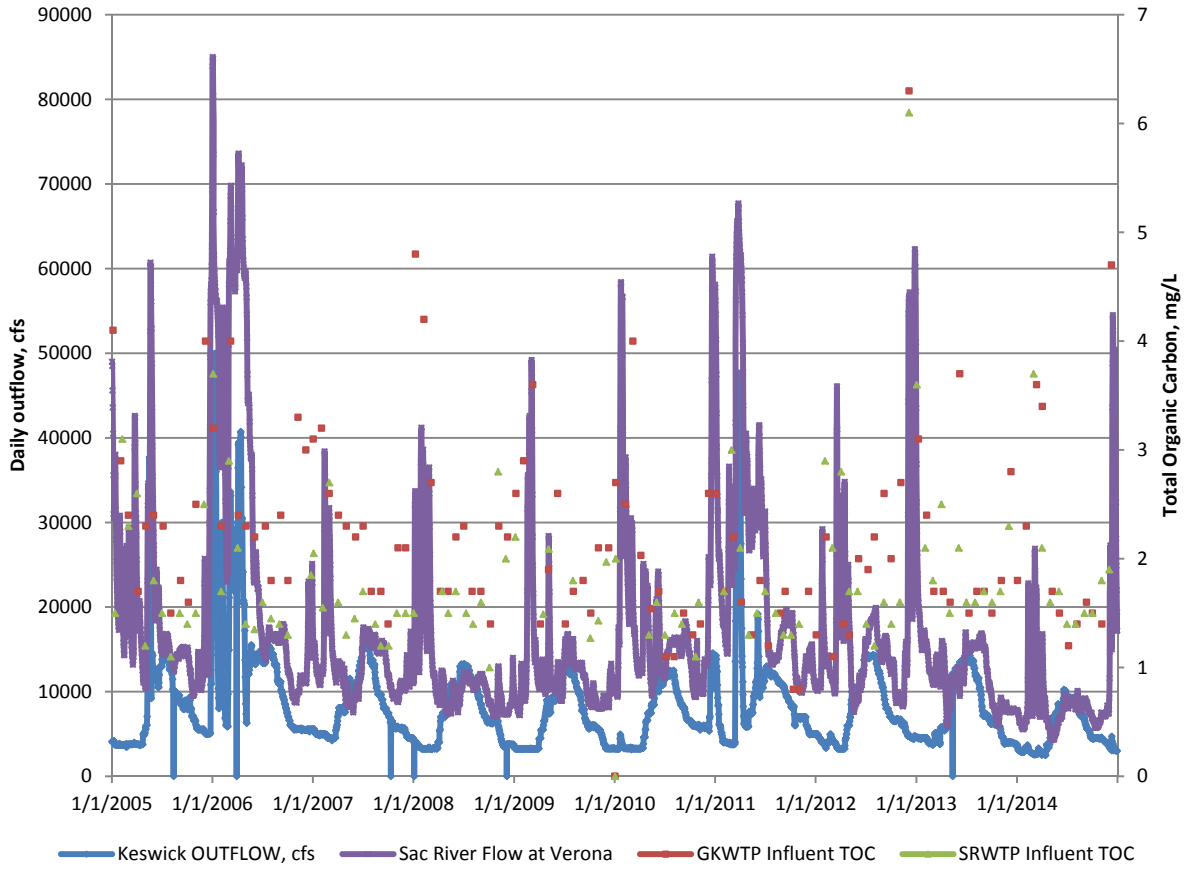


Figure 3-11. Keswick Outflow and Flows at Verona versus TOC Levels at GKWTP, SRWTP, and VSWTP, 2005-2014

Table 3-19 provides a summary of the TOC collected by the DWR CMP monitoring program. The DWR monitoring program begins far upstream in the Sacramento River watershed, and ends at Verona (just downstream of the confluence of Feather and Sacramento Rivers). Examination of the median TOC levels shows that TOC begins to change at Hamilton City, and continues to increase downstream to Verona. The largest increase in median values is seen between the Above CBD monitoring site and the Below Knights Landing monitoring site.

Table 3-19
TOC Levels in Sacramento River Watershed (mg/L), 2010-2014
DWR Coordinated Monitoring Program

Locations Along Sacramento River	# of Samples	Range	Average	Median
Balls Ferry	20	0.2 – 1.8	1.0	1.0
Bend Bridge	20	<0.5 – 3.8	1.1	1.1
Red Bluff	20	<0.5 – 6.9	1.6	1.2
Vina Bridge near Corning	24	<0.5 – 2.8	1.1	1.1
Hamilton City	20	<0.5 – 4.5	1.2	1.2
Colusa	20	0.5 – 2.3	1.2	1.3
Above CBD	20	0.5 – 3.7	1.4	1.4
Below Knights Landing	20	0.04 – 4.5	1.9	1.8
Verona (after confluence with Feather River)	20	<0.5 – 6.8	2.0	1.95

Since the DWR CMP monitoring program also samples sloughs and tributaries leading into the Sacramento River, additional work was completed to investigate if these tributaries could be sources of TOC between Hamilton City and Verona. **Figure 3-12** shows TOC levels at Hamilton City and Colusa, both located on the mainstem of the Sacramento River, as well as Stony Creek and Big Chico Creek which are tributaries entering the Sacramento River between Hamilton City and Colusa. TOC levels are generally below 3 mg/L in Stony Creek, and less than 2 mg/L in Big Chico Creek. These levels are slightly higher than the Sacramento River mainstem levels (generally below 2 mg/L in this reach); therefore, they are likely contributing some TOC, but not substantially different concentrations than the background levels in the river.

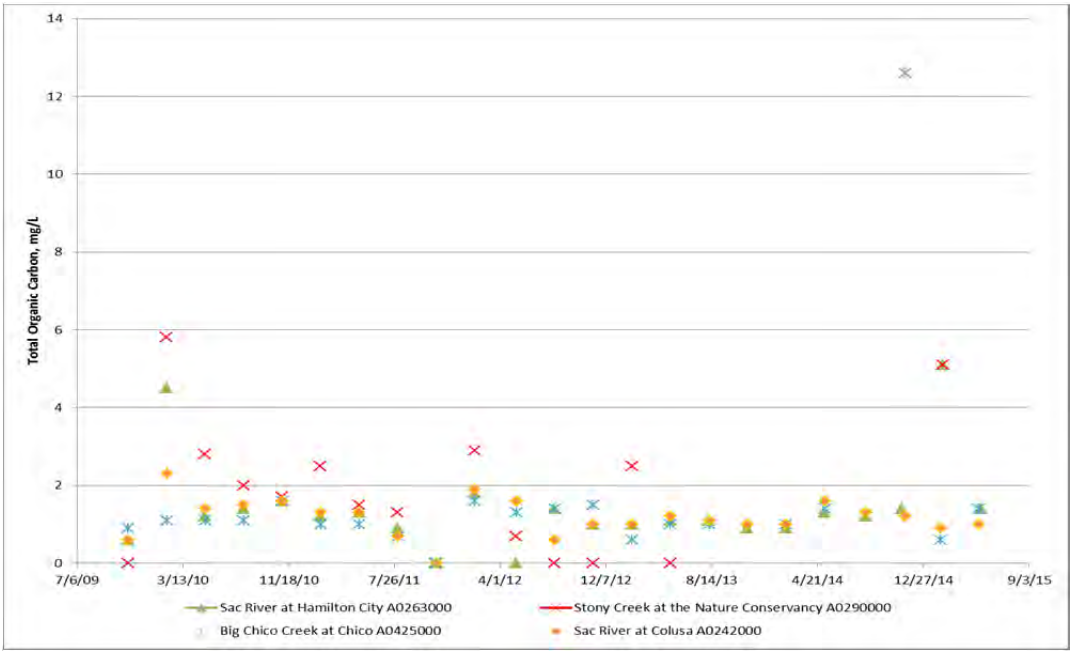


Figure 3-12. TOC Data from Hamilton City to Colusa, DWR CMP Data, 2009-2014

Figure 3-13 shows TOC levels from Colusa to Verona. There are four slough/drains/tributaries that enter the Sacramento River between Colusa and Verona: 1) Butte Slough near Meridian, 2) Colusa Basin Drain near Knights Landing, 3) Sutter Bypass at RD1500, and 4) Feather River.

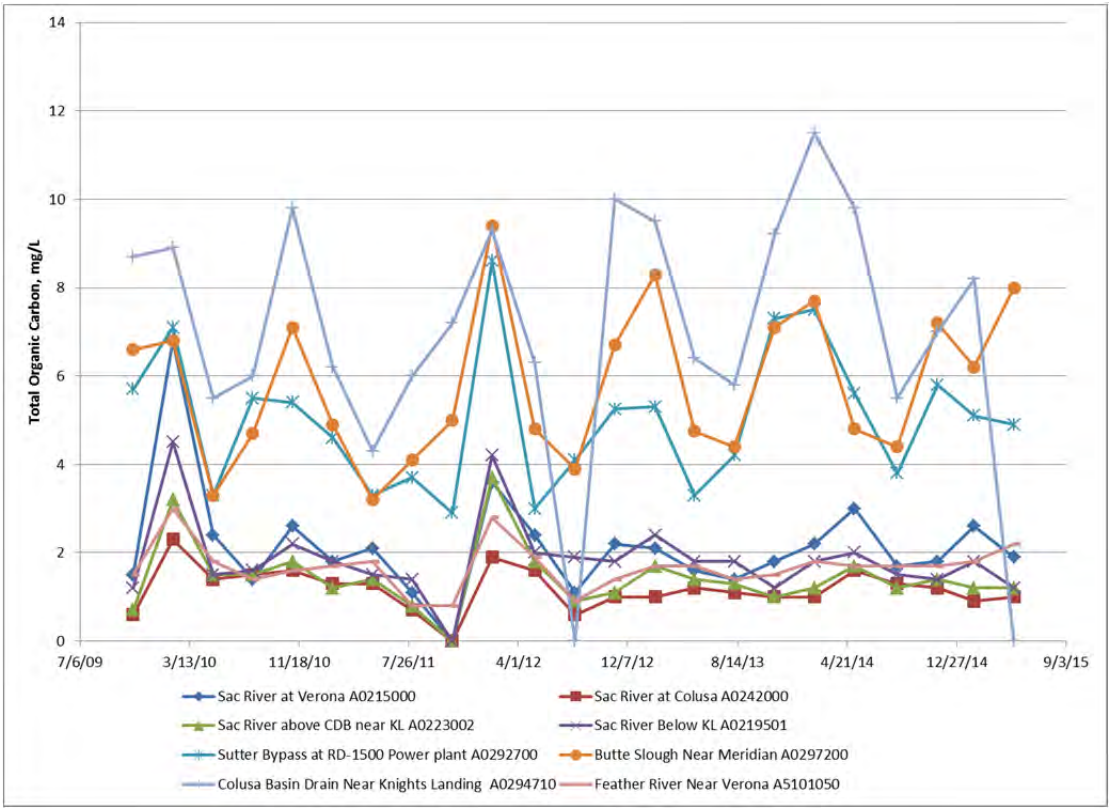


Figure 3-13. TOC Data from Colusa to Verona, DWR CMP Data, 2009-2014

Figure 3-13 clearly shows the higher TOC in the tributaries (specifically Colusa Basin Drain, Butte Slough, and Sutter Bypass) compared to the samples collected in the Sacramento River. Out of the four tributaries which enter the Sacramento River from Colusa to Verona, the three agricultural drains have the highest concentrations of TOC. The highest TOC levels were found in Colusa Basin Drain near Knights Landing, with a median TOC level of 7.2 mg/L and ranging from 4.3 to 11.5 mg/L. High TOC levels were also found in Butte Slough and Sutter Bypass, with medians of 5 and 5.1 mg/L, respectively.

Unfortunately, there are no monitoring locations (either river or tributary) between the DWR CMP monitoring site at Verona and the new WDCWA intake, just upstream of Veterans Bridge. However, the median TOC value at Verona is 1.95 mg/L, similar to the median TOC value of 2.1 mg/L at WDCWA.

Overall, TOC is higher at WDCWA and GKWTP, as compared to the SRWTP. TOC then increases slightly from SRWTP to Freeport. The lower levels at SRWTP are likely caused by the influence of the American River (which has lower organic carbon content) on the diverted water. The TOC increase downstream of the SRWTP (at Freeport) is

likely caused by full mixing of the American River source and the contributions of local runoff and discharges downstream of the confluence.

At WDCWA, the percent occurrence of TOC below 2.0 mg/L or less is 39 percent of the time. At GKWTP, the percent occurrence of TOC below 2.0 mg/L is 65 percent. Please note it is difficult to compare the WDCWA data to the GKWTP, as 52 out of the 101 TOC samples were collected by WDCWA in 2010. At SRWTP, the percent occurrence of TOC below 2.0 mg/L or less is 74 percent of the time. At the FRWA Intake, the occurrence of TOC below 2.0 mg/L or less is 84 percent of the time. It should be noted that the dataset at the FRWA Intake is about the half the number of samples collected at SRWTP and GKWTP, as the facility did not begin operating until September 2011.

As shown in **Table 3-20**, a comparison of TOC levels from the current study period (2010 to 2014) to the previous two watershed sanitary survey study periods (2000 to 2004 and 2005 to 2009) was conducted. The participating water agency data is shaded. For the Sacramento CMP sites and the SRWTP both the TOC averages and medians have gradually increased from the 2000-2004 time period, to 2005-2009, and increased again in 2010-2014 time period. However, the current 2010-2014 TOC averages and medians are lower than the 2005-2009 averages and medians at GKWTP and USGS at Freeport. There is no general conclusion that can be drawn about source water TOC trends from this data. There is a stronger trend for the treated water TOC concentrations at SRWTP and GKWTP, which will be discussed in **Chapter 5**.

Table 3-20
Historic and Current TOC Data, mg/L

Monitoring Site	Average			Median		
	2000-2004	2005-2009	2010-2014	2000-2004	2005-2009	2010-2014
Sacramento CMP - Veterans Bridge	2.26	3.4	5.3	1.90	3.3	5.1
GKWTP	2.30	2.37	2.01	2.00	2.30	1.7
Sacramento CMP - Discovery Park	2.06	2.65	4.5	1.70	2.45	3.6
SRWTP	1.53	1.75	1.9	1.30	1.50	1.6
Sacramento CMP - Freeport	2.35	3.2	4.9	2.00	2.5	4.6
USGS - Freeport	2.44	2.5	2.2	2.25	2.2	1.9

Summary of Results

- Average TOC levels along the river range from 2.5 mg/L at WDCWA, 2.0 mg/L at GKWTP, 1.9 mg/L at SRWTP, and 1.8 mg/L at FRWA Intake. It should be noted that the number of samples collected at each location varied widely.
- Peaks in TOC are likely due to a number of factors potentially including: precipitation events, high outflow from upstream reservoirs, and agricultural drainage waters. The highest WDCWA TOC concentration was 7.8 mg/L, the highest GKWTP TOC concentration was 6.3 mg/L, and the highest SRWTP TOC

concentration was 6.1 mg/L, all occurring in December 2012. The highest SCWA FRWA TOC concentration was 8.0 mg/L in December 2014.

- Spatially, TOC concentrations increase from the upper watershed downstream to WDCWA and GKWTP. Using DWR CMP data, TOC increases between Colusa to Verona appear to be contributed to by elevated levels of TOC from large agricultural drains (Butte Slough, Colusa Basin Drain, and Sutter Bypass). The Colusa Basin Drain had the highest TOC concentrations, with levels ranging from 4.3 to 11.5 mg/L, with a median of 7.2 mg/L. There is then a decrease in TOC levels at SRWTP and increase at Freeport. The lower levels at SRWTP are likely caused by the influence of the American River (which has lower levels of TOC), and the increase downstream of the SRWTP is likely caused by full mixing of the Sacramento River with the Lower American River water and other local runoff and discharges.
- Temporally, for the Sacramento CMP sites and the SRWTP, both TOC averages and medians have gradually increased from the 2000-2004 time period to the 2005-2009, and increased again in 2010-2014 time period. However, the current 2010-2014 TOC averages and medians are lower than the 2005-2009 averages and medians at GKWTP and USGS at Freeport. Therefore, no general conclusion can be drawn about source water TOC trends over time. The Sacramento CMP data collected at Veterans Bridge, Discovery Park, and Freeport shows a definite increasing trend from 2005 to 2014. Since the Sacramento CMP dataset is focused on capturing storm events, this may bias the finding. The current drought condition may be causing a higher degradation in water quality during storm events, as more contaminants are accumulated on the ground during the extended dry period.

Detectable Volatile and Synthetic Organic Compounds of Interest

General Characteristics and Background

Most VOCs and SOCs are formulated for, or are by-products from, industrial, agricultural, and urban use. Pesticides are a main subgroup of the SOCs used for agriculture and urban application. Many of these constituents have been regulated by the Phase I, II, and V regulations. Thiobencarb is of special interest because it has been historically detected in the Sacramento River in the spring. It is used as a pre-emergent pesticide for rice crops, and it is typically applied in the spring. It is biodegradable within weeks. Of special interest are low levels of thiobencarb, below levels of human health concern, because it can cause taste problems in treated water; thiobencarb has a secondary MCL that is much lower than the primary MCL.

Evaluation

There were several detections of thiobencarb on the Sacramento River, including at the GKWTP, however none were detected above the MCL. There was a low level detection of thiobencarb at Sacramento Village Marina on May 25, 2010 at 0.08 µg/L. Also, there

were two low level detections of thiobencarb, 0.12 µg/L and 0.16 µg/L, on June 1, 2011 and May 20, 2013, respectively, at the GKWTP Intake. These data are part of a special rice season monitoring program. The rice pesticides data is presented and discussed in detail in the Agricultural Drainage subsection of **Section 4**, including additional Sacramento River monitoring results.

Throughout the period of study there were no detections of any other VOCs or SOCs with MCLs monitored at WDCWA, SRWTP, and FRWA Intake. There have been low level detects of regulated drinking water constituents at the USGS monitoring site at Freeport and the Sacramento CMP sites as shown in **Tables 3-21** and **3-22.** All detects were well below the respective primary or secondary MCLs, Notification Level (NL), or Archived Advisory Level (AAL) with the exception of one detect of bis (2-ethylhexyl) phthalate of 4.22 µg/L at Discovery Park in October 2010. This sample was slightly above the MCL for bis (2-ethylhexyl) phthalate (4 µg/L), but there are many potential sources of it including laboratory contamination.

Potential sources for many of these organic chemicals include agricultural drainage and urban runoff from the Sacramento urban area or upstream urban areas. Both of these sources have been tested for organic chemicals and reports show that many of the VOCs and SOCs detected in the river system have also been detected in agricultural drainage and/or urban runoff. This is discussed further in **Section 4**. The sporadic, low level detection of organic chemicals do not currently pose any complications for treatment.

Table 3-21
Detected VOCs and SOCs
USGS Monitoring at Freeport

Constituent	MCL, NL or AAL(µg/L)	Date Sampled	Result (µg/L)
Atrazine	1[1]	3/15/2011	0.006
Glyphosate	700[1]	4/15/2014	0.02
Glyphosate	700[1]	6/30/2014	0.02
Glyphosate	700[1]	7/24/2014	0.02
Thiobencarb	70[1]	Various dates – 15 detections	0.004 to 0.047
Simazine	4[1]	Various dates- 44 detections	0.004 to 0.087
Malathion	0.00016[2]	3/15/2011	0.000009
Malathion	0.00016[2]	5/23/2011	0.000017

[1] Primary MCL
[2] Archived Advisory Level

Table 3-22
Detected VOCs and SOCs
Sacramento CMP Monitoring Sites

Constituent	MCL or NL (µg/L)	Date Sampled	Result (µg/L)
Veterans Bridge			
Benzo (a) pyrene	0.2 [1]	6/8/2010	0.00238
Naphthalene	17 [2]	1/18/2010	0.0066
Pentachlorophenol	1 [1]	2/9/2010	0.257
Discovery Park			
Benzo(a)pyrene	0.2 [1]	1/18/2010	0.0046
		2/27/2014	0.010
Bis (2-ethylhexyl) phthalate	4 [1]	1/18/2010	0.139
		10/24/2010	4.220
Naphthalene	17 [2]	1/18/2010	0.0063
		2/6/2014	0.005
Freeport			
Bis (2-ethylhexyl) phthalate	4 [1]	2/9/2010	0.128
Diazinon	1.2 [2]	1/18/2010	0.0048
Naphthalene	17 [2]	1/18/2010	0.0043
		2/9/2010	0.0141

[1] Primary MCL
[2] Notification Level

Summary of Results

- Over the reporting period, the only detection of any VOCs or SOCs at SRWTP, GKWTP, WDCWA, and FRWA Intake were two detects of thiobencarb at GKWTP, at very low levels.
- All detections of VOCs or SOCs in the ambient monitoring programs are below all current MCLs, Notification Levels, and Archived Advisory Levels, except for one detection of bis (2-ethylhexyl) phthalate at Discovery Park.

Detectable Title 22 Constituents of Interest

A review of the Consumer Confidence Reports (CCRs) and Public Health Goal (PHG) Reports was conducted for each participating water agency to identify detectable constituents of interest in the source water. This review resulted in the selection of three metals for additional evaluation: iron, aluminum, and manganese.

General Characteristics and Background

Aluminum is of concern in drinking water because of potential implications to human health. Iron and manganese were selected because they are detectable and they have an aesthetic impact on water quality. All are naturally occurring constituents, but can be elevated from high runoff in the watershed, agricultural drainage, urban runoff, wastewater, industrial dischargers, and mines.

Aluminum has a primary MCL of 1,000 µg/L and a secondary MCL of 200 µg/L. Iron and manganese have secondary MCLs of 300 µg/L and 50 µg/L, respectively.

Manganese was added to the Fourth Contaminant Candidate List (CCL4) for potential regulatory determination as a primary drinking water standard.

Evaluation for Iron and Aluminum

Figures 3-14 and **3-15** show the participating water agency data collected for aluminum and iron in source waters. As shown in the figures, iron and aluminum levels in the raw water are higher than the respective secondary MCLs frequently at WDCWA and GKTWP, but only occasionally at SRWTP. **Table 3-23** is a summary of the aluminum data collected by the participating water agencies and the Sacramento CMP. **Table 3-24** is a summary of the iron data collected by the participating water agencies and the Sacramento CMP. Data collected by the participating water agencies is shaded. The median aluminum concentration is 380 µg/L at WDCWA and 500 µg/L at GKWTP, both above the secondary MCL of 200 µg/L. The median iron concentration is 605 µg/L at WDCWA and 670 µg/L at GKWTP, both above the secondary MCL of 300 µg/L.

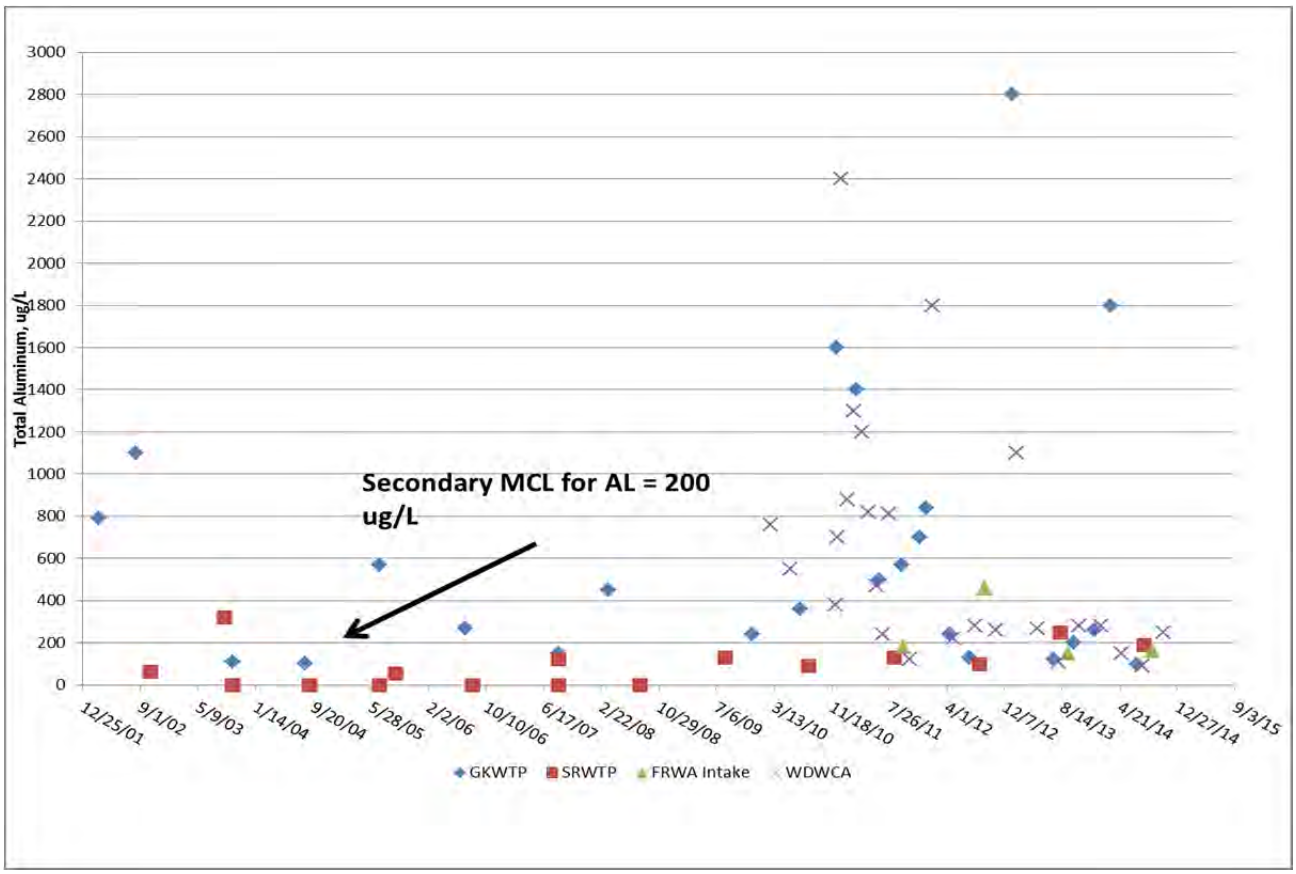


Figure 3-14. Aluminum Levels in Sacramento River at WDCWA, GKWTP, and SRWTP, 2001-2014

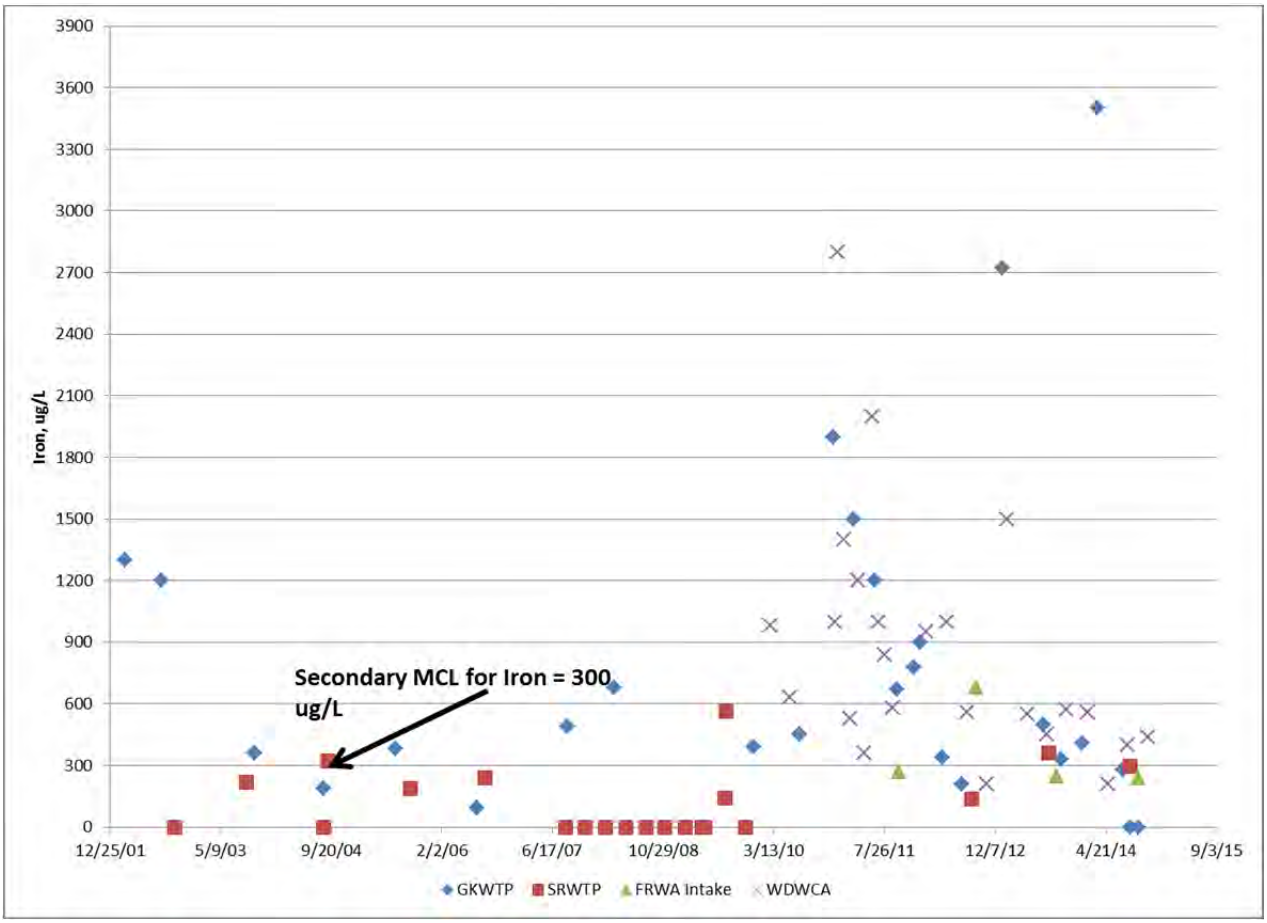


Figure 3-15. Iron Levels in Sacramento River at WDCWA, GKWTP, and SRWTP, 2001-2014

Table 3-23
Aluminum Levels in Sacramento River, Sacramento CMP and WTP sites µg/L, 2010-2014

Location	Number of Samples	Range	Average	Median
WDCWA	25	91 – 2,400	628.8	380
Sacramento CMP - Veterans Bridge[1]	8	220 – 1,600	610	480
GKWTP[2]	15	98 – 2,800	775	500
Sacramento CMP - Discovery Park[1]	8	4.3 - 97	56.8	62.5
SRWTP[2]	5	89 - 249	limited data[3]	limited data[3]
FRWA Intake[2]	5	150 - 460	limited data[3]	limited data[3]
Sacramento CMP – Freeport[1]	8	47 – 3,700	806	446

[1] Based on data from January 2010 – April 2011
[2] Per drinking water permit requirements, finished water samples are collected regularly. Therefore only limited raw water samples were available for this analysis
[3] Insufficient data to calculate statistics

Table 3-24
Iron Levels in Sacramento River, Sacramento CMP and WTP sites µg/L, 2010-2014

Location	Number of Samples	Range	Average	Median
WDCWA	24	210 – 2,800	863.3	605
Sacramento CMP - Veterans Bridge[1]	8	190- - 1,500	707	630
GKWTP[2]	15	210 – 3,500	1,046	670
Sacramento CMP - Discovery Park[1]	8	51 - 350	150	150
SRWTP[2]	3	135- 359	limited data[3]	limited data[3]
FRWA Intake[2]	5	240 – 680	limited data[3]	limited data[3]
Sacramento CMP – Freeport[1]	8	120 – 1,600	525	420

[1] Based on data from January 2010 – April 2011
[2] Per drinking water permit requirements, finished water samples are collected regularly. Therefore only limited raw water samples were available for this analysis.
[3] Insufficient data to calculate statistics

Due to the prevalence of aluminum and iron levels above the secondary MCL at GKWTP and WDCWA, a closer examination of upstream water quality data was conducted. Data collected by the DWR CMP monitoring program was evaluated, as all DWR CMP monitoring sites are upstream of the participating water agency data. **Table 3-25** is a summary of aluminum data collected by the DWR CMP monitoring program and **Table 3-26** is a summary of the iron data collected by the DWR CMP monitoring program.

Both **Tables 3-25** and **3-26** show an increase of both aluminum (approximately 300 percent) and iron (approximately 400 percent) levels measured between Hamilton City and Below Knights Landing. Since the DWR CMP monitoring program also samples sloughs and tributaries leading into the Sacramento River, these were examined as potential sources of iron and aluminum.

Table 3-25
Aluminum Levels in Sacramento River, DWR CMP sites µg/L, 2010-2014

Monitoring Site	# of Samples	Range, µg/L	Average, µg/L	Median, µg/L
Balls Ferry	20	15 – 280	86.4	42.1
Bend Bridge	20	18.1 – 342	83.1	29.9
Red Bluff	32	13.2 – 3,375	226	37.1
Vina Bridge (Corning)	20	8.03 – 338	83.0	43.1
Hamilton City	20	6.03 – 340	84.3	45.4
Colusa	20	10.6 – 800	153.5	87.4
Above CBD	20	28.2 – 1,175	246.7	96.4
Below Knights Landing	20	31.9 – 1,302	299.4	124.3
Verona (after confluence with Feather River)	20	36.7 – 1,258	242.2	88.9

Table 3-26
Iron Levels in Sacramento River, DWR CMP sites µg/L, 2010-2014

Monitoring Site	# of Samples	Range, µg/L	Average, µg/L	Median, µg/L
Balls Ferry	20	ND – 262	89.2	50.9
Bend Bridge	20	ND – 367	83.7	47.0
Red Bluff	32	ND – 4,160	265.1	54.4
Vina Bridge (Corning)	20	ND – 366	86.5	61.0
Hamilton City	20	ND – 383	98.3	63.1
Colusa	20	ND – 809	193.6	130.5
Above CBD	20	ND – 1,230	298.6	153.3
Below Knights Landing	20	ND – 1,600	411.4	263
Verona (after Feather River confluence)	20	ND – 1,230	323.9	189

Figures 3-16 and 3-17 show aluminum and iron levels in the Sacramento River at Hamilton City and Colusa, as well as levels in Stony Creek and Big Chico Creek, which are tributaries entering the Sacramento River between Hamilton City and Colusa. **Figure 3-16** and **Figure 3-17** show that Stony Creek could be contributing iron and aluminum on occasion to the Sacramento River. Stony Creek is known for high erosion/sediment discharge rates and metals from abandoned mines.

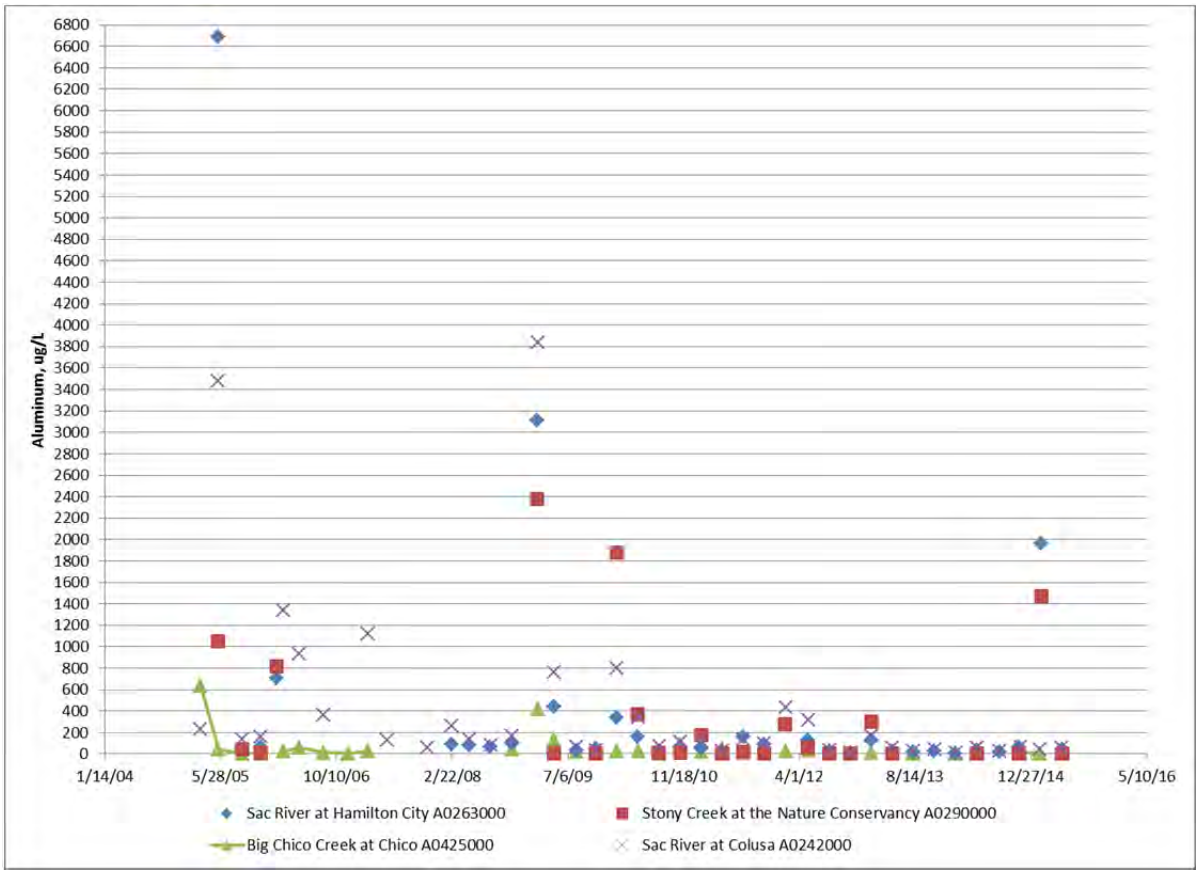


Figure 3-16. Aluminum Levels in Sacramento River and Tributaries from Hamilton City to Colusa, DWR CMP Data

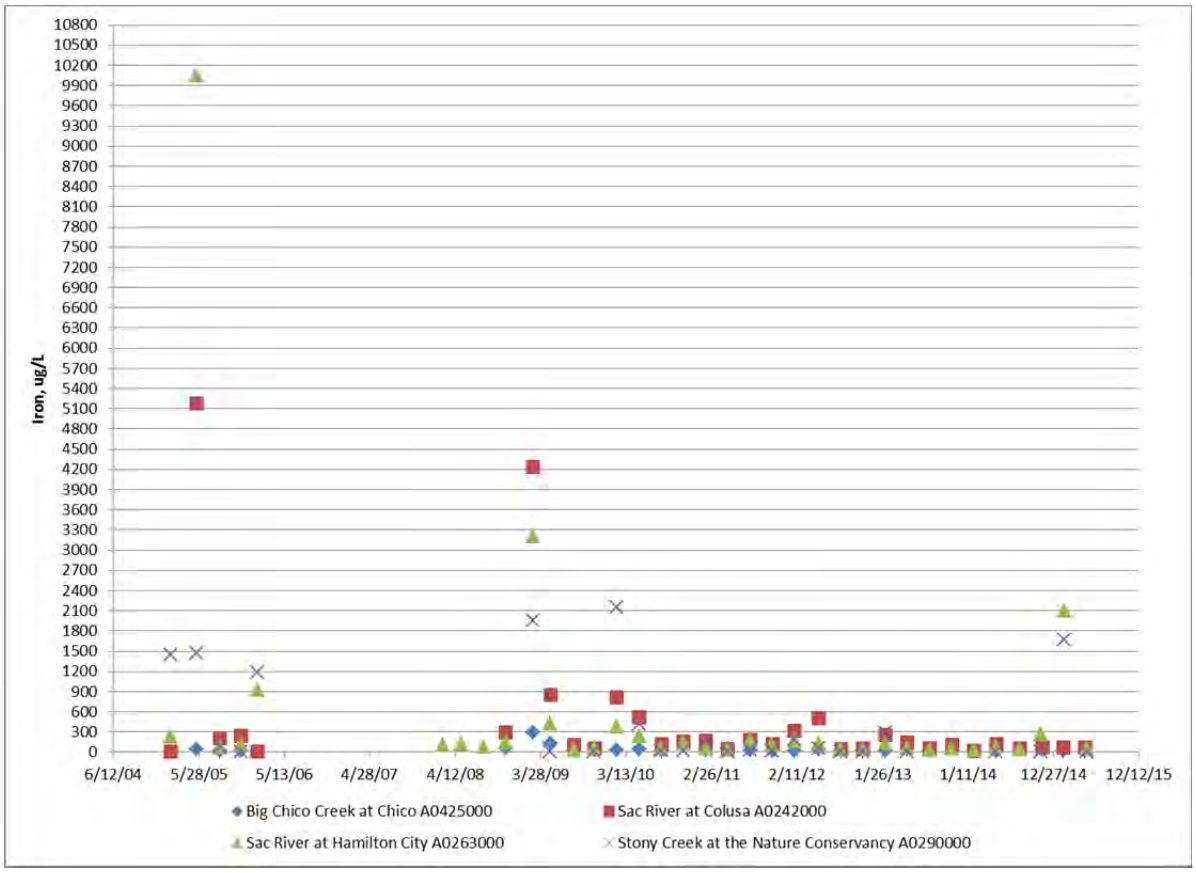


Figure 3-17. Iron Levels in Sacramento River and Tributaries from Hamilton City to Colusa, DWR CMP Data

Figures 3-18 and **3-19** show aluminum and iron levels in the Sacramento River at Colusa and at Verona, as well as tributaries along this reach of the river. There are four slough/drains/tributaries which enter the Sacramento River from Colusa to Verona: 1) Butte Slough near Meridian, 2) Colusa Basin Drain near Knights Landing, 3) Sutter Bypass at RD1500, and 4) Feather River. Aluminum and iron levels in the Colusa Basin Drain were the highest, with a median of 892 µg/L for aluminum and 1,330 µg/L for iron. Aluminum and iron levels in Butte Slough and Sutter Bypass were also above the secondary MCL, with a median of 329.5 µg/L (Butte Slough) and 316 µg/L (Sutter Bypass) for aluminum, and a median of 728 µg/L (Butte Slough) and 637.5 µg/L (Sutter Bypass) for iron. All three of these waterbodies are dominated by agricultural drainage as they discharge into the Sacramento River.

It is apparent that Butte Slough, Colusa Basin Drain, and Sutter Bypass are contributing iron and aluminum to the Sacramento River, as there is an increase in both metals in the Sacramento River from Hamilton City to Below Knights Landing. Median levels of aluminum and iron in the Feather River are much lower of these metals, at 67 µg/L and 173 µg/L, respectively. This likely contributes to the reduced levels of aluminum and iron in the Sacramento River at Verona, as compared with the Below Knights Landing sampling site.

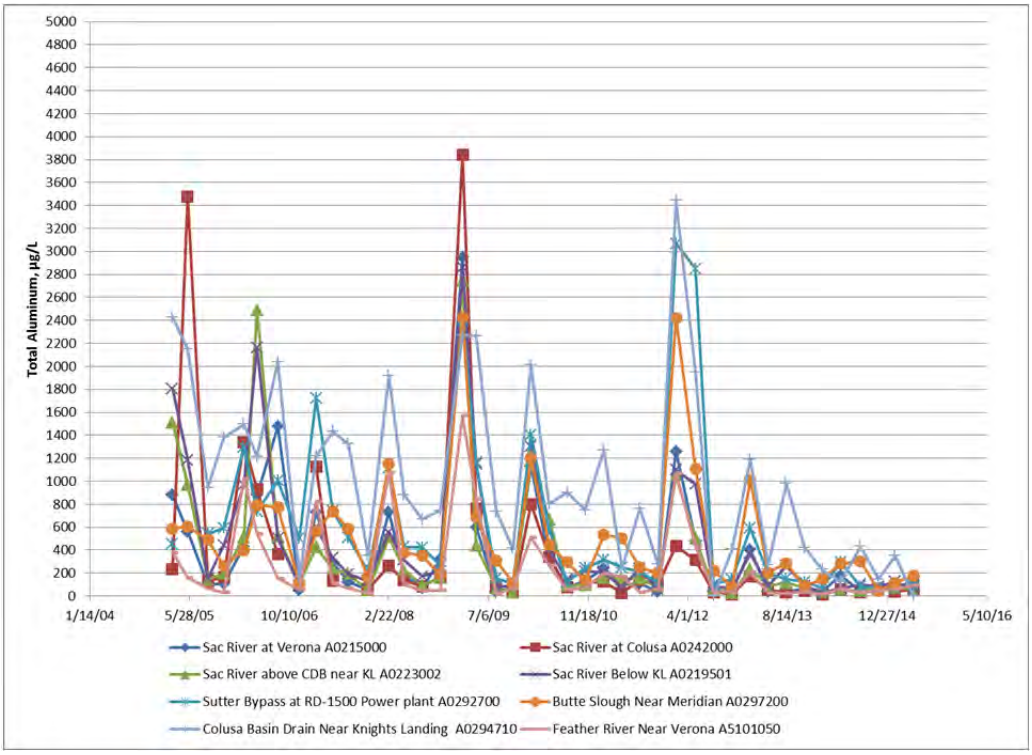


Figure 3-18. Aluminum Levels in Sacramento River and Tributaries from Colusa to Verona, DWR CMP Data

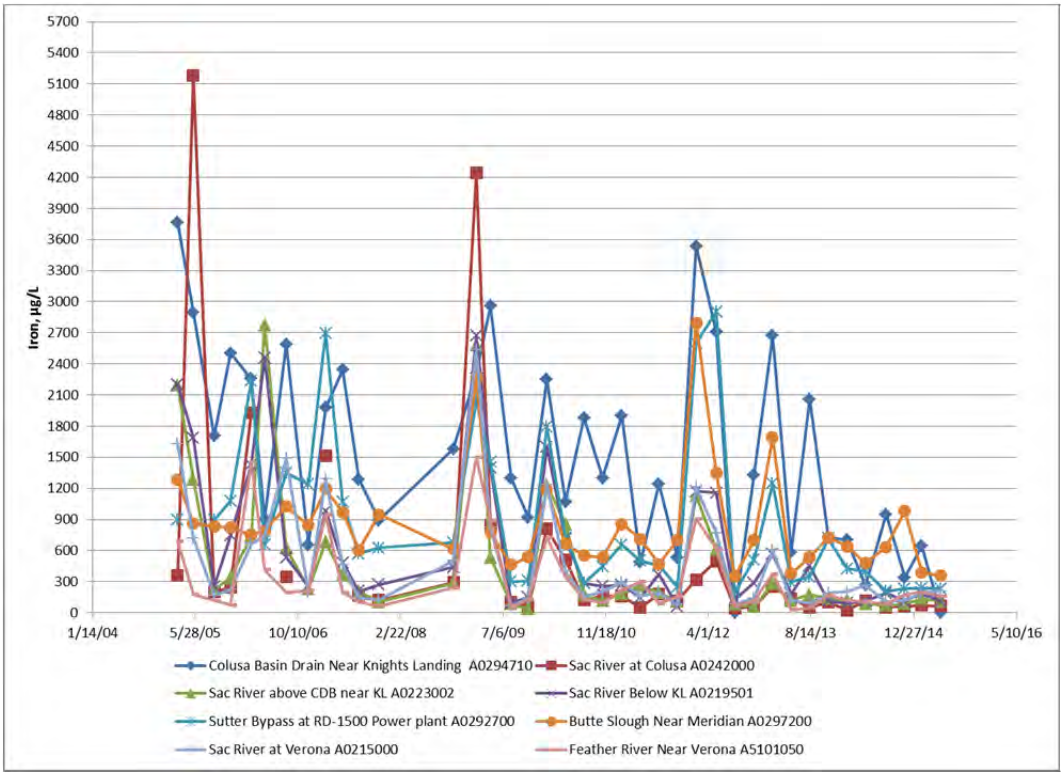


Figure 3-19. Iron Levels in Sacramento River and Tributaries from Colusa to Verona, DWR CMP Data

The median values for iron and aluminum again increase from Verona to the new WDCWA intake. This Report was unable to identify any additional water quality sampling programs in the Sacramento River between Verona and Veterans Bridge. A review of potential discharges along this reach of the river revealed the Natomas Cross Canal and RD1000 pumping plants. The Natomas Cross Canal may be contributing contaminants, including metals, to the Sacramento River as it carries a mixture of stormwater, agricultural drainage, treated wastewater, and groundwater. RD1000 discharges include agricultural and urban runoff.

The Natomas Cross Canal is a modified channel used to drain large portions of northern Sacramento County (Natomas Basin from RD1000), western Placer County (Auburn, Lincoln, northwest Roseville, etc.), and southern Sutter County (RD1001). It is a part of the State/Federal levee project for flood protection for the Natomas Basin. It appears that RD1000 and RD1001 are responsible for operations and maintenance of the canal. RD1000 is a special flood protection district for the Natomas Basin. RD1000 discharges urban runoff and agricultural drainage to the Natomas Cross Canal through two discharge locations with an additional four discharge locations directly into the Sacramento River and one on the Natomas East Main Drainage Canal. RD1001 is another special district north of RD1000 in Sutter County. RD1001 discharges all their drainage through one active pumping plant into the Natomas Cross Canal. Both RD1000 and RD1001 apply a wide variety of pesticides to control algae and invasive species in their drainage canals. They both submitted an Aquatic Pesticide Application Plan (APAP) to the State Board. This requires them to operate as a closed system during pesticide application, sample upstream, downstream, and within the pesticide application areas for the pesticides used during selected application events each year, and submit an Annual Report. A review of the wastewater treatment plant NPDES permits indicates that the following plants discharge to the Natomas Cross Canal (Placer County SMD No. 1, City of Auburn, Thunder Valley Casino, City of Lincoln, and City of Roseville Pleasant Grove). These are discussed further in **Section 4**.

As shown in **Figure 3-20**, the highest peaks of iron and aluminum at WDCWA occurred about two weeks after an extremely sharp increase in outflow from Keswick Dam in December 2010. During this time, there was also high flow measured at Verona. It must be noted, however, that other peak occurrences of iron and aluminum at WDCWA correlate better with high flows at Verona, regardless of upstream reservoir releases.

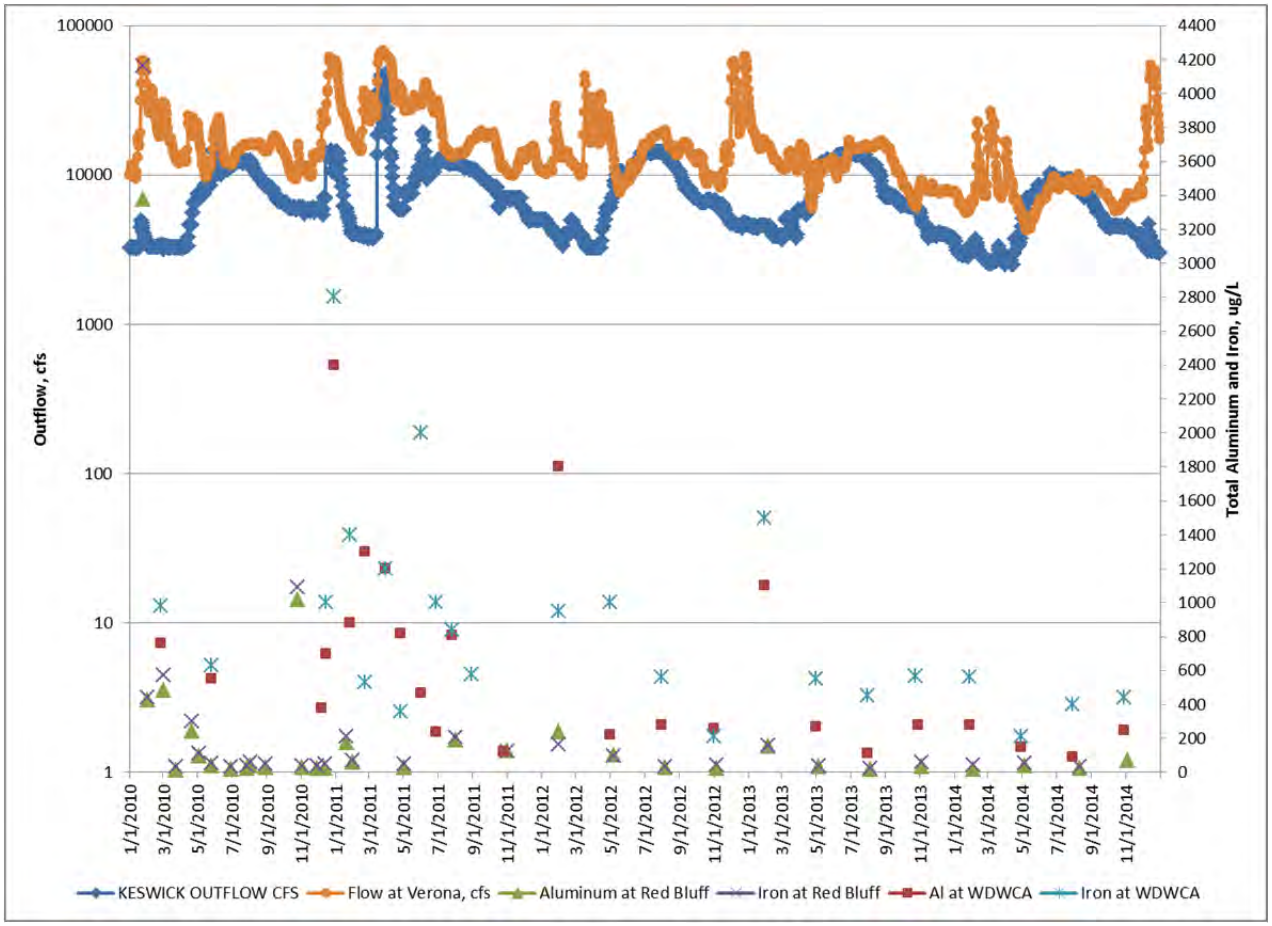


Figure 3-20. Keswick Outflow and Sacramento River Flow at Verona (cfs) versus Aluminum and Iron Levels in Sacramento River at Red Bluff and WDCWA

Summary of Results for Iron and Aluminum

- Median source water aluminum and iron at WDCWA and GKWTP are greater than their respective secondary MCLs frequently.
- Based on the DWR CMP data, aluminum and iron concentrations increase from the upper watershed to Below Knights Landing. Elevated levels of aluminum and iron were found in agricultural drainage tributaries to the Sacramento River, including; Butte Slough, Colusa Basin Drain, and Sutter Bypass. Colusa Basin Drain had the highest iron and aluminum levels of the three drains.
- Iron and aluminum decreases at Verona, likely due to low levels of aluminum and iron in the Feather River. Median iron and aluminum levels continue to increase downstream of Verona, as the median aluminum at Verona increased from 89 µg/L to 380 µg/L at WDCWA and to 500 µg/L at GKWTP. Similarly, median iron levels at Verona increased from 189 µg/L to 605 µg/L at WDCWA and to 670 µg/L at GKWTP.

- Potential sources of aluminum and iron between Verona and WDCWA, such as the Natomas Cross Canal or RD1000 discharges, cannot be confirmed in this Report because there is currently no supporting water quality data.
- Peaks of iron and aluminum at WDCWA can be related to high reservoir outflow from Keswick Dam and high downstream flows on the Sacramento River at Verona.
- Although levels in the source water can be elevated, GKWTP, SRWTP, and VSWTP are able to currently treat total iron and aluminum to either non-detectable or detectable at very low levels in treated water and met the MCLs in all cases.

Evaluation for Manganese

Available raw and treated water total manganese levels were evaluated for WDCWA, GKWTP, SRWTP, and the FRWA Intake. WDCWA has raw water data only and GKWTP has treated water data only. Raw water data is summarized in **Table 3-27**, which also includes data from the DWR CMP. Total manganese levels in the SRWTP raw water were low, ranging from non-detectable to 22.6 µg/L and also low at the FRWA Intake, ranging from non-detectable to 34 µg/L. It should be noted that all treated water samples for the SRWTP and GKWTP were non-detectable, with a detection limit of 20 µg/L. Manganese data was not collected by the USGS or Sacramento CMP within the last five years.

Table 3-27
Manganese Levels in Sacramento River, µg/L, 2010-2014

Monitoring Site	# of Samples	Range, µg/L	Average, µg/L	Median, µg/L
Balls Ferry	20	1.9 – 13.3	4.9	3.8
Bend Bridge	20	2.2 – 15.2	4.9	4.2
Red Bluff	32	1.3 - 144	12.3	5.3
Vina Bridge (Corning)	20	1.2 – 17.9	5.2	4.9
Hamilton City	20	2.2 – 17.1	6.3	5.0
Colusa	20	3.4 – 39.6	11.8	11.9
Above CBD	20	5.1 – 51.3	16.7	12.1
Below Knights Landing	20	11.4 – 60.8	27.6	23.7
Verona (after confluence with Feather River)	20	6.9 - 64	27.0	22.5
WDCWA	57	17 - 200	40	36
SRWTP[2]	3	<20 – 22.6	limited data[1]	limited data[1]
FRWA Intake[2]	5	ND - 34	limited data[1]	limited data[1]

[1] Insufficient data to calculate statistics
[2] Per drinking water permit requirements, finished water samples are collected regularly. Therefore only treated water samples were available for GKWTP, and limited raw water samples were available for SRWTP and the FRWA Intake for this analysis.

A review of the data shows that, similar to aluminum to iron, manganese increases from Hamilton City to Colusa, and again from Colusa to Verona. A detailed examination of manganese levels in the sloughs and tributaries leading into the Sacramento River between Hamilton City and Verona was not completed, as individual samples collected by the participating water agencies are generally below the secondary MCL. The upstream sources of manganese are unknown at this time, but likely include sources similar to iron and aluminum.

WDCWA collected the largest number of samples for manganese in raw water, as shown in **Figure 3-21**. The new WDCWA intake has an average just below the secondary MCL of 50 µg/L, with peaks occurring above that level and up to 200 µg/L. Manganese levels at WDCWA were above the secondary MCL in ten out of sixty-one samples, or 16 percent of samples. All of the peak values occurred during winter months, from November through February.

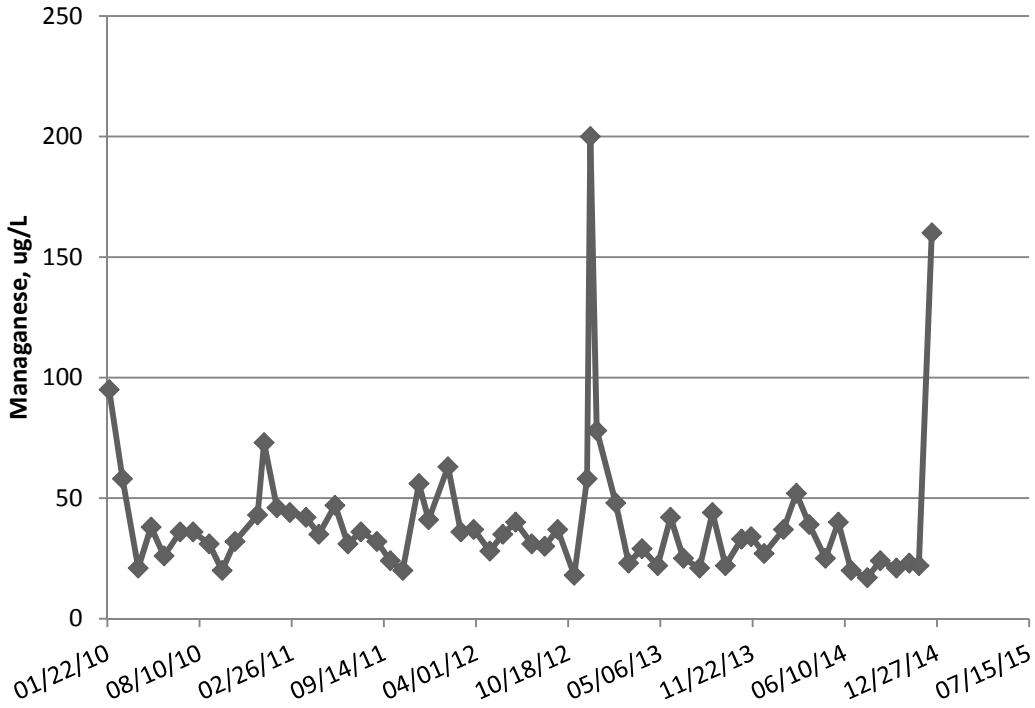


Figure 3-21. Manganese Levels at WDCWA, 2010-2014

The data sets for the SRWTP and FRWA Intake were significantly smaller, and resulted in much lower levels of manganese. The American River is typically lower in metals concentrations and is likely providing some dilution downstream of the confluence.

Summary of Results for Manganese

Manganese levels in the Sacramento River upstream of the GKWTP are higher than those downstream at SRWTP and the FRWA Intake. The WDCWA average manganese values are just below the secondary MCL, with peaks above that during the

winter months. Manganese concentrations at SRWTP and FRWA Intake were always less than 50 µg/L; however this statement is based on a limited number of samples. GKWTP did not collect any manganese data in the raw water over the reporting period.

The upstream sources of manganese are unknown at this time, but could include sources similar to iron and aluminum. Currently, the GKWTP, SRWTP, and VSWTP are able to treat the source water to meet the manganese secondary MCL. Manganese should be continued to be tracked carefully as it was added to the CCL4 for potential regulatory determination as a primary drinking water standard.

SECTION 4 – WATERSHED CONTAMINANT SOURCES REVIEW

This section contains an evaluation of the eight watershed potential contaminant sources selected for review for the 2015 Update. Each contaminant source is presented to include background, seasonal patterns, related constituents, presence in the watershed, regulation and management, water quality issues and data review, and Sacramento River Source Water Protection Program activities. The potential contaminating activities that were selected for review as part of the 2015 Update include:

- Agricultural drainage,
- Livestock, including rangeland and dairies,
- River corridor and river recreation,
- Homeless/illegal camping,
- Urban runoff,
- Industrial National Pollutant Discharge Elimination System (NPDES) permitted facilities,
- Wastewater facilities, and
- Watershed spills.

In addition, three special topics were identified for investigation and brief summary. This included; projected population growth in the watershed, Central Valley Regional Water Quality Control Board's (Regional Board) selected policies and programs, and potential future Central Valley water system operational modifications and impacts. These topics are summarized only for informational purposes.

It should be noted that there are other potential contaminating activities in the watershed, such as wildlife, wildfires, and mining, which have been assessed previously and were not specifically included in this 2015 Update due to their historically stable nature. If significant water quality impacts were identified in **Section 3** that could be related to one of these potential contaminating activities, then they were noted as potential contributory sources. General watershed runoff is discussed through the presentation of the potential contaminating activities that may impact the quality of the runoff.

The reader is also referred to the Watershed Map, **Figure 2-1,** which provides information on selected activities in the watershed. For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the Report.

AGRICULTURAL DRAINAGE

Background

Irrigated agriculture continues to be a dominant type of land use in the Sacramento Valley. The total irrigated acreage in the watershed in 2012 was approximately 1.89 million acres, and is shown on **Figure 4-1**. This represents a two percent reduction in overall acreage between 2007 and 2012, and a 10 percent reduction in the past 10

years. Irrigated agriculture occurs upstream of all existing intakes and proposed diversions covered in this study. It is discussed separately for rice, crops other than rice, and pastureland. Information on agricultural drainage has been obtained from reports from the Rice Pesticide Program and the Irrigated Lands Regulatory Program, and data from the California Department of Water Resources (DWR) monitoring programs.

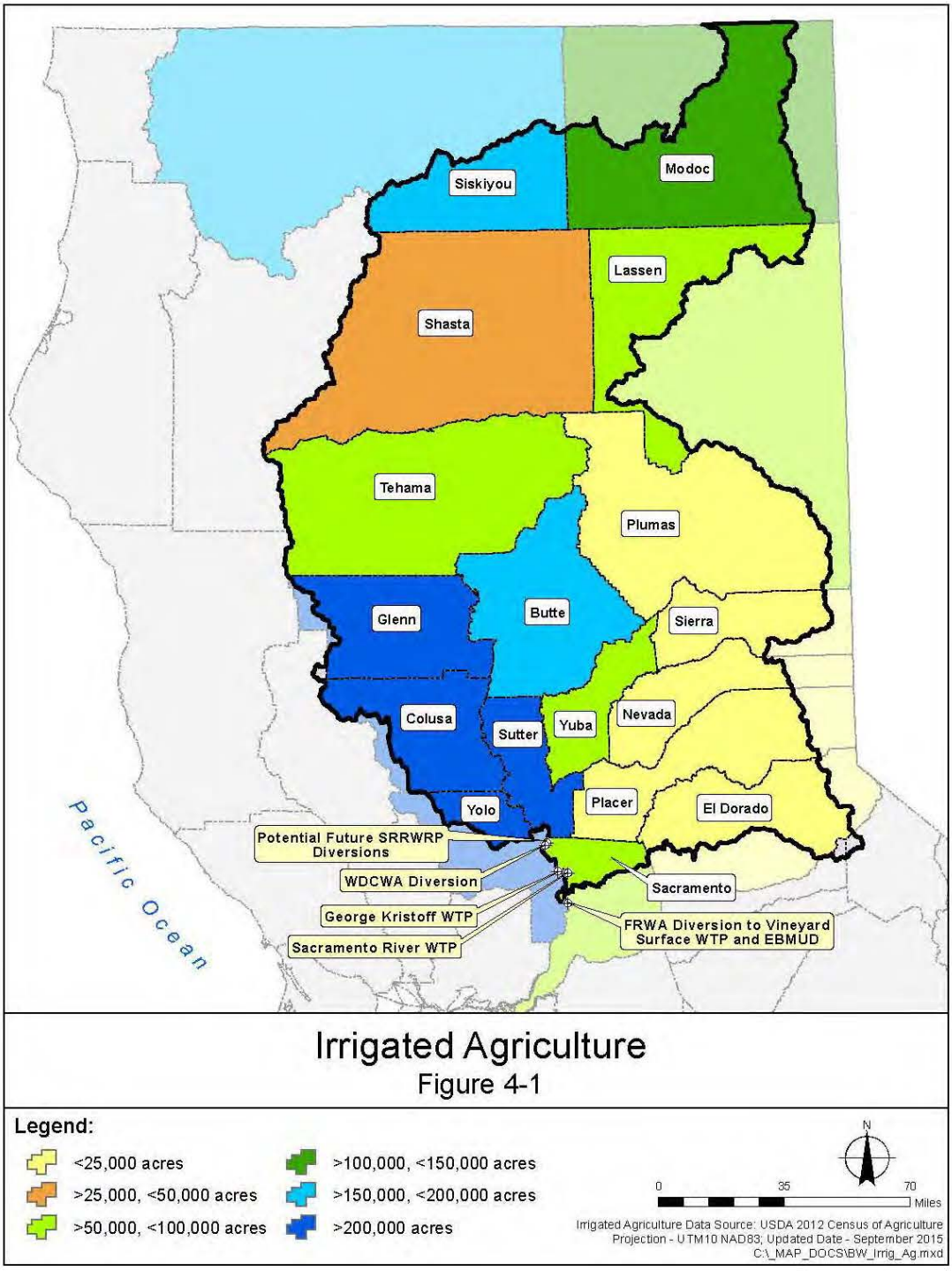


Figure 4-1. Irrigated Agriculture

Rice

Rice has been the principal crop of source water quality interest to date, since it is a water intensive crop and produces large quantities of drainage water. In 2012, there were approximately 550,000 acres of rice farmland in the Sacramento Valley. The term rice discussed in this report includes all varieties, except wild rice which is regulated separately; see Crops Other than Rice below. Drainage from rice fields may carry pesticides and be a source of other constituents like microbials, solids, metals, and total organic carbon (TOC). A wide variety of pesticides are used on rice, and these can be detectable in the major agricultural drainages and the Sacramento River. The rice herbicide thiobencarb has a secondary drinking water standard, in addition to its primary drinking water standard, as it can react with chlorine to cause taste and odor problems in the treated water, even at ultra-low levels. Weed resistance to long-used pesticides (especially thiobencarb), and the phasing out of molinate use, has led to different application combinations of old and new pesticides to achieve weed control. Propanil continues to be a chief feature of sequential herbicide combinations for water grass control, and clomazone has been featured as a molinate replacement.

In addition, standing water has been used during the study period to decompose rice stubble following the harvest, and this affects solids and TOC levels (and also levels of microorganisms as these flooded fields become wildfowl habitat). Finally, urbanization of the land on the east side of the river discharging to the City of West Sacramento's George Kristoff Water Treatment Plant (GKWTP) and the City of Sacramento's Sacramento River Water Treatment Plant (SRWTP) protection zones continues to reduce rice drainage within the protection zone.

The regulatory arena has also changed for rice over the past five years. The Regional Board has adopted the final, long-term Irrigated Lands Regulatory Program (ILRP) water quality order for Sacramento Valley Rice Growers, and it is discussed further below.

Crops Other than Rice

Drainage from other types of crops may carry pesticides and be a source of other constituents like microbials, solids, metals, and TOC. In 2012, other agriculture accounted for nearly 1.1 million acres in the watershed. Dominant other crops are deciduous orchards, grains other than rice, wild rice, and row crops.

Pesticides are used on other crops, including organophosphate pesticides typically used on orchards during the dormant spray season (typically January and/or February). Some of these pesticides are regulated in drinking water and have been monitored at the drinking water intakes, as well by ambient monitoring programs; they have been detected in the Sacramento River and tributaries, but when detected are usually well below primary drinking water standards.

Similar to rice, the Regional Board has adopted the final, long-term ILRP water quality order for other Growers in the Sacramento Valley Watershed, discussed below. Also of note are the Total Maximum Daily Loads (TMDLs) being set by the Regional Board for priority watersheds, i.e., those water bodies listed under Section 303(d) of the Clean Water Act (CWA). A TMDL exists for diazinon and chlorpyrifos levels in various waterbodies throughout the Sacramento Valley, based on impact to aquatic life. Currently, the Regional Board is working on developing four additional Basin Plan Amendments related to pesticides as well. These TMDLs are discussed below.

Pastureland

Pastureland is irrigated rangeland and represents about 0.25 million acres in the watershed. The counties with the greatest amount of irrigated pastureland are furthest from the drinking water intakes; Siskiyou, Modoc, Lassen, and Shasta. Discharges from pasturelands may carry *Cryptosporidium*. Calves are known to be able to transmit *Cryptosporidium*, and there are a large number of cattle (just under 500,000) in the Sacramento River watershed, although calves are only seasonally present in rangeland operations. Most rangeland in the Sacramento Valley consists of beef cattle on private, irrigated lands.

Irrigated pastureland is included in the ILRP, as part of the Growers in the Sacramento Valley Watershed order. Non-irrigated rangeland mostly occurs higher in the watershed on public US Forest Service (USFS) and US Bureau of Land Management (USBLM) lands and is managed under lease conditions set by those agencies; this is discussed further under the Livestock subsection below.

Seasonal Patterns

Rice

Rice cultivation is predictable in its relative timing, although weather can greatly affect the individual season, including the need for and timing of herbicide applications. Typically, the rice fields are prepared in early spring (March) and then flooded in late spring (April/May). During field flooding is when most weed and insect control occurs. In continuously flooded fields, an early season herbicide application is typically followed by a second herbicide application. The fields are flooded through the summer months, with drainage typically occurring in late summer (August/September) prior to harvest. The fields are then flooded during the winter months to allow for waterfowl habitat and rice stubble decay, with a second drain in late winter (February) prior to the planting preparation season. During the two drainage periods, in late summer and late winter, it is expected that the flows would have the highest levels of organic carbon associated with solids loading.

Crops Other than Rice

Organophosphate pesticides, including chlorpyrifos and diazinon, are dormant season sprays and are typically applied to orchards in January and February. Other pesticides are applied to the orchard crops during the irrigation season, which can vary from March through October. It is expected that storm runoff would be largely responsible for contribution of solids, specifically organic carbon, since irrigation season agricultural management practices do not typically result in runoff, except for wild rice crops that utilize flooded fields.

Pastureland

Spring is calving season and therefore is the time of peak risk of infected herds and also still a time when oocysts likely survive well. Early summer can also result in oocysts being contributed from young calves as they graze with cows. Peak *Cryptosporidium* shedding occurs within a very limited group of calves (two months of age[1]), and therefore manure management for the young is of far more importance than manure management for adult animals. Since transport of *Cryptosporidium* overland is inefficient in most pasture environments, pastureland located proximally to rivers and tributaries is of primary concern. Survival of oocysts is also likely affected by seasonal temperature. Research shows that when the temperature of a cow fecal pat exceeds 104°F the *Cryptosporidium* will die within a matter of hours[1]. When air temperatures exceed 78°F, a fecal pat in direct sunlight will achieve the required 104°F. The killing rate declines as the temperature or sunlight exposure declines so that fecal pats deposited in winter (January through April) may provide temperature conditions that allow for oocysts survival for 90 plus days. It is expected that storm runoff would be largely responsible for contribution of solids, specifically organic carbon, since agricultural management practices do not typically result in runoff.

Related Constituents

Rice Pesticides

Due to increased weed resistance, as well as regulatory limitations, a broader slate of pesticides is being used to address weeds and pests. Molinate has not been used since 2009, and is therefore not included in this review. Thiobencarb continues to be a key herbicide for rice growers, with use fairly stable during the study period. Propanil, copper sulfate, sodium carbonate peroxyhydrate, clomazone, and triclopyr are other top herbicides used during the study period. In general, stewardship efforts by the rice industry and educational organizations, regulatory programs, and conditions such as weather, pesticide application methods, and water management practices should contribute to reduced frequency and concentration of pesticides in the Sacramento

[1] University of California Agriculture and Natural Resources, California Rangeland Watershed Laboratory, Department of Plant Sciences, University of California at Davis. www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Crypto_window.html. May 13, 2015.

River and agricultural drainages. However, the trend of increased thiobencarb levels in agricultural drains has not yet been reversed.

The top pesticides used on commercial rice in the counties in the Sacramento River Watershed are shown in **Table 4-1**, in order of use in 2013. The California Department of Pesticide Regulation (DPR) prepares annual summaries of pesticide use as reported to county agricultural commissioners and provides the data on their website. The most recent year of data is from 2013.

Table 4-1
Rice Pesticides Used in Sacramento River Watershed[1]

Pesticide	2009	2010	2011	2012	2013	Trend
Propanil	2,112,211	1,967,323	2,183,114	2,134,516	2,387,053	Increasing
Copper sulfate, pentahydrate	1,947,157	1,045,404	1,039,766	1,457,316	1,178,493	Decreasing
Thiobencarb	308,473	251,560	241,052	273,636	283,454	Stable
Sodium carbonate peroxyhydrate	20,346	51,570	109,490	218,280	162,936	Increasing
Clomazone	93,372	90,065	132,423	132,850	127,621	Increasing
Triclopyr, triethylamine salt	59,306	57,255	63,065	58,515	68,888	Increasing
Azoxystrobin	40,167	32,911	45,781	47,563	43,778	Stable
Sodium chlorate	4,487	59,486	31,980	62,002	21,706	Increasing
Cyhalofop butyl	26,618	27,549	24,536	17,557	20,321	Decreasing
Glyphosate, isopropylamine and potassium salts	2,859	7,626	10,362	11,261	5,223	Increasing
Lambda-cyhalothrin	2,489	3,095	4,676	4,392	5,198	Increasing
Propiconazole	2,218	1,905	2,967	3,135	4,574	Increasing
Trifloxystrobin	2,218	1,905	2,921	3,110	4,168	Increasing
Sulfuryl fluoride	347	5,079		2,769	4,098	Increasing
Bispyribac-sodium	2,697	2,621	2,429	2,976	4,031	Increasing
Penoxsulam	3,016	4,461	4,755	4,434	3,962	Increasing
Pendimethalin	8,414	10,217	3,198	3,846	3,846	Decreasing
Bensulfuron methyl	2,682	2,708	3,327	2,776	2,812	Stable
Imazosulfuron					1,882	New
Carfentrazone-ethyl	1,818	1,401	716	1,630	1,496	Decreasing
2,4-D, dimethylamine salt	5,547	2,829	3,050	2,380	1,446	Decreasing
(S)-Cypermethrin	1,051	1,098	1,466	1,277	1,071	Stable
Sodium hypochlorite	3,070	7,264		2,980	745	Decreasing
Orthosulfamuron	384	665	263	39	304	Decreasing
Carbaryl	478	371	331	263	228	Decreasing
Halosulfuron-methyl	127	71	173	134	105	Decreasing
Diflubenzuron	180	639	244	75	75	Decreasing
Mancozeb	327		9			Sporadic
Paraquat dichloride	62	567	81	138		Sporadic
Limone			5,015			Sporadic

[1]Based on California Department of Pesticide Regulation Pesticide Use Reporting Database for 17 Counties in Sacramento River Watershed for rice (may be an overestimate as not all of counties located in watershed)

There are an additional 15 pesticides that were used during the study period, but they were only applied sporadically and at relatively low amounts (less than a few hundred pounds per year). Overall, there appears to be an increase in the number and amount (an average of 4.2 million pounds per year) of pesticides used on rice crops since the study period of the 2010 Update. However, there was a seven percent reduction in the total amount of pesticides applied through this study period (from 2009 to 2013).

The data show that propanil (herbicide), clomazone (herbicide), and triclopyr (herbicide) continued their increasing trend identified in the 2010 Update report. Azoxystrobin (fungicide) applications have stabilized during the study period. Several new pesticides have been introduced and are being used substantially. Sodium carbonate peroxyhydrate, an algaecide used to treat blue-green algae blooms, increased significantly through the study period.

The acreage of rice treated with pesticides increased during the study period, about six percent overall increase, and the total pound of pesticides applied appears to be increasing slightly as well. This is following nearly 10 years of stable acreage and reduced total pesticide use in the previous study periods.

The Sacramento River Source Water Protection Program (SRSWPP) conducted an updated Pesticide Prioritization in September 2013, which included evaluation of rice pesticides to create a prioritized pesticide tracking list. This included a detailed review of pesticide use and drinking water threshold values. The evaluation for rice pesticides indicated that thiobencarb and propanil were the highest priority pesticides. Other pesticides that topped the priority list included copper sulfate, lambda-cyhalothrin, cyhalofop butyl, sodium chlorate, triclopyr, pendimethalin, 2,4-D, and azoxystrobin. The Pesticide Prioritization included a recommendation on how to conduct follow up for each of these top pesticides.

Other Pesticides

Pesticides are also applied to other irrigated crops in the watershed. Annually, there are between 350 and 400 pesticides used in the Sacramento River watershed. Those pesticides that were only applied in relatively low amounts (less than a thousand pounds per year) were not included in the evaluation. That leaves over 160 pesticides of potential interest. This list is provided in **Appendix D**. The top 50 pesticides and eight other pesticides with interesting annual application, used on other crops in the counties in the Sacramento River Watershed, are shown in **Table 4-2**, in order of use in 2013.

Table 4-2
Commonly Used Pesticides in the Sacramento River Watershed[1]

Chemical	2009	2010	2011	2012	2013	Trend
GLYPHOSATE, All	982,482	1,146,203	1,295,274	1,453,232	1,525,209	Increasing
METHYL BROMIDE	1,169,494	1,301,192	972,597	1,407,099	1,200,348	Stable
COPPER, All	645,762	833,445	810,021	682,988	1,030,627	Increasing
CHLOROPICRIN	522,943	691,560	527,693	776,683	669,676	Increasing
1,3-DICHLOROPROPENE	445,274	350,251	734,910	478,118	628,617	Increasing
MANCOZEB	62,257	308,368	344,545	330,450	417,140	Increasing
ZIRAM	269,372	438,818	316,611	478,670	317,533	Increasing
CHLOROTHALONIL	96,888	170,408	242,454	254,124	245,807	Increasing
METAM-SODIUM	723,805	267,485	122,331	167,867	244,383	Decreasing
SULFURYL FLUORIDE	75,175	87,678	134,040	183,648	173,888	Increasing
PENDIMETHALIN	116,363	133,355	163,362	134,763	166,535	Increasing
OXYFLUORFEN	86,908	64,508	107,052	83,587	147,295	Increasing
CHLORPYRIFOS	137,957	128,547	118,229	126,561	137,031	Stable
POTASSIUM N-METHYLDITHIOCARBAMATE	57,740	116,864	95,714	224,704	124,764	Increasing
2,4-D, All	113,576	166,853	116,392	116,734	117,003	Stable
PARAQUAT DICHLORIDE	99,981	93,103	105,376	122,082	111,763	Increasing
ORYZALIN	138,940	103,645	165,308	127,120	98,390	Decreasing
CALCIUM HYPOCHLORITE	2,436	4,418	10,112	30,199	82,504	Increasing
S-METOLACHLOR	69,856	68,414	46,131	51,610	58,311	Decreasing
DIURON	39,777	40,394	56,273	54,924	51,273	Increasing
TRIFLURALIN	48,805	47,616	40,534	48,916	49,990	Stable
ETHALFLURALIN	22,768	20,351	26,306	34,031	48,646	Increasing
ETHEPHON	20,208	36,176	40,549	46,602	47,732	Increasing
SIMAZINE	44,947	37,704	52,836	48,501	42,088	Stable
BORIC ACID	2,336	5,848	20,906	36,517	41,061	Increasing
HEXAZINONE	66,380	61,860	40,305	32,828	40,487	Decreasing
TRICLOPYR, All	20,320	22,026	34,791	34,559	36,810	Increasing
METOLACHLOR	-	487	27,182	37,354	35,374	Increasing
BORAX	26,941	31,446	35,103	12,027	34,691	Increasing
BIFENTHRIN	20,001	22,633	49,696	55,443	34,587	Increasing
ALUMINUM PHOSPHIDE	12,149	12,850	11,559	-	32,908	Increasing
NALED	23,765	16,729	24,188	25,876	30,986	Increasing
MCPA, All	37,826	28,636	36,717	33,145	30,465	Decreasing
CARBARYL	20,060	21,364	14,553	23,447	27,321	Increasing
MALATHION	35,302	50,990	31,718	29,366	27,190	Decreasing
PERMETHRIN	14,369	15,429	7,092	39,510	26,816	Increasing
CHLORPROPHAM	3,615	6,397	2,812	1,946	26,468	Increasing
DIAZINON	25,673	23,222	18,047	26,607	23,401	Stable
BOSCALID	16,797	22,075	21,141	19,478	23,370	Increasing
CAPTAN	56,798	70,880	36,732	59,100	22,338	Decreasing

Table 4-2 Cont'd
Commonly Used Pesticides in the Sacramento River Watershed[1]

Chemical	2009	2010	2011	2012	2013	Trend
SODIUM CHLORATE	12,638	30,280	28,843	28,795	22,246	Increasing
ENDOTHALL, All	1,472	851	6,097	8,670	19,999	Increasing
METRIBUZIN	15,344	13,196	16,695	15,079	17,545	Increasing
IMAZAPYR	9,810	13,361	12,091	11,811	17,392	Increasing
PIPERONYL BUTOXIDE	15,990	12,702	7,410	13,757	17,038	Stable
PYRACLOSTROBIN	15,328	16,074	16,325	13,371	16,541	Stable
DIMETHOATE	12,919	8,392	10,108	14,590	15,858	Increasing
PROPICONAZOLE	11,878	13,158	17,507	14,278	15,769	Increasing
IPRODIONE	16,326	18,143	21,130	20,054	13,837	Decreasing
METHOXYFENOZIDE	7,976	8,710	7,148	8,773	13,586	Increasing
PROPARGITE	33,645	17,850	13,232	13,226	9,718	Decreasing
OXYTETRACYCLINE, CALCIUM COMPLEX	5,898	6,033	5,910	7,256	7,552	Increasing
GLUFOSINATE-AMMONIUM	45,130	63,276	97,528	24,734	3,873	Decreasing
METHYL PARATHION	4,245	1,757	2,515	4,875	3,395	Decreasing
CLOFENTEZINE	939	305	2,434	1,973	633	Decreasing
BETA-CYFLUTHRIN	1,633	1,309	991	19,603	1,128	Decreasing
PHOSMET	9,479	23,961	15,866	15,750	318	Decreasing
SODIUM METABORATE TETRAHYDRATE	-	7,537	-	10,125	-	

[1]Based on California Department of Pesticide Regulation Pesticide Use Reporting Database for 17 Counties in Sacramento River Watershed for rice (may be an overestimate as not all of counties located in watershed)

The data show that many of the top used pesticides on non-rice crops are increasing in use over the study period, such as glyphosate (herbicide), copper products (pesticide or fungicide), chloropicrin (pesticide), 1,3-dichloropropene (fumigant, nematicide), mancozeb (fungicide), ziram (fungicide), chlorothalonil (fungicide), and sulfuryl fluoride (insecticide). The use of methyl bromide (pesticide) remains high and was stable over the study period. Only one top ten used pesticide showed a decreasing use trend, metam-sodium (pesticide), and its decrease was very substantial at 66 percent reduction.

The SRSWPP conducted an updated Pesticide Prioritization in October 2013, which included evaluation of non-rice pesticides to create a prioritized pesticide tracking list. This included a detailed review of pesticide use and drinking water threshold values. The evaluation for non-rice pesticides indicated that 1,3-dichloropropene and metam sodium were the highest priority pesticides. Other pesticides that topped the priority list included mancozeb, potassium N-Methyl dithiocarbamate, oxyfluorfen, ethalfluralin, chlorpyrifos, oryzalin, iprodione, diazinon, propargite, and simazine. The Pesticide Prioritization included a recommendation for each of these top pesticides.

Total Organic Carbon

Because agricultural drainage comes off of irrigated cropland and through earthen canals and ditches, it has organic content. Standing water, suspended sediment, fecal waste, and decomposing vegetation all contribute to TOC levels.

Giardia and Cryptosporidium

Although *Giardia* and *Cryptosporidium* can come from a variety of animal populations, loading from cattle is a source of key interest. In the Western United States studies have shown that about 19 percent of cattle are infected with *Giardia* and about four percent are infected with *Cryptosporidium*[2]. According to the University of California, California Rangeland Watershed Laboratory, an infected calf can shed upwards of 10,000,000 *Cryptosporidium* oocysts per gram of feces and up to 1,000,000 *Giardia* cysts per gram of feces. Loading is a function of animal density, or stocking rates, timing of grazing, and infection rate among the herd. Calves from one to four months contribute over 99 percent of oocysts shed by cattle. Given the low ratio of calves and their geographic spread, it may be that grazing cattle populations do not spread *Cryptosporidium* as readily as dairy cattle. *Giardia* and *Cryptosporidium* survive well in cool, moist environments and can be transported overland. However, freeze-thaw cycles reduce survivability. Overland transport may be required which will reduce the viability of oocysts; studies show that grassland buffers can capture up to 99.9 percent of oocysts[3].

Presence in the Watershed and Protection Zones

The major agricultural drainage canals on the valley floor are: Colusa Basin Drain, Butte Slough, Sacramento Slough, and the Natomas East Main Drainage Canal. The outfall for the Natomas East Main Drainage Canal is in the protection zone, while the other three are just upstream of it. The Natomas East Main Drainage Canal carries significant amounts of urban runoff and treated wastewater as well. Rice field drainage is also discharged directly to the Sacramento River and the Feather/Bear River systems. The Feather/Bear River system flows into the Sacramento River at River Mile 80. Within the protection zone, agricultural drainage from Reclamation District (RD) 1000, which is responsible for the drainage system in the Natomas Basin, discharges to the Sacramento River both through direct outfalls and through the Natomas Cross Canal, Natomas Main Drainage Canal, and the Natomas East Main Drainage Canal.

There are four drains that discharge to the Sacramento River upstream of the GKWTP between the intake at River Mile 62.5 and the Feather River confluence at River Mile 80. These drains discharge from the east side of the river as follows:

[2] University of California Agriculture and Natural Resources, California Rangeland Watershed Laboratory, Department of Plant Sciences, University of California at Davis. www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Giardia_window.html. May 13, 2015.
[3] www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Crypto_window.html

- River Mile 66 – RD1000 Pumping Plant 3, from the urbanizing Natomas area.
- River Mile 70 – RD1000 Pumping Plant 5, from the area near the Sacramento International Airport, which is mostly agricultural (rice) but is also urbanizing.
- River Mile 75 – RD1000 Pumping Plant 2, from north of the airport in a currently agricultural area (rice).
- River Mile 79 – Natomas Cross Canal from western Placer, south Sutter, and north Sacramento counties with a blend of watershed runoff, agricultural drainage, urban runoff, and treated wastewater effluent.

Agricultural drainage on the west side of the protection zone drains into the Tule Canal and the Yolo Bypass, therefore it is not of concern.

The dominant crops of interest to this study grown in the Sacramento River watershed are rice, deciduous orchards, and pastureland. The acreage of these crops in 2002, 2007, and 2012 is shown in **Tables 4-3** through **4-5,** as well as the percent change in acreage over the five and ten year periods. This information is collected by the California Department of Food and Agriculture once every five years and reported to the US Department of Food and Agriculture. The 2012 data are presented since they are the most recent data available.

Table 4-3
Irrigated Rice Acreage, 2002, 2007, and 2012

County	2002	2007	2012	5 Year Change	10 Year Change
Butte	94,421	97,845	94,546	-3%	0%
Colusa	141,267	147,817	153,224	4%	8%
Glenn	84,357	93,817	94,330	1%	12%
Lassen	-	-	[D]	-	-
Modoc	-	-	[D]	-	-
Placer	12,078	9,313	9,373	1%	-22%
Sacramento	7,185	5,114	2,040	-60%	-72%
Siskiyou	-	-	[D]	-	-
Sutter	108,164	99,284	121,035	22%	12%
Tehama	911	915	1,551	70%	70%
Yolo	31,875	29,675	36,341	22%	14%
Yuba	34,215	33,399	34,303	3%	0%
TOTAL	514,473	517,179	546,743	6%	6%

Based on information from the USDA website: www.nass.usda.gov
[D] Data withheld to avoid disclosing information for an individual farm

Table 4-4
Irrigated Orchards, 2002, 2007, and 2012

County	2002	2007	2012	5 Year Change	10 Year Change
Butte	108,138	86,490	91,648	6%	-15%
Colusa	37,030	51,853	58,306	12%	57%
El Dorado	3,490	3,239	3,370	4%	-3%
Glenn	63,005	70,663	93,129	32%	48%
Lassen	19	189	[D]	-	-
Modoc	[D]	52	[D]	-	-
Nevada	637	383	498	30%	-22%
Placer	1,488	1,306	1,501	15%	1%
Plumas	36	-	-	0%	-100%
Sacramento	25,759	28,752	28,348	-1%	10%
Shasta	963	1,253	1,463	17%	52%
Sierra	-	[D]	[D]	-	-
Siskiyou	116	146	[D]	-	-
Sutter	78,833	65,029	71,855	10%	-9%
Tehama	44,881	35,529	46,096	30%	3%
Yolo	41,675	34,460	49,383	43%	18%
Yuba	36,021	23,532	28,572	21%	-21%
TOTAL	442,091	402,876	474,169	18%	7%

Based on information from the USDA website: www.nass.usda.gov
[D] Data withheld to avoid disclosing information for an individual farm

For rice, acreage was stable from 2002 to 2007, but there was a six percent increase in the total acreage of rice planted over the 2007 to 2012 period. Most of that growth occurred in Colusa, Glenn, and Sutter counties. Decreases were seen in Placer and Sacramento counties. Orchard acreage decreased nine percent in the 2002 to 2007 period, but saw an 18 percent increase in the 2007 to 2012 period. The majority of the growth was in Colusa and Glenn counties. Decreases were seen in Butte and Yuba counties. Pastureland acreage decreased 12 percent in the 2002 to 2007 period, and saw an additional eight percent reduction from 2007 to 2012. The greatest reductions in acreage were in Placer, Sacramento, Shasta, and Tehama counties.

Table 4-5
Irrigated Pastureland, 2002, 2007, and 2012

County	2002	2007	2012	5 Year Change	10 Year Change
Butte	9,928	9,306	5,941	-36%	-40%
Colusa	12,403	8,595	8,812	3%	-29%
El Dorado	1,942	5,278	2,460	-53%	27%
Glenn	16,072	13,331	15,493	16%	-4%
Lassen	28,499	32,064	31,690	-1%	11%
Modoc	36,490	37,592	28,780	-23%	-21%
Nevada	4,044	4,856	4,088	-16%	1%
Placer	16,455	15,079	6,643	-56%	-60%
Plumas	10,349	13,512	9,037	-33%	-13%
Sacramento	18,688	11,267	8,422	-25%	-55%
Shasta	31,764	30,375	19,910	-34%	-37%
Sierra	10,126	5,386	7,820	45%	-23%
Siskiyou	55,496	53,624	56,395	5%	2%
Sutter	6,528	8,514	4,302	-49%	-34%
Tehama	37,041	24,535	25,012	2%	-32%
Yolo	10,888	8,530	6,855	-20%	-37%
Yuba	16,990	10,030	15,780	57%	-7%
TOTAL	323,703	291,874	257,440	-12%	-20%

Based on information from the USDA website: www.nass.usda.gov
[D] Data withheld to avoid disclosing information for an individual farm

Regulation and Management

There are two main regulatory programs related to agricultural drainage in the watershed, the Rice Pesticides Program and the ILRP, as summarized in **Table 4-6**. In addition, the development of Basin Plan Amendments and TMDLs has set more stringent standards on non-point sources.

Table 4-6
Regulatory Overview
Agricultural Drainage in the Sacramento River Watershed

RICE
Rice Pesticides Program
Industry group: California Rice Commission (CRC)
The Rice Pesticide Program prohibits discharge of rice field drainage unless specific management practices are implemented, e.g. holding water on fields to allow for pesticide dissipation, seepage management, and aerial drift control. In recent years, additional management practices for the forthcoming rice season have been worked out between the CRC and the Regional Board. The Rice Pesticide Program originally covered five rice pesticides – only one of which (thiobencarb) is currently addressed through this program.
Discharges from Irrigated Lands Regulatory Program
Order No. R5-2006-0053: Conditional Waiver of Waste Discharge Requirements for Rice Growers (The Rice Waiver Program)
Industry Group: CRC
The Rice Waiver Program was developed to comply with the Discharges from Irrigated Lands Regulatory Program. It addressed constituents not covered by the Rice Pesticide Program, including other pesticides and related constituents. The Rice Waiver Program consisted of a monitoring program to be followed by implementation of additional management practices where the monitoring data indicated the need. While monitoring was underway, the CRC compiled information on the following management practices and their effectiveness: (1) pesticide mixing and loading, (2) pest management practices, (3) management practices to address other constituents, and (4) cultural practices. This information formed the basis for determining additional management practices, where deemed necessary based on the monitoring results.
Order No. R5-2014-0032: Waste Discharge Requirements for Sacramento Valley Rice Growers
Third-party Entity: CRC
The Sacramento Valley Rice Growers Order replaces the Rice Waiver Program, and was developed to comply with the long-term Irrigated Lands Regulatory Program. It was expanded to include discharges to groundwater, as well as surface water. Many of the program requirements will remain the same as the Rice Waiver Program, with key changes made to focus efforts on areas with high threats to water quality, increase grower accountability, require growers to conduct evaluations of management practices, develop regional water quality management plans, monitor to fill data gaps, and to select pesticides for monitoring using a defined prioritization process. This Order was adopted in 2014 and effective for the 2015 growing season, so not applicable to this Report.

Table 4-6 Cont'd
Regulatory Overview
Agricultural Drainage in the Sacramento River Watershed

IRRIGATED CROPS OTHER THAN RICE (INCLUDES WILD RICE AND PASTURELAND)
Discharges from Irrigated Lands Regulatory Program
Order No. R5-2006-0053: Conditional Waiver of Waste Discharge Requirements for the Sacramento Valley (The Sacramento Valley Water Quality Coalition [SVWQC])
Industry Group: SVWQC
The SVWQC was developed to comply with the Discharges from Irrigated Lands Regulatory Program. It consisted of a monitoring program and management practices where the monitoring data indicated the need. While monitoring was underway, SVWQC compiled information on various management practices and their effectiveness. This information formed the basis for determining additional management practices, where deemed necessary based on the monitoring results.
Order No. R5-2014-0030-R1: Waste Discharge Requirements for Growers within the Sacramento River Watershed That are Members of a Third-Party Group (Sacramento River Watershed)
Industry Group: Northern California Water Association (NCWA)
The Sacramento River Watershed Order replaces the SVWQC and was developed to comply with the long-term Irrigated Lands Regulatory Program. It was expanded to include discharges to groundwater, as well as surface water. Many of the program requirements will remain the same as the Rice Waiver Program, with key changes made to focus efforts on areas with high threats to water quality, increase grower accountability, require growers to conduct evaluations of management practices, develop regional water quality management plans, monitor to fill data gaps, and to select pesticides for monitoring using a defined prioritization process. This Order was adopted in 2014 and effective for the 2015 growing season, so not applicable to this Report.

Rice Pesticide Program

The purpose of the Rice Pesticide Program (RPP) is to reduce discharges of specified rice pesticides (molinate, carbofuran, thiobencarb, malathion, and methyl parathion) into surface waters leading to the Sacramento River, only one of which (thiobencarb) is still heavily used for rice. Carbofuran and molinate are no longer allowed for use on rice, while malathion and methyl parathion have been replaced by newer pesticides. Performance Goals were set for these five pesticides in freshwater habitat, including agricultural drains. This included: carbofuran – 0.4 micrograms per liter (µg/L), malathion – 0.1 µg/L, methyl parathion – 0.13 µg/L, molinate – 10 µg/L, and thiobencarb – 1.5 µg/L. In addition, there are water quality objectives for these constituents set at their primary, or secondary, maximum contaminant levels for drinking water. The RPP began in 1983 as part of regulatory requirements set by the Regional Board. It is now jointly administered by the Regional Board and the DPR. DPR provides permit conditions for the County Agricultural Commissioners (CAC) who issue permits and

conduct field work. This program prohibits discharge of rice field drainage unless specific management practices are implemented including; holding water on fields to allow for pesticide dissipation, seepage management, and aerial drift control.

The CRC acts as the lead agency for the rice growers' regulatory compliance. During the study period the management practices and monitoring program for the forthcoming rice season were worked out between the CRC and the Regional Board. The most current order is Resolution R5-2010-9001, Rice Pesticides Program – Control of Rice Pesticides. The Resolution included a few new changes to the program:

- A label amendment from the registrant to reflect the hold time in the permit conditions and to revise the application rate for a new granular formulation of thiobencarb product,
- Increase the funding for county surveillance at non-traditional hours at double the level for 2009 and increase the area of surveillance to other counties not previously funded, and
- Provide additional outreach to applicators and to staff of companies selling and distributing thiobencarb.

The participating water agencies have provided stakeholder input to the annual approval process through discussion with the CRC and Regional Board, submittal of comments, and by verbal input at the Regional Board fall stakeholder coordination meeting.

The RPP tracks program implementation. As part of the annual report prepared to summarize the activities for that year, there is documentation of key issues or conditions that affected the concentrations of pesticides entering adjacent waterways. Some of the key issues or conditions that have occurred during the study period, 2010 through 2014, include the following:

- Unauthorized emergency releases from Colusa County.
- Increased education and outreach efforts to growers and thiobencarb distributors and applicators.
- Increased funding for surveillance inspections.

Under the RPP, approved management practices for rice growers consist of:

- Required water holding periods for applied irrigation water for each pesticide; thiobencarb – 19 to 30 days, molinate - 28 days, carbofuran - 28 days, and methyl parathion - 24 days. There is a recommended holding time for malathion - 4 days. These hold times are reduced for closed water management systems that recirculate flows: thiobencarb – 6 days, molinate – 8 days.
- Seepage control, which includes conducting seepage inspections and requiring compaction of borders surrounding rice fields. Also providing "Seepage Water

Management", a voluntary guideline developed by the University of California Division of Agriculture and Natural Resources, to growers. Seepage inspections now focus on areas of known problems.

- Drift control for aerial application, which includes use of drift control agents, specified application nozzles, wind speeds, downwind buffer zones, buffer zones in proximity to the Sacramento River, etc.
- Formation of the Storm Event Work Group (SEWG) to identify and recommend mitigation measures to improve compliance in the event of a severe storm event. A Communications Plan was developed to communicate on storm situations and required sampling. This was implemented in 2004 and includes notification to the cities of West Sacramento and Sacramento and the Freeport Regional Water Authority (FRWA).
- Mandatory stewardship program for growers, pest control advisors and applicators using thiobencarb (which initially began as a voluntary program).
- Additional resources provided to some CACs for field inspections.

A summary of the Rice Pesticide Program activities over the last five years is shown in **Table 4-7**.

Table 4-7
Rice Production Activities Summary, 2010 - 2014[1]

	2010	2011	2012	2013	2014
Acreage in rice production	565,531	579,281	556,315	566,036	462,636
Inspections (total)	2,052	1,984	2,185	2,182	2,228
Number of Reported Emergency Releases	0	0	0	1 (Yolo County)	0
Acreage treated with Thiobencarb	71,938	45,892	73,460	80,752	106,487
Pounds Thiobencarb applied	247,906	178,968	255,173	276,051	369,786

[1]Based on information from CRC Rice Pesticide Program Annual Reports, 2010 – 2014.

A review of the Annual Reports to the Regional Board indicates that in 2011 and 2012 there were no exceedences of the performance goals or water quality objectives, however there was a low level detect of thiobencarb at the City of West Sacramento's GKWTP in June 2011. In June 2010 there was one exceedance of the performance goal in the Colusa Basin Drain. In May 2013 there were three exceedences of the performance goal in the Colusa Basin Drain. There was also a low-level detect of thiobencarb at the GKWTP in May 2013, but it did not exceed the water quality objective. In May and June 2014 there were three exceedences of the performance goal in the Colusa Basin Drain.

The County Agricultural Commissioners issued Agricultural Civil Penalties (ACP) to several rice growers through the study period, for violations related to seepage, water

holds, and application/mixing. The number of ACPs per year were; 2010 – 6, 2011 – 0, 2012 – 3, 2013 – 5, and 2014 - 16.

Irrigated Lands Regulatory Program

The Regional Board first adopted the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands in July 2003 (R5-2003-0105). This Order was updated by R5-2006-0053, and extended by R5-2011-0032. This was an interim program until a long-term program was developed. These Orders were effective during the majority of the study period and required all irrigated agriculture, including rice, row crops, field crops, tree crops, commercial nurseries, managed wetlands, and pastureland, to develop a monitoring program to assess the sources and impacts of discharges from irrigated lands, and to determine if reduction strategies needed to be implemented. Dischargers had the option of obtaining individual permits or joining a coalition. Two main coalitions were formed in the Sacramento River watershed: the Rice Waiver Program (which included commercial rice) and the SVWQC, which covered all other irrigated agriculture.

In 2014 the Regional Board finalized and adopted the ILRP as the long-term solution for irrigated agricultural discharges. The new orders generally continue the Conditional Waivers, but were expanded to include protections for both surface water and groundwater and provide a more structured framework for implementation. Two orders were adopted by the Regional Board for coalitions in the Sacramento River watershed: R5-2014-0030 – Waste Discharge Requirements General Order for Growers within the Sacramento River Watershed That are Members of a Third-Party Group (Sacramento River Watershed) and R5-2014-0032 – Waste Discharge Requirements General Order for Sacramento Valley Rice Growers (Sacramento Valley Rice Growers). These orders were effective for the 2015 growing season, so their conditions were not applicable during the study period. However, the Orders are briefly summarized in **Table 4-6** and not discussed in detail. In addition to the two Third-Party Orders in the watershed, there is a General Order for Growers Not Participating in a Third-Party Group (Order R5-2013-0100). An individual farmer could voluntarily enroll this way or the Regional Board could require enrollment in the event of failure of an individual to meet the Third-Party Order requirements. Permit conditions are farm-specific, so they are typically more stringent than the Third-Party Orders. Currently, there are no individual Orders in the Sacramento River watershed so it is of limited importance.

Rice Waiver Program

The Rice Waiver Program covered rice field discharges under the Conditional Waiver for the ILRP and addresses selected constituents not covered by the RPP. This program was also administered by the CRC. Authority to approve the program was delegated to the Regional Board Executive Officer and did not require the same approval process as the Rice Pesticide Program. The CRC had a coalition specific Monitoring and Reporting Program (MRP), Order No. R5-2007-0835. This was last

updated in 2009, R5-2009-0809, and again in 2010, R5-2010-0805, and extended through the study period.

The Rice Waiver Program consisted of a monitoring program and management practices where the monitoring data indicate the need. Monitoring commenced in September 2004. The monitoring sites included the same sites as used for the RPP, plus a few extra sample sites. No Sacramento River monitoring was conducted.

Monitoring was conducted only during the irrigation season, from May through August. Constituents monitored were specified in the original MRP and vary by year. Generally, the following constituents were monitored annually; flow, temperature, turbidity, pH, dissolved oxygen, toxicity, total dissolved solids, conductivity, hardness, turbidity, and TOC. There was limited pesticide monitoring conducted during the study period.

- In 2010 and 2011 samples were collected during the irrigation season and analyzed for propanil, in accordance with the Propanil Management Plan. This data is discussed further below.
- In 2012 clomazone and triclopyr were selected for monitoring during the irrigation season. This data is discussed further below.

Sacramento Valley Water Quality Coalition

The SVWQC covered all non-rice irrigated crops in the Sacramento Valley, including wild rice and pastureland. The SVWQC was divided into ten sub-watersheds. Each sub-watershed represented a unique geographic region delineated by hydrologic features, as well as political boundaries. The drainages in each sub-watershed were prioritized according to the presence of irrigated agriculture, major crop types, pesticide use, the presence of impaired water bodies, and other factors.

The SVWQC had a coalition specific MRP, which was updated in 2009, Order No. R5-2009-0875, and continued through the study period. The SVWQC's MRP was designed to evaluate the causes or contributions of aquatic toxicity in receiving waters, and includes source identification, management practice implementation, evaluation effectiveness, and monitoring. The MRP prioritized registered pesticides, pathogen indicators, legacy organochlorine pesticides, trace metals, and salinity. Sampling was conducted in two seasons; storm (December to March) and irrigation (April to October) and the data was reported separately.

Historic monitoring results showed that production practices impact surface water primarily through winter storm runoff and irrigation return flows. Winter storm runoff can transport: pesticides applied to dormant orchards; sediment, which may contain dissolved nutrients or pesticides; and fecal waste and nutrients from pasture and confined animal facilities. Irrigation return flows can transport pesticides applied before irrigation; sediment (with pesticides/nutrients also) from tilled fields (row/field crops); and dissolved salts.

The seasonal reports (either storm or irrigation) from the study period were reviewed, and provided below is a summary of the key data highlights. There were no major water quality problems identified. Pesticides were analyzed in individual water column samples collected throughout the watershed. The number of exceedences of pesticide water quality objectives in water courses entering the Sacramento River or its tributaries upstream of the Sacramento River at Freeport varied between the monitoring seasons, either storm or irrigation. The pesticide monitoring results are summarized later in Water Quality Issues and Data Review. There were very few pesticide detections of concern for drinking water upstream of the FRWA diversion location. Only a few were at a level of interest for drinking water. Most of these samples were isolated and non-repeating, indicating that it was a localized issue.

- December 2009 - One detect of simazine in Walker Creek at 10.089 µg/L, exceeding the State Water Resources Control Board, Division of Drinking Water (DDW) Primary Maximum Contaminant Level (MCL) of 4 µg/L.
- December 2011 - One detect of simazine in Pine Creek at 5.4 µg/L, exceeding the DDW Primary MCL of 4 µg/L.
- December 2009 – Two detects of oryzalin in Walker Creek at 4.6 µg/L and 4.9 µg/L, near the US Environmental Protection Agency (USEPA) Human Health Benchmark for Pesticide (HHBP) for 10^{-6} cancer risk of 5 µg/L (guideline only).
- February 2011 – One detect of Alpha-HCH in Anderson Creek at 0.24 µg/L, above the United States Geological Survey (USGS) Health Based Screening Level (HBSL) for 10^{-6} cancer risk of 0.006 µg/L (guideline only).
- May 2011 – One detect of oxyfluorfen in Colusa Basin Drain at 0.7671 µg/L, above the HHBP for 10^{-6} cancer risk of 0.5 µg/L (guideline only).
- December 2011 – One detect of Diuron in Pine Creek at 14 µg/L, above the USEPA Health Advisory (HA) for 10^{-6} cancer risk of 2 µg/L (guideline only).

For other constituents, there were exceedences of adopted Basin Plan objectives and advisory limits for a wide variety of constituents, including *Escherichia coli (E. coli)* bacteria throughout the watershed. *E. coli* data is summarized later in Water Quality Issues and Data Review.

To address water quality exceedances, the SVWQC developed a Management Plan in 2008. SVWQC also developed a *Landowner Outreach and Management Practices Implementation Communications Process for Monitoring Results* to address exceedences. A Management Plan Progress Report is submitted to Regional Board each year to document the status and progress toward Management Plan requirements. Activities conducted to implement the Management Plan included addressing exceedances of objectives for registered pesticides, completion of source evaluations for pesticides and toxicity, development of management practice implementation goals, and monitoring. Additional implementation for pesticides included evaluation of pesticide application data, identification of potential sources, and determination of likely agricultural sources.

General educational outreach was conducted in all sub-watersheds throughout the study period. The SVWQC submitted a detailed plan, the *Management Practices Process*, which describes an aggressive approach to follow when there are exceedences of the water quality objectives. The SVWQC's targeted outreach approach is to focus on the growers with fields directly adjacent to or near the actual waterway of concern. The SVWQC will work with the sub-watershed groups to implement a Response Plan framed around a three-tiered approach that is consistent with the MRP. Also, a Communications Report has been developed to enhance coordination between the various program entities.

Total Maximum Daily Loads

Section 303(d) of the CWA requires states to develop a list of impaired water bodies and a priority ranking for addressing impairments. This list is updated every two years. Impairments are addressed by developing TMDLs for that water body. Any constituent could be selected for a TMDL, if water quality segments are impaired.

There are three TMDLs established for pesticides in the watershed. All three are for diazinon and chlorpyrifos, based on aquatic toxicity: the Sacramento and Feather Rivers, six Sacramento area urban creeks, and the Sacramento-San Joaquin River Basins. A TMDL is implemented through a Basin Plan Amendment to include site-specific numerical objectives, water quality management strategies to reduce runoff, monitoring, and a plan to reduce levels in the water bodies. The Regional Board has worked the TMDLs into existing regulatory programs, such as the Irrigated Lands Regulatory Program.

The Sacramento-San Joaquin River Basins TMDL, Resolution R5-2014-0041, was adopted by the Regional Board on March 28, 2014. At the time of adoption, there were 43 segments Section 303(d)-listed for diazinon and chlorpyrifos. The amendment removed 11 water bodies from that list after finding they no longer exceeded water quality standards. The Resolution established numeric water quality objectives for diazinon and chlorpyrifos in the remaining 32 water bodies in the Central Valley that are still in exceedance of water quality standards. The Resolution also establishes a pesticide control program and monitoring requirements that will ensure that the numeric water quality objectives will be achieved. This Basin Plan Amendment was approved by the State Water Resources Control Board in June 2015. It is now under review at the Office of Administrative Law (OAL) and will then go to the USEPA for approval before becoming fully effective.

There are three additional TMDLs that may impact the Sacramento River watershed in development at the Regional Board, as follows:

- Central Valley Pyrethroid TMDL – The Regional Board provided an update on the status and schedule for the Pyrethroid TMDL and Basin Plan Amendment in May 2015. This reviewed and discussed the updated University of California at Davis (UC Davis) water quality criteria and changes to the draft proposed Basin Plan

Amendment language, which include water quality objectives, actions for the Regional Board, DPR, USEPA, implementation provisions, and surveillance and monitoring. The draft staff report will be available for public comment toward the end of 2015. It is anticipated to be brought to the Regional Board for potential adoption in Spring 2016.

- Central Valley Diuron TMDL – This program focuses on diuron in Central Valley Section 303(d) listed waterbodies including Stony Creek, Comanche Creek and Main Drainage Canal in the Sacramento Valley. The Basin Plan Amendment is in development and is expected to include water quality objectives, a TMDL, and a control program. The draft staff report is scheduled for public review in Spring 2016 and for potential adoption by the Regional Board in the summer or fall of 2016.
- Central Valley Organochlorine Pesticide TMDL – This program continues to be on hold and is being re-evaluated. There has been no action since late 2010.

University of California Cooperative Extension

The University of California Cooperative Extension (UCCE) branches in Butte County, Colusa/Glenn/Yolo counties, and Sutter/Yuba counties have Rice Programs that assist farmers. The purpose of the Rice Program is to develop research related to growers needs related to weed and pest management and water quality.

The UCCE branches publish a regular newsletter, "Rice Briefs" or "Rice Notes", for rice growers, and conduct an annual rice grower meeting in January, an annual rice field day at the Rice Experiment Station in August, and periodic rice production workshops. Some details include:

- Started a Rice Blog website for growers in March 2011. Updates from the UCCE Farm Advisors are provided throughout the growing season.
- A Rice Production Workshop was held in 2013, but it did not include a water quality component similar to the one in the 2009 Workshop.
- The 2014 and 2015 Growers Meetings were used to educate growers on the new Order under the Irrigated Lands Regulatory Program and its requirements.

The Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991 requires that beginning in September 2001 rice straw could only be burned for specific disease control conditions. Since 1990, the percent of acreage burned has dropped from 90 percent to less than 10 percent[4]. Rice growers have used three key methods to manage rice straw since then: incorporating straw into soil with active flooding, incorporating straw into soil without flooding, and harvesting the rice straw for use in other industries. The use in other industries accounts for less than five percent of the total acreage. The UCCE branches have conducted research to try and improve the amount of rice straw that can be used in other industries. In 2007, UCCE began a research project to conduct dairy feeding of the rice straw. The "double chop" rice straw was used by farmers as a feed supplement. In the pilot program, farmers found this to

[4] California Rice Website; calrice.org/industry/air-quality

be amenable to the cows and were using more than anticipated. Unfortunately, as the study went on the rice straw, sometimes called strawledge, was found to have a very low digestibility in the cows and has proven to be difficult to mix with other grains.

California Rice Experiment Station

The California Rice Experiment Station is owned by California Cooperative Rice Research Foundation, a private, non-profit research foundation, and members are California rice growers. The primary objective of the Station is the development of improved rice varieties and agronomic management systems (breeding) for California rice growers. The Rice Breeding Program is key to developing seeds which are resistant to stem rot, sheath spot, blast, and Bakanae disease. A secondary objective is to assist with industry research with support to the University of California and United States Department of Agriculture (USDA). In the 2009 to 2014 period, research was conducted related to; breeding, fertilizer guidelines, pest management, weed control, metals evaluation, feed hay, and environmental fate of pesticides. The Station also produces periodic newsletters for its members.

United States Department of Agriculture

The USDA has two services that implement assistance programs for farmers and ranchers. One is the Farm Service Agency (FSA) and the other is the Natural Resources Conservation Service (NRCS).

The FSA implements numerous voluntary programs for farmers and ranchers related to conservation.

- Conservation Reserve Program – This program provides yearly rental payments to farmers/ranchers in exchange for removing environmentally sensitive land from agricultural production and planting species to improve environmental quality.
- Conservation Reserve Enhancement Program – This program is an offshoot of Conservation Reserve Program that targets high-priority conservation issues identified by government and non-governmental organizations. Farm land that falls under these conservation issues is removed from production in exchange for annual rental payments.
- Emergency Conservation Program – This program provides funding and technical assistance for farmers and ranchers to restore farmland damaged by natural disasters and for emergency water conservation measures in severe droughts.
- Emergency Forest Restoration Program – This program is very similar to the Emergency Conservation Program as it provides funding to restore privately owned forests damaged by natural disasters.
- Farmable Wetlands Program – This program is designed to restore wetlands and wetland buffer zones that are farmed. Farmers and ranchers receive annual rental payments in return for restoring wetlands and establishing plant cover.
- Grassland Reserve Program – This program works to prevent grazing and pasture land from being converted into cropland or used for urban development. In return for

voluntarily limiting the future development of their land, farmers receive a rental payment.
- Source Water Protection Program – This program is designed to protect surface and ground water used as drinking water by rural residents. The program targets states based on their water quality and population.

The NRCS implements multiple voluntary programs on financial, technical, and easement assistance basis for farmers and ranchers related to conservation.

Financial Programs:
- Environmental Quality Incentives Program – This is a program that provides financial and technical support to farmers and ranchers to promote agricultural production and improve environmental quality. This includes the Conservation Innovation Grant Program. Cost shares from the NRCS are 50 to 90 percent.
- Conservation Stewardship Program – This program provides financial and technical support to farmers and ranchers to help conserve and enhance soil, water, air, and habitat on working lands for selected watersheds. Payments are based on conservation performance, with higher payment for higher performance.
- Agricultural Management Assistance – This program helps agricultural producers use conservation to manage risks.

Technical Programs:
- Conservation Technical Assistance Program – This program is available to any group or individual interested in conserving our natural resources and sustaining agricultural production in this country. This program functions through a national network of locally-based, professional conservationists located in nearly every county of the United States. This assistance may be in the form of resource assessment, practice design, resource monitoring, or follow-up of installed practices. This program does not include financial or cost-share assistance, but may lead to participation in other USDA financial or easement assistance programs. This assistance can help land users:
    - Maintain and improve private lands and their management
    - Implement better land management technologies
    - Protect and improve water quality and quantity
    - Maintain and improve wildlife and fish habitat
    - Enhance recreational opportunities on their land
    - Maintain and improve the aesthetic character of private land
    - Explore opportunities to diversify agricultural operations and
    - Develop and apply sustainable agricultural systems

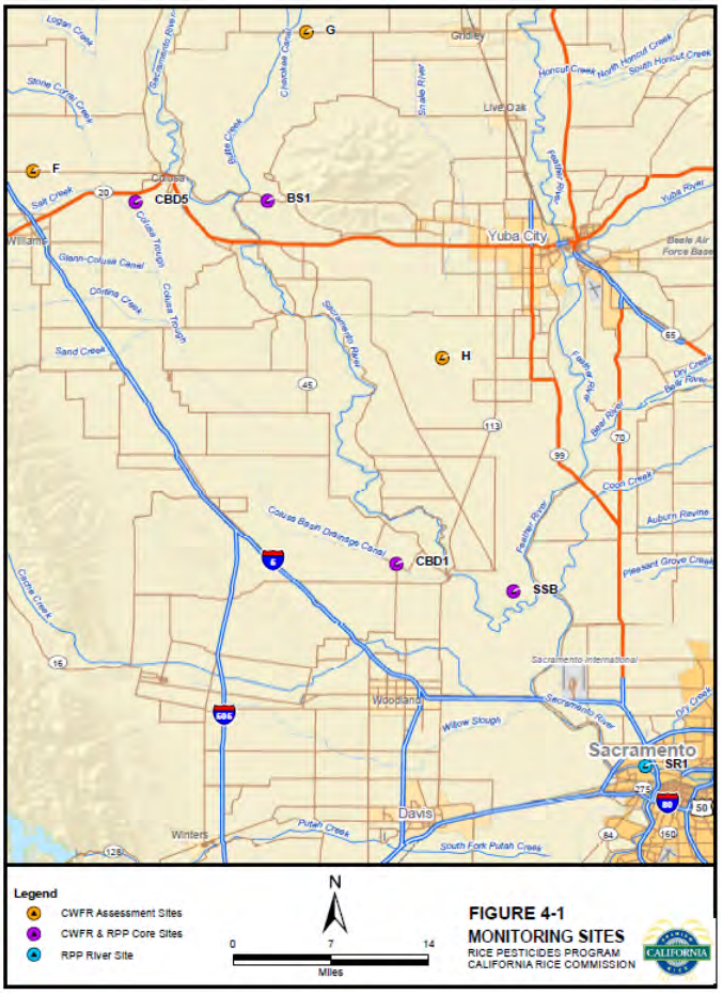
Easement Programs:
- Agricultural Conservation Easement Program – This program provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits.
- Healthy Forests Reserve Program – This program helps landowners restore, enhance and protect forestland resources on private lands through easements and

financial assistance. Through the program, landowners promote the recovery of endangered or threatened species, improve plant and animal biodiversity and enhance carbon sequestration.

Water Quality Issues and Data Review

Rice Pesticide Program

The RPP monitors five ambient sites for the rice herbicide thiobencarb: Colusa Basin Drain near Highway 20 in Colusa County (CBD5), Butte Slough (BS1), Sacramento River at Village Marina (SR1), Colusa Basin Drain above Knights Landing (CBD1), and Sacramento Slough Bridge near Karnak (SSB). See **Figure 4-2** for the RPP locations provided by the CRC. In addition, the cities of Sacramento (SRR) and West Sacramento (WSR) monitor raw water at their respective water treatment plant intakes during late spring and early summer for the rice herbicides as part of a special rice season monitoring program. The CRC's SR1 river monitoring site is located near Dwyer's Happy Landing (River Mile 61.5), between the GKWTP and SRWTP intakes.



Source: CRC 2011 RPP Annual Monitoring Report

Figure 4-2. California Rice Commission Monitoring Sites

Table 4-8 provides a summary of the number of ambient samples above the performance goals set by the Regional Board for thiobencarb, 1.5 µg/L. **Table 4-8** shows that in 2010, 2013, and 2014 there were exceedences of the performance goals for thiobencarb in the agricultural drains. The CRC attributed the 2010 exceedence to a possible unauthorized early release in Colusa County. An ACP was issued for that discharge. Exceedences in 2013 and 2014 were possibly caused by high wind speeds during the May application period, as per the CRC.

Table 4-8
Rice Pesticide Program Ambient Samples Exceeding Thiobencarb Performance Goal (1.5 µg/L)

Sample Site	2010	2011	2012	2013	2014
CBD5	0	0	0	1 (3.97µg/L on May 21)	3 (3.8 µg/L on May 29) (2.2 µg/L on June 3) (1.7 µg/L on June 24)
BS1	0	0	0	0	0
SR1	0	0	0	0	0
CBD1	1 (1.8 µg/L on June 8)	0	0	2 (1.72 µg/Lon May 21) (1.77 µg/L on May 23)	0
SSB	0	0	0	0	0

Table 4-9 provides a ten year history of the maximum detect in the agricultural drainage sites (CDB5, BS1, CBD1, and SSB), as well as the percent of individual samples each season that met the performance goal of 1.5 µg/L for thiobencarb. It can be seen that the lowest values and highest rate of compliance were the 2005 through 2007 period. Since then, the peak values have been increasing and the percent of samples not achieving the performance goal has increased also. The 2013 and 2014 seasons were most profound in terms of the highest peak values seen, in the Colusa Basin Drain, and the percent of samples not achieving the performance goal, up to five percent.

Table 4-9
Rice Pesticide Program Ambient Samples Meeting Thiobencarb Performance Goal

Season	Maximum Detect (µg/L)	Percent of Samples Less than Performance Goal
2005	0.67	100%
2006	0.97	100%
2007	0.76	100%
2008	1.99	97%
2009	1.84	96%
2010	1.8	98%
2011	1.42	99%
2012	1.23	99%
2013	3.97	96%
2014	3.81	95%

Figure 4-3 provides a graph of the thiobencarb levels during the study period at the RPP monitoring sites, with the thiobencarb performance goal and secondary drinking water standards shown. It can be seen that there are higher peaks in the end of the study period and more frequent detections and excursions over the performance goal of 1.5 µg/L, as well as the secondary MCL of 1 µg/L, in agricultural drainage samples.

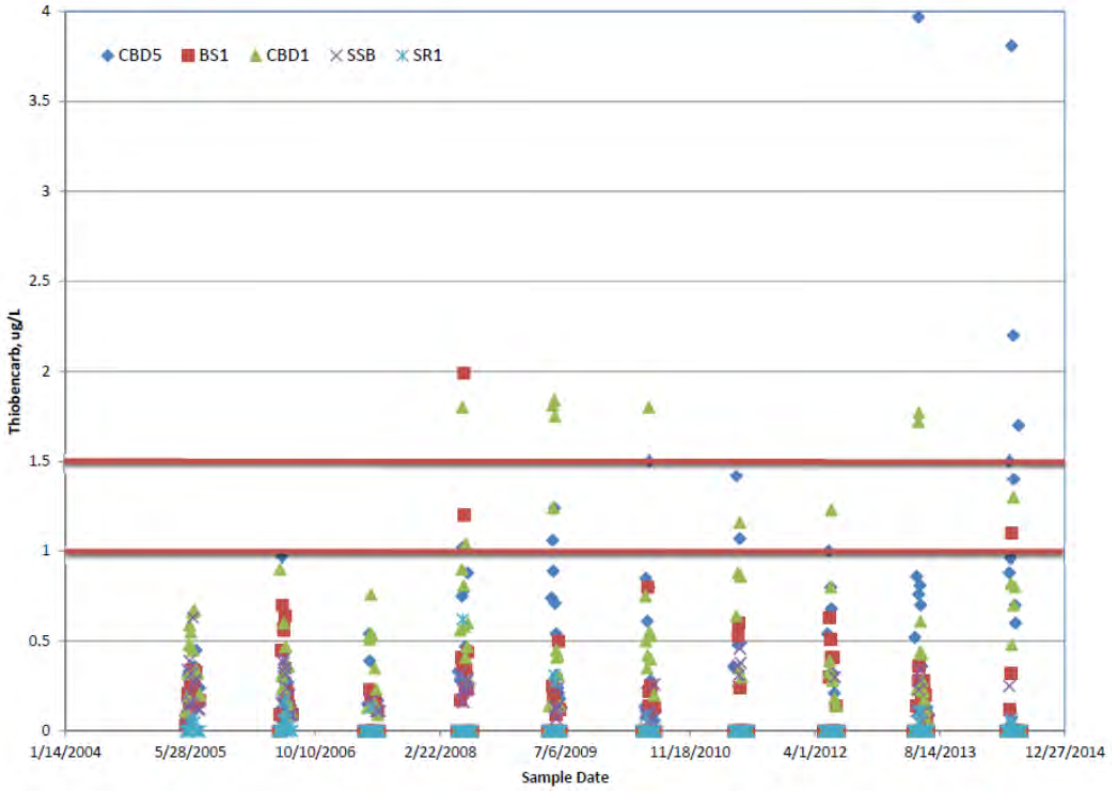


Figure 4-3. RPP Thiobencarb Data, 2005 - 2014

Table 4-10 provides a summary of the maximum raw water levels at the water treatment plant intakes for thiobencarb. The levels of thiobencarb over the study period were sporadic, with mostly non-detects and low levels when detected. Detects at the GKWTP intake in 2011 did not correlate in time with the higher detections in the upstream agricultural discharges, but the 2013 detect was likely associated with the peak values from the Colusa Basin Drain. It is uncertain why this is occurring, but possible causes include unauthorized emergency releases, seepage, and drift from aerial application.

Table 4-10
Rice Pesticide Program
Peak Raw Water Treatment Plant Thiobencarb Levels (µg/L)

Sample Site	2010	2011	2012	2013	2014
WSR (GKWTP)	<0.1	0.12 (June 1)	<0.1	0.16 (May 20)	<0.49
SRR (SRWTP)	<0.1	<0.1	<0.1	<0.1	<0.49

Rice Waiver Program

As weed resistance increases, it is likely that growers will use more sophisticated application patterns, resulting in a broader array of pesticides applied at lower levels. Very few of the newer use rice pesticides have drinking water standards at this time. Pesticide registration information indicates that degradation should be significant in reducing the concentration of these constituents in the Sacramento River. Collection of water quality data under the Rice Waiver Program provides more information on a few additional pesticides.

The Rice Waiver Program sampled for three pesticides in the agricultural drains (Butte Slough, Colusa Basin Drain, and Sacramento Slough) during the study period, with all three pesticides detected. **Table 4-11** provides a summary of the pesticides detected in samples collected during the 2010, 2011 and 2012 irrigation seasons (only years sampled). All detectable values were below the respective human health threshold.

Table 4-11
Summary of Rice Waiver Program Pesticides Detects, 2010 - 2012

Constituent	Human Health Threshold[1]	2010		2011		2012	
		Detects/ Samples	Peak Detect	Detects/ Samples	Peak Detect	Detects/ Samples	Peak Detect
Propanil	63 µg/L	15/40	10 µg/L	14/40	6.5 µg/L	-	-
Clomazone	5,880 µg/L	-	-	-	-	9/16	12 µg/L
Triclopyr	350 µg/L	-	-	-	-	6/16	6.4 µg/L

[1] USEPA Human Health Benchmark for Pesticide, Lifetime Non-Cancer

In addition, the CRC conducted monthly monitoring of the agricultural drains during each irrigation season (May through August) for turbidity and TOC. During the study period, there were 102 samples for turbidity. The individual values ranged from 6.1 nephelometric units (NTU) in the Sacramento Slough to 83.87 NTU in Colusa Basin Drain. The median values at each site were generally from 25 to 50 NTU. This indicates a high solids loading coming from the agricultural discharges during the irrigation season. There were 98 samples for TOC. The individual values ranged from 1.9 milligrams per liter (mg/L) in Butte Slough to 19 mg/L in Colusa Basin Drain. The median values at each site were generally from 5 to 6 mg/L. This indicates that there is significant organic content coming from the agricultural discharges during the irrigation season.

Sacramento Valley Water Quality Coalition

Similar to rice crops, it is likely that growers will use a broader array of pesticides applied at lower levels and very few of the newer use pesticides have drinking water standards at this time. Pesticide registration information indicates that degradation should be significant in reducing the concentration of these constituents in the Sacramento River and is supported by the low levels detected in the existing data. Collection of water quality data under the SVWQC provides more information on a broader suite of pesticides.

Provided below is a summary of the key detectable pesticides, as well as information on *E. coli* and organic carbon sampling results. The discussion below includes information on water quality objectives exceedences for pesticides based on program requirements, as well as information on respective drinking water human health levels for purposes of this study. The monitoring site locations were evaluated to determine which sites were discharging to the Sacramento River, or a tributary, upstream of Freeport based on information in various SVWQC program documents and other mapping sources. Each year data typically is collected from 10 monthly events and two storm events.

2010 Annual Monitoring Report (October 2009 – September 2010)

- Overall, 11 different pesticides were detected in 31 separate samples (out of 2,034 results) of the 14 sites monitored. It should be noted that detected pesticides are not equivalent to exceedences and that some of these were outside of the watershed upstream of Freeport. There were seven pesticides with detects and four observed exceedences of pesticide water quality objectives in water courses entering the Sacramento River or its tributaries upstream of Freeport during the 2010 season.
    - Chlorpyrifos – one detect below the trigger limit at 0.0111 µg/L [USEPA HAs: 1 day – 30 µg/L, 10 day – 30 µg/L, Lifetime – 2 µg/L]
    - Diazinon – six detects and all below the trigger limit, ranging from 0.0053 – 0.0747 µg/L [DDW Notification Level (NL) of 1.2 µg/L]
    - Diuron – one detect below the WQO at 0.41 µg/L [USEPA HAs: 1 day – 1,000 µg/L, 10 day – 1,000 µg/L, 10^{-6} Cancer Risk – 2 µg/L]
    - Malathion – five detects with three exceeding the trigger limit, ranging from 0.017 – 0.5252 µg/L [DDW Archived Advisory Level (AAL) of 160 µg/L]
    - Oryzalin – two detects below the trigger limit at 4.6 and 4.9 µg/L [USEPA HHBPs: Acute 1-day – 8,250 µg/L, Chronic Lifetime – 980 µg/L, 10^{-6} Cancer Risk – 5 µg/L]
    - Simazine – four detects with one exceeding the trigger limit, ranging from 0.0277 – 10.089 µg/L [*One sample in Walker Creek exceeded the DDW Primary MCL of 4 µg/L*]
    - Tebuthiuron – two detects below the trigger limit at 0.55 and 0.58 µg/L [USEPA HAs: 1 day – 3,000 µg/L, 10 day – 3,000 µg/L, Lifetime – 500 µg/L]
- *E. coli* was analyzed in 94 samples at 11 sites, with 25 of those samples exceeding the water quality objective of 235 most probable number per 100 milliliters (MPN/100 mL). The exceedences ranged from 240 to greater than 2,420 MPN/100 mL.

2011 Annual Monitoring Report (October 2010 – September 2011)

- Overall, 18 different pesticides were detected in 81 separate samples (out of 4,256 results) of the 22 sites monitored. It should be noted that detected pesticides are not equivalent to exceedences and that some of these were outside of the watershed upstream of Freeport. There were 12 pesticides with

detects and nine observed exceedences of pesticide water quality objectives in water courses entering the Sacramento River or its tributaries upstream of Freeport during the 2011 season.

- Alpha-HCH – one detect above the trigger limit at 0.24 µg/L [USGS HBSLs: Non-Cancer – 7 µg/L, 10^{-6} Cancer Risk – 0.006 µg/L]
- Chlorpyrifos – 15 detects with six of those exceeding the trigger limit, ranging from 0.0022 – 0.248 µg/L [USEPA HAs: 1 day – 30 µg/L, 10 day – 30 µg/L, Lifetime – 2 µg/L]
- Diazinon – three detects with one of those exceeding the trigger limit, ranging from 0.0195 – 0.1352 µg/L [DDW NL of 1.2 µg/L]
- Disulfoton – one detect below the trigger limit at 0.0087 µg/L [USEPA HAs: 1 day – 10 µg/L, 10 day – 10 µg/L, Lifetime – 0.7 µg/L]
- Diuron – two detects below the trigger limit at 0.52 and 0.55 µg/L [USEPA HAs: 1 day – 1,000 µg/L, 10 day – 1,000 µg/L, 10^{-6} Cancer Risk – 2 µg/L]
- Endosulfan I – one detect below the trigger limit at 0.011 µg/L [USEPA HHBPs: Acute 1-day – 150 µg/L, Chronic Lifetime – 42 µg/L]
- Fensulfothion – one detect at 0.0036 µg/L [No human health threshold available]
- Malathion – one detect from a prohibited discharge at 0.0312 µg/L [DDW AAL of 160 µg/L]
- Metolachlor – five detects ranging from 0.0173 – 0.755 µg/L [USEPA HAs: 1 day – 2,000 µg/L, 10 day – 2,000 µg/L, Lifetime – 700 µg/L]
- Oryzalin – one detect at 0.6 µg/L [USEPA HHBPs: Acute 1-day – 8,250 µg/L, Chronic Lifetime – 980 µg/L, 10^{-6} Cancer Risk – 5 µg/L]
- Oxyfluorfen – six detects ranging from 0.0229 – 0.7671 µg/L [USEPA HHBPs: Chronic Lifetime – 210 µg/L, 10^{-6} Cancer Risk – 0.5 µg/L]
- Simazine – eight detects all below the trigger limit, ranging from 0.0162 – 0.151 µg/L [DDW Primary MCL of 4 µg/L]

- *E. coli* was analyzed in 114 samples at 9 sites, with 39 of those samples exceeding the water quality objective of 235 MPN/100 mL. The exceedences ranged from 240 to greater than 2,400 MPN/100 mL.

2012 Annual Monitoring Report (October 2011 – September 2012)

- Overall, 15 different pesticides were detected in 48 separate samples (out of 2,977 results) of the 23 sites monitored. It should be noted that detected pesticides are not equivalent to exceedences and that some of these were outside of the watershed upstream of Freeport. There were eight pesticides with detects and six observed exceedences of pesticide water quality objectives in water courses entering the Sacramento River or its tributaries upstream of Freeport during the 2012 season.
  - Bromacil- one detect below the trigger limit at 0.45 µg/L [USEPA HAs: 1 day – 5,000 µg/L, 10 day – 5,000 µg/L, Lifetime – 70 µg/L]
  - Chlorpyrifos – six detects with one of those exceeding the trigger limit, ranging from 0.0027 – 0.0383 µg/L [USEPA HAs: 1 day – 30 µg/L, 10 day – 30 µg/L, Lifetime – 2 µg/L]

  - Diazinon – 15 detects all below the trigger limit, ranging from 0.0046 – 0.0322 µg/L [DDW NL of 1.2 µg/L]
  - Diuron – one detect above the trigger limit at 14 µg/L [USEPA HAs: 1 day – 1,000 µg/L, 10 day – 1,000 µg/L, 10^{-6} Cancer Risk – 2 µg/L]
  - Malathion – one detect from a prohibited discharge at 0.0135 µg/L [DDW AAL of 160 µg/L]
  - Methyl Parathion – two detects from a prohibited discharge at 0.0328 and 0.342 µg/L [DDW AAL of 2 µg/L]
  - Oxyfluorfen – one detect at 0.065 µg/L [USEPA HHBPs: Chronic Lifetime – 210 µg/L, 10^{-6} Cancer Risk – 0.5 µg/L]
  - Simazine – one detect exceeding the trigger limit at 5.4 µg/L [*One sample from Pine Creek exceeded the DDW Primary MCL of 4 µg/L*]
- *E. coli* was analyzed in 97 samples at 9 sites, with 30 of those samples exceeding the water quality objective of 235 MPN/100 mL. The exceedences ranged from 240 to greater than 2,400 MPN/100 mL.

2013 Annual Monitoring Report (October 2012 – September 2013)

- Overall, 10 different pesticides were detected in 25 separate samples (out of 2,667 results) of the 21 sites monitored. It should be noted that detected pesticides are not equivalent to exceedences and that some of these were outside of the watershed upstream of Freeport. There were three pesticides with detects and three observed exceedences of pesticide water quality objectives in water courses entering the Sacramento River or its tributaries upstream of Freeport during the 2013 season.
  - Chlorpyrifos – three detects with two of those exceeding the trigger limit, ranging from 0.0026 - 0.0432 µg/L [USEPA HAs: 1 day – 30 µg/L, 10 day – 30 µg/L, Lifetime – 2 µg/L]
  - Diazinon – two detects below the trigger limit at 0.0195 and 0.0241 µg/L [DDW NL of 1.2 µg/L]
  - Malathion – one detect from a prohibited discharge at 0.0967 µg/L [DDW AAL of 160 µg/L]
- *E. coli* was analyzed in 92 samples at 9 sites, with 23 of those samples exceeding the water quality objective of 235 MPN/100 mL. The exceedences ranged from 235.9 to greater than 2,400 MPN/100 mL.

2014 Annual Monitoring Report (October 2013 – September 2014)

- Overall, 14 different pesticides were detected in 56 separate samples (out of 4,251 results) of the 22 sites monitored. It should be noted that detected pesticides are not equivalent to exceedences and that some of these were outside of the watershed upstream of Freeport. There were eight pesticides with detects and four observed exceedences of a pesticide water quality objectives in water courses entering the Sacramento River or its tributaries upstream of Freeport during the 2014 season.

  - Bromacil – one detect at 0.62 µg/L [USEPA HAs: 1 day – 5,000 µg/L, 10 day – 5,000 µg/L, Lifetime – 70 µg/L]
  - Chlorpyrifos – 12 detects with two exceeding the trigger limit, ranging from 0.001 – 0.1867 µg/L [USEPA HAs: 1 day – 30 µg/L, 10 day – 30 µg/L, Lifetime – 2 µg/L]
  - p-p'-dichlorodiphenyl dichloroethane (DDD) – one detect exceeding the trigger limit at 0.0058 µg/L [No human health threshold, Integrated Risk Information System {IRIS} cancer risk drinking water comparison value 0.1 µg/L]
  - p-p'-dichlorodiphenyl dichloroethylene (DDE) – one detect exceeding the trigger limit at 0.006 µg/L at Coon Hollow Creek in El Dorado County [No human health threshold, IRIS cancer risk drinking water comparison value 0.1 µg/L]
  - Dichlorvos – one detect below the trigger limit at 0.0071 µg/L [USEPA HHBPs: Acute 1-day – 80 µg/L, Chronic Lifetime – 4 µg/L]
  - Dimethoate – two detects below the trigger limit at 0.033 and 0.1985 µg/L [USEPA HHBPs: Acute 1-day – 130 µg/L, Chronic Lifetime – 15 µg/L]
  - Diuron – one detect below the trigger limit at 0.71 µg/L [USEPA HAs: 1 day – 1,000 µg/L, 10 day – 1,000 µg/L, 10^{-6} Cancer Risk – 2 µg/L]
  - Metolachlor – one detect at 0.17307 µg/L [USEPA HAs: 1 day – 2,000 µg/L, 10 day – 2,000 µg/L, Lifetime – 700 µg/L]
- *E. coli* was analyzed in 163 samples at 18 sites, with 37 of those samples exceeding the water quality objective of 235 MPN/100 mL. The exceedences ranged from 235.9 to greater than 2,400 MPN/100 mL.
- The 2014 Annual Report included a trend analysis of the detectable constituents as part of the Waste Discharge Requirements (WDRs). This included a Spearman's Test of the analytical results. Of all the data recorded, it was found that 107 results had potential for significance as a trend ($p<0.05$). Of those, 46 were determined to be potentially negative impacts that warranted further evaluation. Of the 46, 15 were dismissed for insufficient data available to review the trends. The main body of the report does tell what constituents those were, but does not present any of the evaluation or explanation to support why the constituents were not included for further evaluation. Of the 31 remaining, the majority were conventional/physical parameters in various waterbodies. There were no metals or pesticides included. This did include TOC in Pine Creek and Walker Creek, which showed a significant trend for potential degradation but was not recommended for any additional action. The report includes a sentence stating that all the trends for conventional/physical parameters are caused by the climatic impacts of the current drought and therefore is not representative of a real trend as it will revert once the weather is back to normal. The report indicates that the trend analysis does not support the need for any new/revised/or additional monitoring actions for any of the constituents.

TOC has been sampled at various sites throughout the watershed between January 2010 and December 2014, at varying periods and frequencies. TOC data from January

2010 through June 2013 was available electronically through the California Environmental Data Exchange Network (CEDEN) and used to calculate statistics.

- Individual sample results ranged from 1.2 to 74 mg/L, with annual averages ranging from 5.1 to 6.1 mg/L.
- The average value of Sacramento Slough was 5.7 mg/L and the Colusa Basin Drain was 6.6 mg/L.

Sacramento River Source Water Protection Program Activities

The Sacramento River Source Water Protection Program agencies have conducted a significant amount of outreach and activity related to agricultural discharge (both rice and other crops) over the past five years. Efforts were related to rice pesticides stewardship, general pesticide tracking, and agricultural discharges, as described below. Several of the documents are provided as samples in **Appendix D**.

Rice Pesticides Stewardship Program

The SRSWPP agencies have provided significant stakeholder involvement, technical evaluations, and tracking work as part of the RPP.

- The Cities of Sacramento and West Sacramento continued annual special rice season intake monitoring for thiobencarb at the GKWTP and SRWTP intakes. The water agencies also received RPP monitoring results from the CRC and Valent.
- Reviewed the CRC RPP Annual Reports. Conducted scientific evaluation of annual RPP thiobencarb monitoring data, in the context of previous monitoring data and other relevant information. Developed and sent comments on the Annual Report to the Water Board.
- Attended RPP annual coordination meetings with the CRC and Regional Board.
- Participated in RPP resolution renewal in 2010. Provided significant input to the Regional Board in regard to the 2010 Rice Pesticides Program renewal. This required development of supporting scientific information, including scientific information and analysis obtained from or collaborated with the USEPA and DPR.
- Completed a scientific assessment of rice pesticide management practices. Reviewed proposed management practices and made recommendations to Regional Board about the proposed practices in light of lessons from recent monitoring data and the RPP annual Stakeholder meeting.
- Conducted outreach to UCCE to review emerging trends in pesticide usage.

General Pesticides Tracking

- Submitted comments on a wide variety of USEPA proposals related to pesticide use and registration and tracked information, such as:

- Submitted comments to require disclosure of pesticide inert ingredients like water pollutants, requesting that drinking water protection be a recognized basis for disclosure.
- Tracked pesticide registration and registration review schedules for rice pesticides & other priority pesticides. Track changes in allowable pesticide use resulting from actions initiated by agencies other than USEPA, such as court decisions and pesticide consultations with US Fish & Wildlife Service under the Endangered Species Act. Review documents related to consultation on six herbicides in the Sacramento River watershed.
- Tracked USEPA registration status and plans for upcoming reviews of pesticide priorities, including: Diazinon, Chlorpyrifos, 1,3-dichloropropene, 2,4-D, Methyl bromide, Thiobencarb, Methyl iodide, Propanil, Fluoxastrobin, Fluroxypyr, Dinotefuran, Azoxystrobin, Cyhalofop Butyl, Ethalfluralin, Iprodione, Mancozeb, Metam Sodium & Metam Potassium, Oryzalin, Oxyfluorfen, Pendimethalin, Propargite, Simazine, Sodium chlorate, and Triclopyr.
- Tracked new pesticide registrations and changes in allowable pesticide uses for rice. Assessed outcomes of comments and identified and sought resolution to public noticing problem. Assisted with development of letters requesting that during its review, USEPA carefully consider drinking water quality at downstream intakes for the following proposed new rice pesticides: Benzobicyclon, Fluxapyroxad, Saflufenacil, Flupyradifurone, and Trinexapac-ethyl.
- Tracked USEPA methodologies and policies for evaluation of the importance of pesticide uses for drinking water quality.
- Tracked new pesticide registrations and changes in allowable pesticide uses for rice. Looked into proposed change in allowable levels of bispyribac-sodium.
- USEPA Thiobencarb Registration Review Work Plan – Completed scientific analysis of the draft work plan, focusing on the elements that feed into the drinking water assessment and assembled thiobencarb monitoring data to provide to USEPA. Developed a comment letter to USEPA, accompanied by transfer of a large volume of documents to USEPA's Thiobencarb Registration Review team.
- USEPA Chlorpyrifos Registration Review Drinking Water Assessment - Analyzed USEPA's new methodology for pesticide drinking water risk assessments, using the chlorpyrifos risk assessment as an example. Coordinated with the Regional Board to confirm that the monitoring data in the risk assessment are consistent with Sacramento River monitoring data and to ensure that the Regional Board is considering drinking water quality as well as aquatic life protection in its own participation in USEPA's chlorpyrifos review.
- USEPA/Fish & Wildlife Service Thiobencarb Consultation - Reviewed documents related to consultation between USEPA and US Fish & Wildlife Service on thiobencarb use in the Sacramento River watershed.

Participate remotely in DPR seminar by US Fish and Wildlife Service; met with USEPA staffer to learn about review approach, analyzed methodologies and reviewed draft biological opinion.
  - Obtained information about USEPA's Human Health Benchmarks for Pesticides.
  - Identified and tracked a new USEPA project to improve its rice modeling capabilities. In coordination with USEPA Region 9, set up an educational teleconference meeting between the Sacramento River water agencies and the USEPA modeling team to share information about source water protection, drinking water treatment processes, the geography of the Sacramento Valley rice-growing area and drinking water intakes, and the data and lessons learned from the RPP. USEPA modified its modeling approach based on information provided by the water utilities.
  - Tracked USEPA scientific method revisions for estimating spray drift to surrounding surface waters, which will improve the accuracy of USEPA's modeling and correct a long-standing gap in USEPA's estimation procedures.
  - Tracked new scientific information that can help USEPA in developing improved approaches to source water protection, including discoveries of rice pesticides in air and rain.

- Tracked and provided comments to DPR on a wide variety of projects and proposals related to pesticide use and registration, such as:
  - DPR's surface water regulatory concept. DPR revised its approach, which initially considered only aquatic life protection, to address both drinking water quality protection and aquatic life.
  - Tracked progress of DPR's surface water protection regulations and overall regulatory approach for surface water quality protection. DPR has decided to break out its proposed regulations into topic-specific pieces that will be proposed and adopted one at a time. Although none of the immediate pieces would target source water protection, DPR is seeking to enhance its surface water monitoring program to provide better data about potential pesticides water quality problems. DPR is interested in the water agencies' input on monitoring priorities for source water protection.
  - Tracked other DPR regulatory proposals, including changes in enforcement regulations.
  - Tracked DPR rice modeling project, which is developing more robust modeling tools for rice pesticides. Reviewed and assessed scientific paper describing DPR's new modeling approach. The new model provides DPR with the ability to predict water pollution potential when a pesticide is being reviewed by DPR for potential registration for use on rice
  - Propanil Risk Assessment - Tracked DPR's process for development of a risk assessment for propanil.

- Tracked registration status of methyl iodide, which has potential implications for source water quality, as do other related fumigants (methyl bromide and 1,3-dichloropropene).
- Change in Use of Thiobencarb - Provided input on a proposed change in the allowable use of the thiobencarb Abolish product. Input requested careful review of water quality implications of the new use pattern and clarification of product labels with regard to hold time. DPR completed the special water quality review and required modification of the product labels.
- Tracked rice pesticide registration changes, including the proposed registration of imazosulfuron, a new product that would also contain thiobencarb.
- Tracked DPR pesticide monitoring in the Sacramento River watershed. Obtained a report on intensive pesticide monitoring in Sacramento River, which included a few pesticides on the SRSWPP pesticides watch list (none at levels of interest).
- Reviewed DPR scientific documents related to two other new rice pesticides, Methyl anthranilate and Clothianidin. Based on information from DPR and USEPA, clarified that these pesticides would not be a source water protection priority.
- Tracked DPR development of pesticide monitoring priorities. DPR developed a new methodology for prioritizing pesticides for monitoring in agricultural and urban watersheds. The monitoring list will be used not only by DPR but also by other agencies, such as the Regional Board, which are using the agricultural list in the selection of pesticide monitoring requirements under the ILRP. Although DPR's initial prioritization methodology did not explicitly include drinking water in the prioritization process, in response to informal input, DPR revised its procedures in mid-2014 to add drinking water to the prioritization process, using drinking water standards and USEPA's HHBP.
- Provided request to DPR to route Valent USA Corporation's product, League MVP Herbicide, to DPR's Environmental Monitoring Branch's Surface Water Program.

- Pesticide Tracking and Follow Up –
  - Developed a fact sheet methyl bromide, 1,3-dichloropropene, propanil, Chlorpyrifos, Diazinon, Sodium Chlorate, and 2,4-D that presented technical information related to the chemicals, its use and regulation, drinking water standards, water quality data, and recommendations.
  - Prepared two Pesticide Prioritization Memoranda on rice and non-rice pesticide use in the watershed to develop a list of priorities to inform input on the ILRP WDRs. The memoranda will assist with determining which pesticides may be priorities for joint source water protection program attention in the next two years.
  - Examined the potential for the fumigants 1,3-dichloropropene (Telone) and methyl bromide to occur in agricultural runoff. Based on available

information, recommended consideration of Telone as a continued priority for potential ILRP monitoring, but consider dropping methyl bromide from the priority list. Annual special samples collected from the City of Sacramento's SRWTP intake following the fall first flush were tested for Telone and methyl bromide during 2012-2014 with no detection in the samples.

- Regional Board Tracking - Tracked basin plan amendments, including TMDL, that are in development related to pesticides or other constituents of interest for the Sacramento River watershed.

Agricultural Discharges

- Conducted outreach and coordination with Regional Board staff and agricultural coalition staff on the development of the Long Term ILRP, including review of Board Resolutions, WDRs, Staff Reports, and coalition templates. Provided comments on the tentative WDRs and templates for the Eastern San Joaquin Parties (for the purpose of its use as a template for other ILRP orders), Individual, Sacramento River Watershed, and rice. Technical support for water agencies' participation in development of long-term ILRP, particularly related to potential integration of pesticides water quality protections.
- Reviewed the SVWQC semi-annual reports for their monitoring and reporting program. This consists of storm season events (December through March) and irrigation season events (April through October).
- Reviewed of the CRC's Rice Waiver Program Annual Reports.
- Tracked the Basin Plan Update to review the current drinking water quality standards and updated the pesticide prioritization analysis as appropriate to confirm the highest priority pesticides and herbicides for on-going work.
- Attended DPR Presentation on USGS Rice Study. Tracked and obtained preliminary results from USGS's special pesticide monitoring study in the Sacramento Valley rice-growing area.
- Participation in the Regional Board stakeholder group for the Municipal and Domestic Water Supply (MUN) Beneficial Use Project for the Sacramento Publicly Owned Treatment Works (POTWs) and Region-Wide, including review and comment on numerous documents.
- Prepared updates on a variety of regulatory management programs related to agricultural activities in the watershed, including: Pesticide TMDL Update, Dairy Update, and Department of Pesticide Regulation Surface Water Regulations Update.
- Participated in the ILRP Pesticide Evaluation Advisory workgroup.
- Reviewed the State Water Resources Control Board (State Board) Agricultural Expert Panel Review of the ILRP and submitted comments.

LIVESTOCK

Background

In this report, livestock includes rangeland cattle and dairy cattle. There is a sizeable livestock population in the watershed, especially rangeland grazing cattle. Cattle are a known host for *Cryptosporidium parvum* and *Giardia*. Just one infected animal can shed a large number of *Cryptosporidium parvum* oocysts and *Giardia* cysts. Although there are far fewer dairy cattle in the watershed than rangeland cattle, calves are present year-round in dairies; calves are known to be able to transmit *Cryptosporidium*, and a single infected calf can shed millions of oocysts. Dairies are considered a concentrated animal feeding operation (CAFO). The cattle population is upstream of all the existing water treatment plant intakes, the WDCWA intake under construction, and the potential future SRRWRP diversion, so the potential for *Cryptosporidium parvum* or *Giardia* loading from livestock is of equal importance to all participating water agencies. Although livestock can contribute other constituents, this evaluation focuses on *Cryptosporidium* and *Giardia* due to the distance between the water treatment plants and the potential sources of other constituents of interest such as TOC.

Information for this section was obtained from several agencies' websites and from discussions with personnel from the State Board, the Regional Board, the USFS, as well as staff at UC Davis.

Seasonal Patterns

The risk of loading viable *Cryptosporidium parvum* oocysts and *Giardia* cysts into the river system from cattle in the watershed appears to be highest during storm events. Runoff from animal feeding operations (AFOs), such as dairies, is prohibited and would likely only occur during storm events. This is when an AFO's waste management system is vulnerable to exceeding its capacity and spilling into nearby watercourses. Storms also will cause sheet flow over rangeland areas that can pick up fecal matter from grazing livestock. Storm runoff from rangeland grazing areas is more likely to carry *Cryptosporidium parvum* during the calving season since calves are more likely to be infected with the pathogen than adult cows. Spring is calving season and therefore is the time of peak risk of infected herds and also still a time when oocysts likely survive well. Early summer can also result in oocysts being contributed from young calves as they graze with cows.

Peak *Cryptosporidium* shedding occurs within a very limited group of calves (two months of age[5]), and therefore manure management for the young is of far more importance than manure management for adult animals. Since transport of *Cryptosporidium* overland is inefficient in most range environments, rangeland located proximally to rivers and tributaries is of primary concern. Survival of oocysts is also

[5] University of California Agriculture and Natural Resources, California Rangeland Watershed Laboratory, Department of Plant Sciences, University of California at Davis. www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Crypto_window.html. May 13, 2015.

likely affected by seasonal temperature. Research shows that when the temperature of a cow fecal pat exceeds 104°F the *Cryptosporidium* will die within a matter of hours[6]. When air temperatures exceed 78°F, a fecal pat in direct sunlight will achieve the required 104°F. The killing rate declines as the temperature or sunlight exposure declines so that fecal pats deposited in winter (January through April) may provide temperature conditions that allow for oocysts survival for 90 plus days.

Giardia and *Cryptosporidium* survive well in cool, moist environments and can be transported overland. However, freeze-thaw cycles reduce survivability. Overland transport may be required which will reduce the viability of oocysts; studies show that grassland buffers can capture up to 99.9 percent of oocysts[6].

Another source is created when ranchers use check dams on small watercourses to create waterholes for grazing livestock. Ranchers typically release the boards on these check dams in anticipation of storm events, to prevent flooding of the rangeland upstream of the check dam. Close proximity of fecal waste to water bodies would reduce the opportunity for desiccation, which can cause inactivation of oocysts.

High levels of coliform in the Sacramento River appear to be associated with precipitation, as discussed in **Section 3**. Even though coliform are not considered a good indicator for *Cryptosporidium* and *Giardia*, the bacteria data available for the river system supports the theory that storm events are the time of highest risk with respect to microbial contaminants. There is no similar correlation for *Cryptosporidium* and *Giardia* data, which possibly indicates that insufficient data exists to consistently connect the source impact to water quality.

Related Constituents

Although *Giardia* and *Cryptosporidium* can come from a variety of animal populations, loading from cattle is a source of key interest. In the Western United States studies have shown that about 19 percent of cattle are infected with *Giardia* and about four percent are infected with *Cryptosporidium*[7]. According to the University of California, California Rangeland Watershed Laboratory, an infected calf can shed upwards of 10,000,000 *Cryptosporidium* oocysts per gram of feces and up to 1,000,000 *Giardia* cysts per gram of feces. Loading is a function of animal density, or stocking rates, timing of grazing, and infection rate among the herd. Calves from one to four months contribute over 99 percent of oocysts shed by cattle. Given the low ratio of calves to adults in grazing cattle as compared to dairy cattle, as well as their geographic spread, it may be that grazing cattle populations do not spread *Cryptosporidium* as readily as dairy cattle. Current studies suggest that the daily contact between a calf and a carrier mother results in an initial infection that is then spread between calves though calf play.

[6] www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Crypto_window.html

[7] University of California Agriculture and Natural Resources, California Rangeland Watershed Laboratory, Department of Plant Sciences, University of California at Davis. www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Giardia_window.html. May 13, 2015.

Therefore, dairies are expected to have greater opportunity for spreading infection than rangeland cattle.

Presence in Watershed and Protection Zones

The total livestock population, including both rangeland and dairy cows, was over 477,000 in 2012, as shown in **Table 4-12**. This is a seven percent reduction over the five-year period from 2007 to 2012. This continues the decreasing trend that has been occurring for several decades. The counties with the largest populations continue to be Glenn, Modoc, Siskiyou, and Tehama. The majority of cattle and calves in Sacramento County are dairy cattle located outside of the watershed upstream of the FRWA Intake. The only county to see significant increase in population was Shasta County.

Table 4-12
Inventory of Livestock[1], 2002, 2007, and 2012

County	Cattle and Calves				
	2002	2007	2012	5 Year Change	10 Year Change
Butte	19,431	15,930	14,282	-10%	-26%
Colusa	16,922	16,501	14,757	-11%	-13%
El Dorado	7,675	6,738	8,134	21%	6%
Glenn	65,397	62,012	62,329	1%	-5%
Lassen	49,324	45,051	40,820	-9%	-17%
Modoc	75,193	59,174	51,705	-13%	-31%
Nevada	5,042	5,615	4,778	-15%	-5%
Placer	20,991	16,996	12,873	-24%	-39%
Plumas	16,417	13,350	17,022	28%	4%
Sacramento	67,536	71,205	56,213	-21%	-17%
Shasta	28,405	39,212	35,122	-10%	24%
Sierra	7,116	3,467	9,383	171%	32%
Siskiyou	64,689	56,535	53,944	-5%	-17%
Sutter	10,326	7,868	6,616	-16%	-36%
Tehama	68,195	58,444	61,785	6%	-9%
Yolo	16,909	21,570	14,756	-32%	-13%
Yuba	31,438	14,050	12,647	-10%	-60%
TOTAL	571,006	513,718	477,166	-7%	-16%

Based on information from the USDA website: www.nass.usda.gov.
Data reported are inventory numbers and do not reflect livestock sold off during the course of the year.
[1]Includes rangeland and dairy cattle

The majority of dairies in the watershed are in Glenn County, with some also in Tehama and Yuba counties, see **Table 4-13**. None of these are in the protection zones. Most of

the dairies in the Sacramento River watershed are classified as small CAFOs. These numbers were stable over the study period. The numbers obtained clearly show that rangeland cattle are by far the most numerous livestock in the watershed.

Table 4-13
Inventory of Dairy Cows, 2002, 2007, and 2012

County [1]	Dairy Cows				
	2002	2007	2012	5 Year Change	10 Year Change
Butte	222	[D]	427	-	92%
Colusa	[D]	[D]	102	-	-
El Dorado	9	5	27	440%	200%
Glenn	17,304	22,499	20,463	-9%	18%
Lassen	38	65	48	-26%	26%
Modoc	14	15	[D]	-	-
Nevada	108	21	58	176%	-46%
Placer	[D]	[D]	[D]	-	-
Plumas	7	[D]	[D]	-	-
Shasta	562	38	192	405%	-66%
Sierra	[D]	0	[D]	-	-
Siskiyou	1,518	1,100	970	-12%	-36%
Sutter	[D]	[D]	6	-	-
Tehama	5,489	3,381	5,741	70%	5%
Yolo	2,012	[D]	[D]	-	-
Yuba	3,325	3,258	2,719	-17%	-18%
TOTAL	30,608	30,382	30,753	1%	0%

Based on information from the USDA website: www.nass.usda.gov.
[1] All or most of the dairies in Sacramento County are in the south county area - outside of the watershed upstream of Freeport. Sacramento County numbers were excluded from the total.
[D] Data withheld to avoid disclosing information for an individual farm

Regulation and Management

Rangeland

Runoff from rangeland is considered a non-point source of pollution and it is covered under the State Board's Non-Point Source (NPS) Program. As for all non-point sources under this program, the state has a three-tiered approach to regulation:

- Tier 1: Self-determined implementation – non-regulated management practices.
- Tier 2: Regulatory based encouragement – conditional waiver of WDRs.
- Tier 3: Effluent limitations and enforcement actions - WDRs.

In order to address rangeland issues in California, the Rangeland Management Advisory Committee (RMAC) was created. This committee is comprised of livestock industry and public members. The RMAC advises the California Department of Forestry and Fire Protection (CalFIRE) Board of Forestry on issues related to rangeland management. The RMAC worked with the State Board to create a rangeland water quality management program to comply with Tier 1 for the NPS program.

Federal lands owned by the USFS and the USBLM continue to be used extensively for rangeland grazing. Grazing on these lands is governed by the Water Quality Management Plan (WQMP) for National Forest System Lands in California. This was developed in 2000 and includes standards and guidelines to meet the CWA and California Standards. This program focuses on range management through best management practices (BMPs). This includes range analysis and planning, grazing permits, and rangeland improvements as necessary.

The State Board began development of a statewide waiver for USFS (including timber harvest, roads, range, recreation, and fuel management) in 2009 in order to streamline management policies state-wide for non-point source activities. A proposed Resolution was prepared in 2011 to cover the USFS statewide activities under one order, but it has not yet been finalized or adopted. As part of the resolution development, the USFS worked in collaboration with the State Board and Regional Boards to develop a new Water Quality Management Handbook (WQMH) to address control of nonpoint source pollution generated by various activities on National Forest System lands in California. The WQMH was adopted by the USFS in May 2011 with revised management practices to improve water quality protection related to the activities prioritized in the proposed statewide order. Some key new provisions include road, range, and recreation management policies; BMPs with adaptive management; and an expanded monitoring program.

Grazing Regulatory Action Project

The State Board created the Grazing Regulatory Action Project (GRAP) in 2014 to try to create a statewide approach for water quality impacts from grazing activities. After two years of focused listening sessions, the State Board determined in September 2015 that due to regional differences in hydrology, topography, climate, and land use, they will discontinue the GRAP and direct the Regional Boards to work collaboratively with individual property owners, livestock grazing operators, and other interested stakeholders to develop regional programs to protect water quality and beneficial uses, including regulatory actions and effective non-regulatory efforts for BMP implementation.

The State Board resolution directs the Regional Boards to consider prioritizing actions to address livestock grazing operations that cause impairment, or have the likelihood to do so. The resolution directs that the Regional Boards should consider BMPs, where appropriate, and should consider establishing monitoring programs to evaluate the

effectiveness of those BMPs. Finally, the resolution directs the Regional Boards to take actions they determine to be necessary to protect water quality and the beneficial uses of waters from pollution consistent with state and federal laws.

The State Board has directed staff to work with academia and resource groups to update grazing BMPs and Ranch Management Plans and to report back to the them in late 2016 regarding the status of those efforts. Staff anticipates providing this update by January 2017.

Rangeland Water Quality Management Program

The Rangeland Water Quality Management Program (RWQMP), developed in 1995 by the UCCE, the Cattlemen's Association, and the USDA's NRCS for the State Board as a Tier 1 approach, continues to be used as a voluntary management program for privately owned rangeland. The heart of the program was a series of short courses given to ranchers to help them develop and implement water quality management plans at their ranch. This included grazing and irrigation management practices to improve runoff quality. The last workshop was in 2009 and over 1,000 ranchers, covering over 2 million acres, took the course. The courses are still available on the website.

Dairies

Historically, dairies were required to confine all waste, washwater, and storm runoff that contacts animal waste on site under Section 15 of the California Code of Regulation; discharge to receiving waters is prohibited. Some of the very large dairies and dairies with known problems were required to obtain individual permits under the Regional Board's WDRs Program, which covers discharges to land. There are four dairies located upstream of Sacramento which are covered under individual WDRs, as shown in **Table 4-14**. None of these facilities had any enforcement actions or violations in the past five years. The permits for the Neles Dairy and the Glenn Milk Plant were rescinded during the study period; neither was actually functioning as a dairy.

Table 4-14
Individually Permitted Dairies

County	Name and Permit Number	Animal Count	Waste Management
Tehama	Alston Farms Dairy No. 2 R5-2010-0012	850 animals	Lagoon, land application
Glenn	Henry Jongsma & Son Dairy R5-2007-0102	3,000 animals	Ponds, land application
Glenn	Greenwood Dairy R5-2008-0122	3,650 animals	Ponds, land application
Glenn	Weststeyn Dairy R5-2009-0082	5,000 animals	Lagoon, land application

In May 2007, the Regional Board adopted Order No. R5-2007-0035, Waste Discharge Requirements for Existing Milk Cow Dairies. It was modified in 2009 (R5-2009-0029), and then reissued in 2013 (R5-2013-0122). This covers all dairies that submitted a Report of Waste Discharge (ROWD) in 2005. This includes 58 dairies in the study area, as shown in **Table 4-15**. Also shown are enforcement actions and violations.

Table 4-15
General Order for Existing Milk Cow Dairies[1]

Facility Name	County	# Enforcement Actions within 5 years	# Violations within 5 years
CSU Chico Dairy Facility	Butte	0	0
Schroer Diary (Sierra Rose)	Butte	0	0
Alston Dairy 1	Glenn	0	0
Alves Dairy	Glenn	0	0
Amaral Dairy	Glenn	1	1
Bekendam Dairy	Glenn	0	0
Boer Dairy/ M&H Jerseys	Glenn	1	1
Chris Verboom Dairy	Glenn	2	2
Couto Dairy	Glenn	0	0
Creek Dairy	Glenn	0	1
Goedhart Dairy	Glenn	0	0
Gomes Holstein Dairy, Inc.	Glenn	0	0
Hillside Farms	Glenn	0	0
K-D Cheda Dairy	Glenn	0	0
Leo Martin Dairy	Glenn	0	0
Leonardo Dairy	Glenn	1	1
Maarten Poldervaart Dairy	Glenn	0	1
Manny Aguiar Dairy	Glenn	0	0
Martins Family Dairy	Glenn	0	0
Nick Beglinger Dairy	Glenn	0	0
Northwind Dairy	Glenn	1	1
Paul Schmidt Dairy	Glenn	0	0
Pedrozo Dairy	Glenn	1	2
Pinheiro & Deniz Dairy	Glenn	2	2
Pinheiro Dairy	Glenn	1	1
S/K Dairy	Glenn	1	1
Schager Dairy	Glenn	0	0
Silveira Dairy / Creekside Farms	Glenn	0	0
Silveira Jersteins Dairy	Glenn	0	0
Simson Dairy	Glenn	2	2
Van Tol Brothers Dairy	Glenn	0	0
Van Tol Dairy No 2	Glenn	0	0
Vogts Holstein Dairies #1	Glenn	0	0
Vogt's Holstein Dairies #2	Glenn	0	0
Zuppan Dairy	Glenn	0	0
FG Dairy/ Frank G Machado Dairy	Placer	1	3

Table 4-15 Cont'd
General Order for Existing Milk Cow Dairies[1]

Facility Name	County	# Enforcement Actions within 5 years	# Violations within 5 years
Van Warmerdam Dairy (Cornelius Ave)	Sutter	2	2
Alderson Dairy	Tehama	0	0
Alderson Family 4A Dairy	Tehama	0	0
Belo Dairy	Tehama	0	0
Bob Fumasi Dairy	Tehama	1	1
Brentwood Farms Dairy	Tehama	0	0
Duivenvoorden Farms	Tehama	0	0
Ferreira & Son Dairy	Tehama	3	2
Martin Dairy	Tehama	0	0
Poldervaart Dairy	Tehama	1	1
Smith Family Dairy	Tehama	2	2
Luis Dairy	Yuba	1	1
Staas Farms	Yuba	1	1
Staas Farms, Inc.	Yuba	1	0
Tollcrest Dairy	Yuba	0	0

[1] Data from the California Integrated Water Quality System Database

The key components of the Existing Milk Cow Dairies Order are:

- Prohibition of discharge of waste and/or stormwater to surface water,
- Prohibition of animals entering surface water within the confinement areas,
- Requirement to retain waste and stormwater onsite for a 25 year, 24-hour event,
- Requirement for development of an Existing Conditions Report,
- Requirement for development of a Waste Management Plan by 2011,
- Requirement for development of a Nutrient Management Plan by 2012 if they apply waste to land,
- Requirement to conduct monitoring if wastewater is released to surface water, and
- A 50 percent fee reduction if complete certification through the Dairy Quality Assurance Program (DQAP).

Regional Board staff completed approximately 250 dairy inspections for Fiscal Year 2014/15, including 200 compliance inspections. The Regional Board has a target performance goal of inspecting each DQAP-certified dairy covered under the Existing Milk Cow Dairies Order once every five years, and non-certified dairies once every three years.

In addition to the Existing Milk Cow Dairies Order, the Regional Board has developed WDRs for dairy manure digesters that are not covered under that Order. This includes independent digesters (R5-2010-0130) and centralized digesters (R5-2011-0039). These programs relate to the digesting of dairy manure and then land

application and are protective of surface water. A query of the California Integrated Water Quality System (CIWQS) did not identify any permits in the watershed.

The Regional Board adopted a NPDES permit for existing CAFOs (operating as of October 17, 2005) in 2010 (R5-2010-0118) and modified it in 2011 (R5-2011-0091). This is implementation of the Federal CAFO law. This applies to large CAFOs (>700 herd) and with the potential to discharge to surface water. This is a separate permit than the Existing Milk Cow Dairies Order discussed above. A query of CIWQS did not identify any permits in the watershed.

The Dairy Quality Assurance Program

The DQAP was formed in 1997 as a voluntary program, sponsored by the State Board, the California Department of Food and Agriculture, and the UCCE, to assist dairy owners to comply with regulations and improve sanitary conditions at dairies. In 1999 the Environmental Stewardship Module was established to educate producers on air and water quality. Over 1,800 producers in the Central Valley have completed the program and been certified. The certification is valid for five years and the components include:

- Attendance at a 6-hour education short course on farm management.
- Development of an individual Farm Management Plan.
- Third party evaluation, conducted by California Department of Food and Agriculture inspectors who have received additional training from UC Davis and the Regional Board. Over 500 evaluations have been completed.

Once a dairy operator completes all three of these components, a certification is issued. The DQAP has been incorporated into the Regional Board permitting process, through a 50 percent fee reduction for Environmental Stewardship certification, which has contributed to the success of the program.

University of California Cooperative Extension

The UCCE Sierra Foothill Research and Extension Center is located east of Marysville and conducts research on various topics, including grazing. Current and recent research focuses on rangeland watershed and water quality management, invasive species management, native plant conservation and restoration, as well as cattle production and health. In addition, the UCCE county offices provide support to ranchers and farmers.

University of California at Davis

The University of California's Division of Agricultural and Natural Resources also hosts two programs through the College of Agriculture and Environmental Science: the California Rangeland Watershed Laboratory (CRWL) and the California Rangelands Research and Information Center (CRRIC). These both have informative websites.

The CRWL conducts extensive research coordination, while the CRRIC focuses more on public outreach and information sharing. This includes the Rustici Rangeland Science Symposium, held in 2013, 2014, and 2015, to discuss rangeland management and water quality. Updates on applied research findings from the Sierra Foothill Research and Extension Center and strategies to ranchers are presented. These also provide a short course on grazing management for ranchers.

United States Department of Agriculture

The USDA has two services that implement assistance programs for farmers and ranchers. One is the FSA and the other is the NRCS.

The FSA implements numerous voluntary programs for ranchers related to conservation.

- Conservation Reserve Program – This program provides yearly rental payments to farmers/ranchers in exchange for removing environmentally sensitive land from agricultural production and planting species to improve environmental quality.
- Conservation Reserve Enhancement Program – This program is an offshoot of Conservation Reserve Program that targets high-priority conservation issues identified by government and non-governmental organizations. Range that falls under these conservation issues is removed from production in exchange for annual rental payments.
- Emergency Conservation Program – This program provides funding and technical assistance for farmers and ranchers to restore farmland damaged by natural disasters and for emergency water conservation measures in severe droughts.
- Emergency Forest Restoration Program – This program is very similar to the Emergency Conservation Program as it provides funding to restore privately owned forests damaged by natural disasters.
- Grassland Reserve Program – This program works to prevent grazing and pasture land from being converted into cropland or used for urban development. In return for voluntarily limiting the future development of their land, farmers receive a rental payment.
- Source Water Protection Program – This program is designed to protect surface and ground water used as drinking water by rural residents. The program targets states based on their water quality and population.

The NRCS implements multiple voluntary programs on financial, technical, and easement assistance basis for farmers and ranchers related to conservation.

Financial Programs:

- Environmental Quality Incentives Program – This is a program that provides financial and technical support to farmers and ranchers to promote agricultural production and improve environmental quality. This includes the Conservation Innovation Grant Program. Cost shares from the NRCS are 50 to 90 percent.
- Conservation Stewardship Program – This program provides financial and technical support to farmers and ranchers to help conserve and enhance soil, water, air, and

habitat on working lands for selected watersheds. Payments are based on conservation performance, with higher payment for higher performance.
- Agricultural Management Assistance – This program helps agricultural producers use conservation to manage risks.

Technical Programs:
- Conservation Technical Assistance Program – This program is available to any group or individual interested in conserving our natural resources and sustaining agricultural production in this country. The program functions through a national network of locally-based, professional conservationists located in nearly every county of the United States. This assistance may be in the form of resource assessment, practice design, resource monitoring, or follow-up of installed practices. This program does not include financial or cost-share assistance, but may lead to participation in other USDA financial or easement assistance programs. This assistance can help land users:
    - Maintain and improve private lands and their management
    - Implement better land management technologies
    - Protect and improve water quality and quantity
    - Maintain and improve wildlife and fish habitat
    - Enhance recreational opportunities on their land
    - Maintain and improve the aesthetic character of private land
    - Explore opportunities to diversify agricultural operations and
    - Develop and apply sustainable agricultural systems

Easement Programs:
- Agricultural Conservation Easement Program – This program provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits.
- Healthy Forests Reserve Program – This program helps landowners restore, enhance, and protect forestland resources on private lands through easements and financial assistance. Through the program landowners promote the recovery of endangered or threatened species, improve plant and animal biodiversity, and enhance carbon sequestration.

Water Quality Issues and Data Review

Section 3 presented a discussion of ambient levels of *Cryptosporidium* and *Giardia* in the focus area. There was very limited available data during the study period, but the data continues to show a small number of presumptively positive samples for both protozoa, and low average levels. Two out of 26 samples were positive for *Cryptosporidium*, with concentrations ranging from non-detect (<0.09) to 0.273 oocysts per liter (oocysts/L) and an average value of 0.014 oocysts/L. The two detects of *Cryptosporidium* both occurred in winter months (January 2010 and February 2011). Thirteen out of 26 samples were positive for *Giardia*, with concentrations ranging from non-detect (<0.09) to 0.286 cysts per liter (cysts/L) and an average value of 0.076

cysts/L. The detects of *Giardia* occurred throughout the year, but the peak level occurred in October 2010.

Winter months are when rangeland cattle and dairy cattle are projected to have the potential to impact source water quality, so it is possible that the detects of protozoa may be related to livestock in the watershed. There are other sources to consider.

Sacramento River Source Water Protection Program Activities

During the study period, the SRSWPP agencies tracked rangeland and dairy management programs from the Regional Board and developed informational updates. This included a review of the new regulatory programs as well as tracking general compliance with the Orders.

RIVER CORRIDOR AND RIVER RECREATION

Background

River recreation includes body and non-body contact activities. Body contact recreation, such as swimming, wading, and rafting, is allowed on all major reservoirs and river reaches in both the Sacramento and American river watersheds. The number of body contact recreationalists will be far less than the estimated number of annual recreationalists. Much of the recreational use is associated with non-body contact recreation including on-shore activities such as fishing, hiking, biking, in-line skating, walking, dog-walking, or picnicking and in-river activities such as boating. Activities occurring within the river corridor can lead to illegal dumping, such as abandoned boats or other trash.

Seasonal Patterns

Recreation in the watershed can occur throughout the year, but is most significant during the summer months between Memorial Day and Labor Day. Recreation on the Sacramento River in the protection zones is largely limited to activities involving limited or no body contact, such as power boating, jet skiing, and on-shore fishing.

Recreation on the Lower American River near Discovery and Tiscornia parks is comprised of both body and non-body contact types. Swimming, rafting, and wading are common throughout the summer months, with peaks around weekends and holidays. Many people living near the American River Parkway use it regularly for on-shore activities, like dog-walking.

Related Constituents

Body contact recreation in general has long been known to be a source of pathogen contamination, resulting partly from personal sanitary conduct and partly from a natural shedding process. Pathogens shed by recreationalists include bacteria, viruses, and

protozoa. Moreover, because their origin is human, microorganisms shed by recreationalists are transmissible to other humans. Boaters may dump sewage waste into the river rather than use a sewage pumpout. Non-body contact could result in a wide variety of constituents, including pet fecal waste. Illegal dumping could result in discharge of a wide variety of constituents, including petroleum products.

Presence in the Protection Zones

The Sacramento River is heavily used for power boating, jet skiing, water skiing, and fishing. Recreational use is not controlled or tracked on the river. There are multiple access points at marinas, boat launches, recreational areas, and private docks along the length of the river. Non-body contact recreation occurs all along the river system. Illegal dumping, such as boat abandonment, could occur anywhere along the reach. Restrooms are located at marinas and at public parks along the river, but there are no floating restrooms along this reach of the Sacramento River.

Marinas

There are 12 marinas on the Sacramento River between Freeport and the Feather River confluence. These facilities are listed in upstream to downstream order in **Table 4-16**.

Overnight Boats

Overnight boats are frequently anchored near the mouth of the American River. The cities of Sacramento and West Sacramento have ordinances that prohibit unseaworthy boats from anchoring in the river, limit the time or anchoring, and provide for the removal of all derelict boats. The ordinance and subsequent enforcement and removal have been effective at ensuring these boats are managed to protect water quality. Under current law, police officers must have probable cause to board a boat, such as observing a dumping incident. This probable cause rarely occurs.

Body Contact Recreation

Body contact recreation on the Lower American River at Tiscornia Park and Discovery Park consists primarily of rafting/kayaking, swimming from shore, and swimming associated with overnight boats. Swimming from shore occurs at various locations, the main ones on the Sacramento River are Sand Cove Park (River Mile 62) and Elkhorn Regional Park (River Mile 70). Neither facility monitors use statistics.

Sacramento County Department of Regional Parks manages the American River Parkway, including Discovery Park on the north side of the river, as well as the Elkhorn Boat Launch Facility. The City of Sacramento Department of Parks and Recreation manages Tiscornia Park on the south side of the American River, as well as Sand Cove, Miller, Chicory Bend, and Pocket Area parks on the Sacramento River. There are fewer restrooms in the downstream section of the American River Parkway as there have been problems in the past with vandalism of restrooms in this area.

Table 4-16
Marinas on the Sacramento River

Facility/River Mile	Activities/Waterside Facilities	Owner
Verona Village River Resort 6485 Garden Highway, Nicolaus 916.927.8387 River Mile 80	Berths, restrooms, store, camping, restaurant	Private
Rio Ramaza Marina 10000 Garden Highway, Sacramento 916.925.5432 River Mile 76	Berths, boat launch, restrooms, camping	Private
Alamar Marina 5999 Garden Highway, Sacramento 916.922.0200 River Mile 71	Berths, fuel, restrooms, restaurant	Private
Metro Marina 5871 Garden Highway, Sacramento 916.920.8088 River Mile 71	13 Berths, sewage pumpout[1], restrooms, restaurant, store, camping	Private
River View Marina 1801 Garden Highway, Sacramento 916.925.4100 River Mile 62	88 Berths, sewage pumpout[1,2], restrooms, store, restaurant	Private
Dwyer's Happy Landing/Virgin Sturgeon 1951 Garden Highway, Sacramento 916.929.5662 River Mile 61.5	Berths, restrooms, restaurant	Private
Riverbank Marina 1371 Garden Highway, Sacramento 916.922.0720 River Mile 61	175 Berths, sewage pumpout[1,2], restrooms, restaurant	Private
Sacramento Marina Front Street, Sacramento 916.808.5712 River Mile 58	475 Berths, boat launch, sewage pumpout[1,2], restrooms, fuel, store	Public
Sacramento Yacht Club 3365 S. River Rd, West Sacramento 916.371.5058 River Mile 55.5	>100 Berths, restrooms, sewage pumpout	Private
Sherwood Harbor Marina 3505 S. River Road, West Sacramento 916.371.3471 River Mile 54.5	130 Berths, sewage pumpout[1], fuel, shower facilities, restrooms, camping, store	Private
Stan's Yolo Marina 31070 S. River Rd, Clarksburg 916.371.7040 River Mile 50	Berths, fuel	Private
Freeport Marina 8250 Freeport Blvd, Sacramento 916.665.1555 River Mile 46	Berths, sewage pumpout[1,2], restaurant, store, restrooms	Private

[1]Pumpout available for public use.
[2]No charge to use pumpout

Regulation and Management

Law enforcement personnel from the Sutter County, Yolo County, and Sacramento County Sheriff's Offices, as well as the cities of Sacramento and West Sacramento Police Department, patrol the river. Local law enforcement officers also have control over recreational users in areas within their agency's jurisdiction and up to 500 feet from the high waterline in any agency's jurisdiction.

Local parks and recreation department personnel can enforce park rules at recreational areas under the jurisdiction of that agency. In the protection zones, this includes:

- Yolo County Parks Department - Elkhorn Regional Park.
- Sacramento County Department of Regional Parks - Elkhorn Boat Launch and the American River Parkway.
- City of Sacramento Parks and Recreation Department - Sand Cove Park, Tiscornia Park, Chicory Bend Park, Miller Park, and Pocket Area Parks.

County of Sacramento Department of Regional Parks

The County of Sacramento is the owner and operator of the American River Parkway, as well as the Elkhorn Boat Launch Facility. The Department of Regional Parks has the responsibility for operation and maintenance of these parks and their facilities. The American River Parkway Plan was most recently updated in 2008. Sacramento County implemented Measure A in 2009, which is a new sales tax (0.5 percent) for roadway and transit improvements. This will be effective through 2039. The County receives monies from this fund for improvements to the American River Parkway bike path, but no projects to date have been near Discovery Park. During the study period the Department has completed numerous capital improvement projects in the Parkway, including the Jibboom Street Bridge sidewalk replacement in 2012.

Sacramento County has an ordinance related to vessel mooring and sanitation. This ordinance can be enforced by the Sheriff, Environmental Management, Code Enforcement, and Peace Officers. Chapter 6.42 – Vessel Sanitation and Mooring Ordinance requires a permit issued by the Sheriff for any vessel to be moored, anchored, grounded, placed or otherwise located in any waterway of Sacramento County for a period exceeding fourteen (14) days. The long-term permit is only valid for 30 days in a 60 day period. The vessel must have a sanitation device, be seaworthy, and not obstruct any waterway. An inspection must also be conducted in order to obtain the permit.

City of Sacramento

The City of Sacramento is the owner and operator of numerous parks located along the Sacramento River, from Sand Cove to the Pocket Area. Key parks for body-contact recreation are Sand Cove and Tiscornia, located between GKWTP and SRWTP.

Although there is heavy use in the summer season, there are no restrooms at either of these sites. Further downstream is Miller Regional Park, with limited body-contact recreation, which does have restroom facilities.

The City of Sacramento has an ordinance (Title 8.112 – Boating) that establishes rules related to vessels in the waterway. The Sacramento City Police Department enforces the ordinance. Three key provisions include:

- Once notified, an owner/operator must remove any non-seaworthy vessel within 48 hours.
- If a vessel sinks, an owner/operator must mark it with a buoy.
- The maximum time to moor or anchor in a waterway is 96 consecutive hours. After this time the vessel must be moved to a marina/berth/slip/wharf or leave the City limits for 24 hours prior to returning to the waterway.

City of West Sacramento

The City of West Sacramento also has an ordinance (Title 8.40 – Pollution and Anchorage of Vessels) that establishes rules related to vessels in the waterway. The City of West Sacramento Police Department enforces the ordinance. There are two key provisions:

- Once notified, an owner/operator must remove any non-seaworthy vessel within 48 hours.
- No anchoring or mooring any vessel on any waterway in one location for more than six hours a day for a total of 30 or more days in any 90-day period without a long-term anchorage permit.
- Long-term anchorage (greater than 90 days) permits are only issued to vessels with a sanitation device and require the operator to log sanitation, with sewage pumpout every four days.

United States Environmental Protection Agency

There are now two USEPA general vessel permits: the Vessel General Permit (VGP) and the small Vessel General Permit (sVGP). Recreational vessels as defined in section 502(25) of the CWA are not subject to these permits. As part of the NPDES program, USEPA regulates incidental discharges from the normal operations of vessels under the CWA, Section 402. This includes ballast water, bilge water, gray water, and anti-fouling paints.

The VGP was renewed in 2013 and it regulates discharges incidental to the normal operation of commercial vessels greater than 79 feet in length operating in a capacity as a means of transportation. The VGP includes general effluent limits applicable to all discharges: general effluent limits applicable to 27 specific discharge streams; narrative water-quality based effluent limits for seven categories of contaminants; inspection, monitoring, recordkeeping, and reporting requirements; and additional requirements

applicable to certain vessel types. The sVGP was adopted in 2014 and essentially has the same requirements as the VGP, but for vessels less than 79 feet in length.

Since the majority of vessels on the Sacramento and American rivers in the vicinity of the drinking water intakes are recreational vessels, the VGP and SVGP do not apply.

State Water Resources Control Board

Marinas and recreational boating are considered non-point sources of pollution. Regulation and management falls under the State Board Non-Point Source Program. Management has focused on Tier 1; as discussed under Rangeland, this means that implementation is met through implementation of self-determined non-regulated management practices. The State Board adopted the "Policy for Implementation and Enforcement of the Non-Point Source Pollution Control Program" in 2004. The Policy covered marinas and indicated that a non-voluntary Clean Marina Program would be developed to include 26 best management practices as well as monitoring. This was subsequently revised to continue to be a voluntary program.

The CWA prohibits untreated vessel discharges in US waters, and the Porter Cologne Act prohibits untreated sewage discharges throughout the state. The Regional Boards have the primary authority and responsibility in California for enforcing these acts, but they do not have the resources to operate a program to inspect or enforce their authority with respect to acts of dumping from boats.

California State Parks, Division of Boating and Waterways

The California State Parks, Division of Boating and Waterways (DBW) has two grant funding programs to assist with abandoned recreational vessels and marine debris. Grants are awarded annually to local public agencies. The first program is the Abandoned Watercraft Abatement Fund (AWAF). This program provides local agencies grant funding for the abatement, removal, storage, and disposal of abandoned, wrecked, and dismantled vessels in waterbodies. Three local agencies participate in the Sacramento River watershed: Butte County Sheriff, Sacramento County Sheriff, and Sacramento City Police. Ten percent matching funds are required. They typically receive funding to remove from one to four boats per year. Most are located in the Delta. The cost for removal and disposal is quite high for submerged boats, around $200 per lineal foot of boat.

The second program is the Vessel Turn-in-Program (VTIP). This program is different in that it targets boat owners who don't want boats any longer and provides them an opportunity to surrender their boats to a local agency instead of abandoning them. Similar to AWAF, it requires a ten percent matching fund. Two local agencies participate in the Sacramento River watershed: Butte County Sheriff and Sacramento City Police. The Sacramento County Sheriff is interested in this program, but is not able to participate currently since they do not have appropriate surrender facilities.

California Coastal Commission/Division of Boating and Waterways

The Boating Clean and Green Campaign (Campaign) is a statewide boater educational and technical assistance program. The Campaign has been conducted by the California Coastal Commission (CCC) since 1997, and as of March 2006 the Campaign has been led by the DBW, with assistance and support provided by the CCC.

Since the Campaign's inception, the California Integrated Waste Management Board, the National Oceanic and Atmospheric Administration and the USEPA have provided funding. The Campaign assisted Contra Costa County to develop and implement its boating program called "Keep the Delta Clean. You Play in it, You Drink it too!". The Campaign has four major components as follows.

- Networking. As part of its efforts to promote clean and safe boating, the Campaign facilitates the California Clean Boating Network (CCBN). The CCBN consists of a collaboration of government, environmental, business, boating, and academic organizations working to increase and improve clean boating education efforts in California. This includes a website that provides a marina geographic information system (GIS) database and listing of pumpout stations.
- Research. For the last several years, the Campaign has developed research to better orient its educational messages, develop outreach materials, and identify and promote environmental services for boaters statewide.
- Technical Assistance. Identifying and promoting environmental services for boaters (sewage and bilge pumpouts, oil absorbent distribution and collection, used oil and household hazardous waste collection centers), assisting marinas and local governments in identifying the need and installing pollution prevention services for boaters, and participating at conferences and trade shows.
- Education and Outreach. The Campaign is focused on a multi-faceted outreach strategy to target boat shows and events, marine supply stores and word-of-mouth to reach boaters. This also includes the CCBN's "The Changing Tides" newsletter and the Clean Marina Toolkit. The Campaign trains Dock Walkers to do face-to-face boater education.

Clean Marinas California Program

This is an independent organization for education and outreach to marinas and yacht clubs; it is administered by the Marina Recreation Association. This program was created in San Diego County in response to potential regulatory action by the Regional Board. It became a statewide program in 2007 and there are currently 127 marinas certified through the program. This is an all-voluntary program that encourages the use of BMPs to prevent and reduce pollution.

The program provides a Program Manual with BMPs related to a variety of issues, including boat sewage discharge, waste management, hazardous materials, and storm runoff. Marina owners are provided a checklist to assist as they educate, train and encourage boaters and employees to protect the environment and water quality through

the routine use of these BMPs. A review of each facility is performed by an independent team to determine that day-to-day activities and operations are enhancing the environment and water quality. Those meeting the Program standard and implementing a pledge to continue the use of these BMPs receive a Clean Marina designation.

There is a website, www.cleanmarina.org. There are currently three marinas in the watershed which are certified through the program: two at Lake Oroville (since 2006) and the Sacramento Marina (since 2008).

Water Quality Issues and Data Review

Water quality data collected to date indicate that pathogen levels (specifically *Giardia* and *Cryptosporidium*) at the drinking water diversions are low and infrequently detected. On the Sacramento River, there were 26 *Giardia* and *Cryptosporidium* samples, collected from 2010 through 2012. When detected, the levels were relatively low. Data presented in **Section 3** show that the number of pathogens potentially contributed by recreational users (as well as from other sources) and/or fate and transport dynamics are not sufficient to result in routinely measurable levels at the intakes.

The most frequent and more significant *E. coli* peaks at SRWTP, Discovery Park, and Freeport occur during the winter months, as discussed in **Section 3**. Plots of coliform levels and local precipitation at the water treatment intakes show that high coliform levels are frequently associated with high precipitation and high flow events in the winter months. Neither of these are likely associated with river recreation or corridor activities.

Regional Board Safe to Swim Study

The Regional Board implements the Safe to Swim Study through the Surface Water Ambient Monitoring Program (SWAMP). The purpose of this study is to assess levels of microbial constituents in recreational waters to see if the beneficial use is impacted. The program began in 2007 and continued during this study period. The program uses *E. coli* as an indicator, with a guideline of 235 most probable number per 100 milliliters (MPN/100mL). There are 55 sites throughout the Sacramento River watershed, but only one site in the protection zones: Discovery Park on the Lower American River. Samples were collected for total coliform and *E. coli* during the recreation seasons of 2010 through 2013. The range of *E. coli* was 14.8 - >2,420 MPN/100 mL, with an average of 384 MPN/100 mL and a median of 98 MPN/100 mL. Samples were collected in September 2012 and June 2013 and analyzed for *Giardia*, *Cryptosporidium*, *E. coli* 0157:H7, and *Salmonella*. No *E. coli* 0157:H7 was detected, *Giardia* was detected in one sample at 0.09 cysts per liter, *Cryptosporidium* was detected in both samples at 0.09 oocysts per liter, and *Salmonella* was detected in one sample at 0.0138 MPN/100 mL. Since this sample program targeted locations with body-contact recreation during the recreation season, it is possible that constituents detects may be associated with those activities.

Sacramento River Source Water Protection Program Activities

"Keep Our Waters Clean" (KOWC) continues to increase awareness among local recreationalists about drinking water sources and the use of sewage pumpouts and restrooms. This program is run by the City of Sacramento Department of Utilities on behalf of a group of water agencies and other local organizations along the Sacramento and American rivers. The program was started in 2000 along the Sacramento River and was extended to the Folsom Lake and the Lower American River. Agency sponsors during the study period include the cities of Sacramento, West Sacramento and Roseville, East Bay Municipal Utility District (EBMUD), and Sacramento County Water Agency (SCWA), among others.

"Pups in the Park" continues to increase awareness among local dog owners about the use of pet waste stations. This program is run by the American River Parkway Foundation, and financially supported by the City of Sacramento. This includes pet waste stations, filled with waste collection bags, located throughout Sacramento County parks, including along the American River Parkway.

The program utilizes several means of sharing information with recreationalists including; maps of sewage pumpout and restroom locations, brochures, promotional items, and participation in local outreach events. The program also creates partnerships with other organizations including other counties and jurisdictions, State and County Parks, educational outlets, boating and rafting businesses, and local marinas to help distribute information.

Program updates during the study period include:

- Updated website (http://www.cityofsacramento.org/Utilities/KOWC),
- GIS map which shows boat launch locations, public restrooms, marinas, pumpout stations, used oil filter drop off locations, and pet waste stations,
- Social media outreach via the Facebook KOWC page (since 2009) https://www.facebook.com/keepourwatersclean,
- On-line radio ad, and
- Educational presentations at educational outlets such as the Effie Yeaw Nature Center and Sacramento Zoo.

In 2014, a survey of 40 recreationalists was conducted to find out their habits on the water and their knowledge about preventing water pollution. It was determined that 88 percent are using public restrooms and 25 percent are familiar with using sewage pumpouts. By conducting these surveys annually, KOWC obtains a better understanding of community needs and tendencies, and can better plan for the future of the program.

HOMELESS/ILLEGAL CAMPING

Background

Another river corridor activity of interest to source water quality is illegal camping and homelessness. There is a continuous, though shifting, population of homeless people and illegal encampments in the river corridors for the Sacramento and American Rivers. The illegal camps become littered with debris, garbage, sewage, litter, used toilet paper, human waste, discarded syringes, food wrapper, old clothes, etc.

Seasonal Patterns

Illegal camping and homelessness are a storm source with the principal concern being wash off caused by rain runoff that may pick up waste from the camps. The illegal camping is typically located within the flood plain. For this reason, the principal concern is that contaminants associated with the sites, including human waste, may be washed off during storm events and transported to the Sacramento and American rivers.

Related Constituents

Illegal camps are of potential concern as a source of fecal waste. The waste may have a disproportionately high load of disease-causing organisms since, as noted in the Sacramento County and Cities Board on Homelessness' Five Year Plan, there is "substantial documentation of high incidence of diseases among the homeless population."

Presence in the Protection Zones

There are known illegal camping areas within the levees on both the east and west sides of the Sacramento River and along the Lower American River. Illegal camps are created largely in the American River Parkway, mostly downstream of the Business 80 bridge crossing, close to social services in downtown Sacramento. Many of the camps are located near the river. On the Sacramento River, there has been illegal camping in West Sacramento around the Lighthouse Marina area.

The number of homeless people has stabilized to around 200 to 400 living in the furthest downstream three-mile reach of the Lower American River, and this population is predominantly a service-resistant population. There is a "no-alcohol" area from the Capital City Freeway Bridge crossing to Discovery Park. Park Rangers confiscate alcohol as well as cite and jail people for illegal camping in this area.

The Sacramento Housing and Redevelopment Agency, in partnership with Sacramento Steps Forward, conducts Point-in-Time Homeless Counts every other year in Sacramento County. **Table 4-17** presents the findings from 2007 through 2013.

The number of chronically homeless has decreased over time, but the total homeless has remained relatively stable. In 2007, approximately 41 percent were unsheltered and in 2013 only 31 percent were unsheltered. Only a portion of the unsheltered homeless reside in the river corridor.

Table 4-17
Homeless Count Results

Category	2007	2009	2011	2013
Chronically Homeless	718	468	353	432
Other Homeless	1,734	2332	2,005	2,106
Total Homeless	2,452	2,800	2,358	2,538

The Yolo County Homeless and Poverty Action Coalition also conducts homeless counts annually throughout the County, including in the City of West Sacramento. The 2015 count showed there were 167 homeless in the City of West Sacramento, and 80 of those were unsheltered. Over the past eight years the unsheltered count has ranged from 80 to 201. Only a portion of the unsheltered homeless reside in the river corridor. Yolo County estimates that 20 percent of the unsheltered homeless reside outdoors.

Regulation and Management

County of Sacramento/City of Sacramento

There are County (Title 8.36) and City (Chapter 15.52) ordinances which ban illegal, or public, camping within City limits. These are enforced by Sacramento County Park Rangers and the City of Sacramento Park Services. All static camps on County property are dismantled and occupants are forced to move. There is other land within the floodplain that is either owned by the City of Sacramento or privately where homeless populations illegally camp. Most of the camps in the American River Parkway are located near the river. The City of Sacramento Park Services also enforces illegal camping bans but involvement is limited to the City or the privately owned lands located within the American River floodplain within the City limits.

In 2013, Sacramento County implemented a new data tracking system which allows for tracking more details related to illegal camping. A review of this database from February through October 2013 showed that there were 615 occupied camps that were cited, 561 unoccupied camps that were provided notice to vacate, and an additional 106 camps that were identified for further action. This has resulted in 1,269 camp sites cleaned by County Parks' maintenance staff, with 255 of those sites cleaned by a 25-person work crew.

In the American River Parkway (specifically the property owned by Sacramento County), park rangers clean up the camps and also direct County Sheriff work crews in cleanup efforts. "Grabber sticks" are used to pick up toilet paper where possible, but human waste and decomposing paper are left on the ground due to health and

aesthetic concerns with close handling of the waste. The County budget for funding work associated with camp cleanup efforts varies greatly annually.

City of West Sacramento/Yolo County

The City of West Sacramento enacted a "No Camping" ordinance in the late 1990s and began conducting enforcement sweeps on a regular basis. The Code Enforcement Department of the Police conducts annual sweeps. Throughout the year, staff visit the known illegal camping areas, including the Lighthouse Marina area, to assess the populations. Once a significant population has developed, staff posts a 72-hour notice to vacate. Bags are provided for illegal campers to remove their belongings. Persons remaining in the camps are cited, and all belongings are removed. Camps are cleaned up by Public Works Department personnel. Cleanup includes identification and removal of the bathroom area as well as all litter and debris. After the camps are cleaned, staff trim all trees to eight feet above the ground to prevent low-lying canopies.

Yolo County, in cooperation with the Cities of Davis, West Sacramento, Winters, and Woodland, has developed a 10 Year Plan to End Homelessness in Yolo County. Some key actions of the plan are:

- Create and expand housing resource centers in each City.
- Identify and access funding for extremely affordable permanent housing and services to access and maintain housing.
- Increase availability and access to mental health and substance use services.
- Make transportation assistance available to improve access to services and employment opportunities.

Sacramento Steps Forward

The Sacramento Housing and Redevelopment Agency created Sacramento Steps Forward to manage work efforts to implement the 10 Year Plan to End Homelessness in Sacramento County. The Plan describes innovative new strategies to address chronic homelessness. The essential components of the Plan to solving the problems of homelessness are:

- Housing First
- Outreach and Central Intake
- Prevention
- Leadership
- Evaluation and Reporting to the Community

Sacramento Steps Forward works with the County and private businesses to find long term solutions for chronically and temporarily homeless; offers emergency shelter, housing assistance, food, health care, transportation, and employment assistance; hosts the winter sanctuary; and conducts the biennial point in time homeless counts and interviews. The winter sanctuary provides rotating winter shelter at houses of worships mid-November through March, with an average of 450 to 550 guests per season.

Water Quality Issues and Data Review

Water quality data indicate that pathogen levels (specifically *Giardia* and *Cryptosporidium*) at the drinking water diversions have historically been low and infrequently detected. Data presented previously on the Regional Board's Safe to Swim Study and in **Section 3** show that the number of pathogens potentially contributed by homeless and/or fate and transport dynamics are not sufficient to result in routinely measurable levels at the intakes.

The most frequent and more significant *E. coli* peaks at SRWTP, Discovery Park, and Freeport occur during the winter months, as discussed in **Section 3**. Plots of coliform levels and local precipitation at the water treatment plant intakes show that high coliform levels are frequently associated with high precipitation, which are typically high flow events also. It is likely that illegal camping is a storm-related contribution, although it is uncertain what amount of microbial contribution is associated with this activity.

URBAN RUNOFF

Background

Much of the greater Sacramento metropolitan area discharges urban runoff to the Sacramento and American Rivers year-round. With the urbanization of outlying areas, the volume of urban runoff in the rivers may continue to increase in future years. Upstream urban areas, including Roseville, Auburn, Yuba City, Chico, and Redding, also discharge urban runoff to the rivers.

Urban runoff is currently of greater interest to the cities of Sacramento and West Sacramento and the FRWA diversion, than to the potential future Sacramento River Regional Water Reliability Project (SRRWRP) and new Woodland Davis Clean Water Agency (WDCWA) diversions. However, this may change with future growth and changes in the watershed.

Seasonal Pattern

Urban runoff occurs on a year-round basis and includes wet and dry weather flows. Wet weather runoff resulting from seasonal storms is of relatively short duration and can have highly variable pollutant concentrations. Because of the high degree of imperviousness and the efficiency of the drainage systems, urban areas generally generate higher per acre volumes of runoff than undeveloped or agricultural lands. Dry

weather runoff reaching surface waters is referred to as “non-stormwater discharges”; it results from activities such as lawn irrigation and washing activities including street, sidewalk, parking lot, building, and car washing.

Related Constituents

Urban runoff is one of several sources of microorganisms, turbidity, and TOC. Urban runoff can contain volatile organic compounds (VOCs) and synthetic organic compounds (SOCs). Urban runoff is generally associated with anthropogenic sources of increased runoff volume in urbanized land use areas. With higher volumes of runoff, some constituents can be present at higher than background concentrations. The relative impact of urban runoff depends on a number of watershed factors, as well as the timing of wet weather events.

Data on urban runoff discharges indicate that the runoff can have highly variable turbidity and organic carbon concentrations, is a source of indicator bacteria, and is a source of other constituents such as pesticides, metals, and organic compounds. Limited data on *Giardia* and *Cryptosporidium* levels in Sacramento urban runoff showed few protozoa detections in dry weather runoff and generally low level detections in wet weather runoff with the exception of high protozoa levels in urban runoff from an early season storm, first-flush event.

Presence in the Watershed and Protection Zones

The State Board’s CIWQS database was queried to identify the number of currently active stormwater permittees in the watershed in the various programs.

In the Sacramento River watershed there are two NPDES Municipal Stormwater Phase I permits; the Sacramento Stormwater Quality Partnership (SSQP) and the Statewide California Department of Transportation (Caltrans).

Under the new Municipal Phase II Permit, there are 42 city, county, or census designated places designated in the watershed, an increase of 15 since the 2010 Update. **Table 4-18** provides a summary of all of the designated Phase II permittees located within the Sacramento River watershed upstream of Freeport. It should be noted that the cities of Grass Valley and Live Oak have applied for waivers from the program due to hardship. The applications were both rejected by the Regional Board and then appealed to the State Board. A waiver will exist until a final determination is made by the State Board.

Caltrans also has 11 individual NPDES permits under the State’s Construction General NPDES Permit program in the watershed. These range in size from 3.5 to 560 acres. These numbers change frequently as construction projects open and close. A list is provided in **Appendix D**. Under the Construction General Permit program there are 484 other sites that have filed a Notice of Intent (NOI) to comply with the Construction

General Permit Order, ranging in size from less than one acre to 3,320 acres. A list is provided in **Appendix D**.

Finally, there are 571 NPDES permits under the Industrial General Permit Order located throughout the watershed. The sites range from less than one acre to nearly 23,000 acres. A list is provided in **Appendix D**. Approximately 330 of these facilities are located within the Near-Intake Protection Zones. The majority of these facilities are small, with only 41 of them greater than 50 acres within the protection zones. **Table 4-19** provides a summary of the large industrial sites within the protection zones.

Table 4-18
Phase II Stormwater Permittees in the Sacramento River Watershed

County, City, or Census Designated Place	County, City, or Census Designated Place
Anderson	Marysville
Auburn	North Auburn
Butte County	Olivehurst
California Exposition and State Fair	Oroville
California Department of Corrections – California Medical Facility	Paradise
California Department of Corrections – California State Prison	Placer County
California Department of Corrections – Folsom State Prison	Placerville
California State University Chico	Red Bluff
California State University Sacramento	Redding
Cameron Park	Rocklin
Chico	Roseville
Colusa County	Shasta County
Diamond Springs	Shasta County Fairgrounds (27th Ag District)
El Dorado County	Shasta Lake
El Dorado Hills	Silver Dollar Fairgrounds (3rd Ag District)
Granite Bay	Sutter County
Grass Valley	West Sacramento
Lincoln	Yolo County
Linda	Yuba County
Live Oak	Yuba City
Loomis	Yuba Sutter County Fairgrounds (13th Ag District)

Table 4-19
Large Industrial Stormwater Permittees In Protection Zones

Facility Name	Size (Acres)	Facility Address	Facility City	Facility County
US Air Force Base Beale	22944	9 CES CEV 6451 B Street	Beale AFB	Yuba
Sacramento International Airport	2479	Sacramento International Airport	Sacramento	Sacramento
Dept. of Corrections Folsom	1200	300 Prison Rd	Represa	Sacramento
Western Aggregates LLC	1200	4711 Hammonton Rd	Marysville	Yuba
Naumes Inc. Juice Concentrate Plant	945	3792 Feather River Blvd	Marysville	Yuba
Yuba County Airport	933	1364 Sky Harbor Dr	Marysville	Yuba
Roseville Yard	915	1600 Vernon St	Roseville	Placer
Lincoln City Airport	659	1480 Flightline Dr	Lincoln	Placer
Hewlett Packard	492	8000 Foothills Blvd	Roseville	Placer
Lincoln City Wastewater Treatment Facility	470	1245 Fiddyment Rd	Lincoln	Placer
Patterson Sand & Gravel	326	8705 Camp Far West Rd	Sheridan	Placer
Western Placer Waste Management Authority WRSL Athens Ave	320	3195 Athens Ave	Lincoln	Placer
Tollcrest Dairy	304	3355 Virginia	Wheatland	Yuba
Butte Sand & Gravel	280	10373 S Butte Rd	Sutter	Sutter
Recology Ostrom Rd	261	5900 Ostrom Rd	Wheatland	Yuba
El Dorado County Placerville Air	253	3501 Airport Rd	Placerville	El Dorado
Sierra Pacific Industries	234	1445 Highway 65	Lincoln	Placer
Intel Corp Fm4 124	234	1900 Prairie City Rd	Folsom	Sacramento
Reclamation District 1001	190	1959 Cornelius Ave	Rio Oso	Sutter
Recology Yuba Sutter	180	3001 N Levee Rd	Marysville	Yuba
El Dorado County Georgetown Airport	154	Dry Diggins Road	Georgetown	El Dorado
Big Cut Mine	131.34	2261 Donovan Ranch Rd	Placerville	El Dorado
Auburn City Airport	125	New Airport Rd	Auburn	Placer
Colusa County Evans Landfill/Transfer	122	Evans Rd 1 2 Mile S Of Meyers	Colusa	Colusa
Sac City Landfill	113	20 28th St	Sacramento	Sacramento
Pleasant Grove WWTP	107	5051 Phillip Rd	Roseville	Placer
Dry Creek WWTP	105	1800 Booth Rd	Roseville	Placer
TSI Semiconductors America LLC	102	7501 Foothills Blvd	Roseville	Placer
Auburn WWTP	88	10441 Ophir	Auburn	Placer
Colusa County Airport	81	2915 Highway 20	Colusa	Colusa
Lava Cap Winery	80	2221 Fruitridge Rd	Placerville	El Dorado
Calpine Greenleaf Unit One Cog	77	5087 S Township Rd	Yuba City	Sutter
Gladding McBean	64	601 7th St	Lincoln	Placer
Wadham Energy Ltd Part	63	6247 Myers Rd	Williams	Colusa
Roseville City Corp Yard	59	2005 Hilltop Cir	Roseville	Placer

Table 4-19 Cont'd
Large Industrial Stormwater Permittees In Protection Zones

USCG Air Station Sacramento	58	6037 Price Ave Bldg 1106	North Highlands	Sacramento
Hanson Pipe & Precast	53	7020 Tokay Ave	Sacramento	Sacramento
Rio Bravo Rocklin	50	3100 Thunder Valley Court	Lincoln	Placer
Newman Trucking	50	1500 Gladding Rd	Lincoln	Placer
Sysco Food Services	50	7062 Pacific Ave	Pleasant Grove	Sutter
Shoei Foods USA Inc.	50	1900 Feather River Blvd	Olivehurst	Yuba

Regulation and Management

In 1972, The Federal Water Pollution Control Act (also referred to as the CWA) was amended to provide that the discharge of pollutants to waters of the United States from any point source is unlawful, unless the discharge is in compliance with an NPDES permit. The 1987 amendments to the CWA added section 402(p) which directs that stormwater discharges are point source discharges and establishes a framework for regulating municipal and industrial stormwater discharges under the NPDES program. On November 16, 1990, the USEPA promulgated final regulations that established the stormwater permit requirements.

NPDES permits are required for discharges from a municipal separate storm sewer system (MS4). The USEPA developed its stormwater regulation in two phases. The Phase I regulation was promulgated in 1990 for cities or contiguous unincorporated urban areas with populations greater than 100,000. The Phase II regulation was promulgated in 1999 for cities and other contiguous areas with populations less than 100,000. USEPA defined MS4 to include road systems owned by states which are in an area with a population greater than 100,000. MS4 permits do not establish numeric effluent limitations for stormwater, although the permits do include receiving water limits. Therefore, implementation of the stormwater management programs to the Maximum Extent Practicable (MEP) is considered compliance with the MS4 discharge permits and limits. Also, wasteload allocations can be included in permits to protect receiving waters through the TMDL process required by the CWA**.**

The federal regulations also specified a requirement for stormwater permits from 10 categories of industry, as well as construction activities equal or greater than one acre.

Municipal Stormwater Program

Both the Phase I and Phase II stormwater regulations require municipalities to reduce urban runoff pollution to the MEP through implementation of control measures known as BMPs. Management programs must include public education, pollution prevention and good housekeeping for municipal operations, implementation of new development BMPs, erosion and sediment control measures at construction sites, and control of illicit discharges. Phase I and Phase II programs must also include control programs for select industrial/commercial sites. Both the Phase I and II regulations provide the regulated municipalities with the flexibility to make their own selection of BMPs in

designing their own individual programs. Although the entire slate of program elements (new development BMPs, municipal activities [street sweeping], etc.) is designed to improve water quality, program elements of special interest to downstream drinking water agencies are the construction site element, illicit discharges element, new development element, and the public outreach element. Phase I permittees have individual NPDES permits, while Phase II permittees submit a NOI to comply with a Statewide General NPDES permit.

Sacramento Stormwater Quality Partnership

The greater Sacramento metropolitan area (including portions of the cities of Sacramento, Folsom, Citrus Heights, and Rancho Cordova, as well as the urban unincorporated area of Sacramento County) discharges urban runoff to the American and Sacramento River systems. There are 55 direct discharge points to the American and Sacramento rivers. A few of the drainage basins with direct discharge are relatively small, self-contained basins. Many, however, include multiple sub-basins and/or a network of urban creeks.

The Natomas Main Drainage Canal and the Natomas East Main Drainage Canal carry urban runoff from large areas, as well as some agricultural runoff. The Natomas East Main Drainage Canal also carries creek flow and City of Roseville urban runoff and treated wastewater effluent.

On the east side of the Sacramento River, storm drain pumps, canals and creeks convey runoff to sumps that pump the runoff over the levee into the river on an episodic basis, based on sump capacity. The sumps on the east side of the Sacramento River are operated by the City of Sacramento, which has automated its sump operations with a supervisory control and data acquisition (SCADA) system.

Management of Sacramento area urban runoff began in 1989 as a cooperative effort between Sacramento County, the City of Sacramento, and the smaller cities within the County to address stormwater pollution through a county-wide NPDES Phase I stormwater permit. The permit is renewed every five years, and the current permit is Order No. R5-2015-0023. During the study period, the previous order (R5-2008-0142) was in effect.

Order No. R5-2015-0023 is a Limited-Term NPDES permit that will expire in October 2016 and is expected to be replaced with a Region-Wide Stormwater Permit for all Phase I permittees in the Central Valley. Phase I communities will need to request coverage under the new permit through a NOI, when their existing permits expire. The Region-Wide permit will also allow Phase II permittees to opt into the permit, and will likely include participation in the Delta Regional Monitoring Program. Order No. R5-2015-0023 gives the SSQP the ability to participate in the Delta RMP in lieu of certain local monitoring requirements. The MRP includes provisions that allow the SSQP to propose an alternative monitoring plan for urban tributary and discharge monitoring that allows modifications to the monitoring locations, sampling method and frequency, and

constituents with Executive Officer approval. In Fiscal Year 2014/2015 the Regional Board Executive Officer approved an alternate monitoring program schedule in exchange for Delta RMP participation and funding. In Fiscal Year 2015/2016 the Regional Board Executive Officer approved SSQP Delta RMP participation in lieu of the ambient river monitoring permit requirements. Participation in the Delta RMP also required approval from the Delta RMP Steering Committee. The current permit also allows modified monitoring requirements with approval from the Regional Board Executive Officer. A reduction in Willow Creek and Laguna Creek monitoring frequency was approved with implementation of a continuous sensor pilot study at Arcade Creek. In place of monitoring of Sump 111 and Strong Ranch Slough, a continuous sensor pilot study was approved at Natomas Basin No. 4. The alternative monitoring plan does include long-term monitoring at five year intervals at the three urban tributary sites (Arcade, Willow, and Laguna creeks).

As part of the previous permit, the permittees developed a Stormwater Quality Improvement Plan (SQIP) that describes the stormwater pollution prevention activities to be undertaken over a five year period. This includes permittee specific elements such as construction activities, illegal discharges, industrial activities, municipal operations, outreach, and new development. The SQIP also includes joint activities, including: target pollutant reduction strategies, a water quality monitoring program, special studies, regional public outreach and education, a regional commercial/industrial program, and program effectiveness evaluation. The permittees last revised their SQIP in 2009, with modifications in subsequent Annual Reports and Workplans.

The BMPs of particular interest to source water quality are:

- BMPs that seek to address pollutants at the sources, such as eliminating spills and dumping through storm drain marking, public outreach, and an illicit discharge program.
- BMPs that provide education: stormwater compliant pressure washer program through the Business Environmental Resource Center, recreational behavior through the Keep Our Waters Clean campaign, general behavior through regional media campaigns, Creek Week, Our Water Our World, and Water Smart Car Wash.
- BMPs that address fecal waste include an illicit connection program, pet waste public education and programs to maintain dog waste dispenser stations in parks developed in coordination with parks and recreation departments and districts, inspection of kennel facilities, street sweeping, and sump cleaning. This includes funding of the “Pups on the Parkway” and “Scoop the Poop” pet waste cleanup programs.
- BMPs that address TOC include detention basins, bioretention (e.g. stormwater planters), and grassy swales; street sweeping; sump cleaning; erosion and sediment control at construction sites; public education for landscape management (River Friendly Landscaping and Rain Garden rebate programs); and containerization of green waste in many parts of the greater Sacramento urban area. The City of Sacramento implemented a voluntary containerization program beginning in August

2007 with 90 percent of customers participating by the end of the 2010/2011 Fiscal Year. After City of Sacramento residents approved Measure T in November 2012, allowing the City to implement a city-wide containerized yard waste collection program combined with seasonal loose-in-the-street yard waste, the City Council approved a plan to mandate containerization for all residential customers. This new program was implemented in July 2013 and includes mandated containerized yard waste collection with loose-in-the-street pickup during the fall leaf season (November 1 through January 30) each year.

- Other BMPs to reduce constituents in urban runoff through watershed-based public education and outreach include promotion of proper pet waste disposal and use of less toxic pesticides via television ads, radio ads, online ads and billboards, participation in the Sacramento Area Creek's Council Annual Creek Week events, four workshop events focused on the use of less toxic pesticides, and funding school education programs, including the awarding-winning "Splash."
- Implementation of new development, as well as redevelopment, source controls, treatment controls, hydromodification management measures, and Low Impact Development (LID) BMPs. The goal of the source control measures is to prevent pollutants from contacting site runoff, while the treatment controls treat and remove pollutants from site runoff. LID measures are designed to help reduce the site runoff volume and supplement the hydromodification management measures, which are designed to attenuate the increased site runoff and discharge it to the receiving water body at a controlled rate. An example of LID implementation is a joint project with California State University Sacramento to retrofit areas of the campus with LID measures and river friendly landscaping.
- Funding of Community Action Grants to projects whose goal is to improve the quality of local creeks, rivers and watersheds within the City of Sacramento. This establishes working partnerships with the local community, fosters environmental stewardship to assist in meeting pollution prevention goals, and targets teachers, neighborhood and volunteer groups, environmental organizations and other non-profit associations. Sacramento County has a similar grant program that provides financial assistance to schools within the unincorporated County.

The target pollutant reduction program has led to creation of reduction strategies for several constituents including sediment, pesticides, mercury, lead, copper, and pathogen indicators. Sediment control is a key strategy for controlling sediment bound pollutants, including metals, and sediment is addressed through new development standards, construction BMPs, street sweeping, and basin/drain cleaning. A Sediment Strategy was finalized in 2012. In 2004 a Fecal Waste Reduction Strategy was completed which continues to be implemented. Efforts have included implementation of BMPs that help to eliminate or reduce fecal matter in the storm drain system, including investigation and elimination of sanitary sewer cross connections, control of sanitary sewer overflows, street sweeping, and cleaning of the storm drainage system infrastructure; prohibition of discharges of pet waste into the storm drain; inspection of kennels for appropriate waste handling procedures; outreach to increase appropriate disposal of pet waste; and workgroup meetings to review current status of

coliform/pathogen control efforts in the state. A comprehensive Pesticides Plan, approved in 2006, is being implemented, which includes education and outreach related to integrated pest management and initiatives to better protect urban water bodies through more effective regulation of pesticides at the state and national level. The SSQP is currently working to improve modeling of constituents in the discharge. This will allow them to implement more active management of target pollutants and align with the TMDL process.

The permittees conducted river, creek and urban runoff monitoring during the study period. River monitoring was performed as part of the Sacramento CMP and included in this study are one site on the Lower American River (Discovery Park) and two sites on the Sacramento River (Veteran's Bridge and Freeport). This was discussed previously in **Section 3**. Creek monitoring included sampling at three urban creeks (Willow Creek, Arcade Creek, and Laguna Creek). Only Arcade Creek is directly tributary to the Sacramento River upstream of Freeport. Three urban runoff sites were monitored (Strong Ranch Slough, Sump 111, and Natomas Basin No. 4). Only Natomas Basin No. 4 discharges to the Sacramento River upstream of Freeport. The data is discussed further in the Water Quality Issues and Data Review subsection.

The SSQP compared runoff concentrations from the existing developed areas (Strong Ranch Slough, Sump 104, and Sump 111) and the recently developed area (Natomas Basin 4) and found significantly lower concentrations of pollutants of concern in the discharges from the new developed area. The new developed area was developed using BMPs required by the permit and the SQIP to address water quality.

A review of the Stormwater Multiple Application and Report Tracking System (SMARTS) database showed that there were no violations or enforcement orders issued in the past five years for any SSQP permittees.

Caltrans

The entire watershed encompasses numerous state highways and roads that are regulated for stormwater discharge by the State Board. Caltrans Districts 2 and 3 are located within the watershed. Generally, road drainage is diverted locally to receiving waters.

In 1996, Caltrans requested that the State Board consider adopting a single NPDES permit for stormwater discharges from all Caltrans properties, facilities, and activities that would cover both the MS4 requirements and the statewide Construction General Permit requirements. The federal regulations allow for the issuance of system-wide MS4 NPDES permits. Caltrans stormwater was then regulated under State Board Order No. 99-06-DWQ, beginning July 1999. The permit does not establish numeric effluent limitations for stormwater. Therefore, this permit allows Caltrans to implement BMPs to comply with the requirements of this permit. Caltrans has a Storm Water Management Plan (SWMP) that it implements statewide.

USEPA Region 9 audited Caltrans' Stormwater Management Program in October 2009. As a result of that audit, the USEPA issued a Findings of Violation and Order for Compliance to Caltrans requesting substantial changes to its program in October 2010. In response, Caltrans prepared a revised 2003 SWMP (CTSW-RT-11-286.19.1) and submitted it to USEPA on March 1, 2011. Caltrans also received a renewal of its statewide NPDES permit on September 19, 2012. This Permit became effective in July 2013. Caltrans revised its program in 2013 to accommodate the requirements of the new Permit, and modified the measureable goals and reporting process accordingly.

The key components of the Caltrans SWMP, originally created in 2003 and updated in July 2012, include:

- Vegetation Control Program
- Storm Water System Management
- Accidental Spills
- Illicit Connection/Illegal Discharge Detection
- Characterization of Discharges
- Maintenance Facilities – Pollution Prevention Programs
- Training and Public Education – Employees, Contractors, General Public (Don't Trash California and Adopt-A-Highway)
- Region Specific Concerns

Caltrans has adopted the California Stormwater Quality Association approach to assessing program effectiveness, which has six outcome levels. Caltrans conducted an effectiveness assessment for each program element. District 3 has an Annual Report and Plan that they use to implement the SWMP. The FY 2011/2012 Annual Report states that Caltrans implemented the Stormwater Management Program effectively (Level 1) and increased awareness of program requirements among targeted audiences (Level 2), resulting in positive behavior change (Level 3) and decreased pollutant loads (Level 4).

A review of the State's SMARTS database showed that there were no violations or enforcement actions issued by the Regional or State Board in the past five years for the Caltrans Phase I permit, but there were 14 enforcement actions and 15 violations for various Caltrans construction projects under the State's Construction General Permit Order.

Phase II MS4s

There are 42 current Phase II MS4 systems in the watershed, including the City of West Sacramento and Yolo County. It should be noted that West Sacramento urban runoff mostly drains to the Ship Channel, Toe Drain, or Yolo Bypass. Only two pump stations

discharge to the Sacramento River: Lighthouse and Raley pump stations. Little to no drainage from Yolo County enters the watershed upstream of Freeport.

In 2003, smaller urban areas came under a Statewide General Permit for Phase II stormwater permits (Water Quality Order No. 2003-0005-DWQ). Phase II permittees implement urban stormwater management programs similar to, but on a smaller scale than, the Phase I permittees. The Phase II program focuses on implementation of BMPs, including implementation of treatment BMPs in new development. A monitoring program was not required for most permittees. Areas that were required to monitor include those with high population, high growth rate, or a discharge to a sensitive water body. There was no required monitoring in the Sacramento River watershed. Under this program, each of these entities was required to develop and implement a SWMP to manage the stormwater program. These entities implemented their SWMP using existing programs and ordinances (such as a grading ordinance) to the extent possible, but expanded the programs as necessary to cover all aspects of the SWMP. Each program element has specific control measures the entity identified for implementation, and those are largely efforts that were already on-going through various departments.

A SWMP has six key components;

- Public Education and Outreach: Ensure greater public support and knowledge of stormwater issues in the implementation of the SWMP.
- Public Participation and Involvement: Provide the public with a way to contribute an active role in the development of better stormwater management and become more informed on stormwater issues.
- Illicit Discharge Detection and Elimination: Intended to minimize discharges into the stormwater system that are not stormwater, and reduce and eliminate pollutants entering the stormwater system and any receiving waters.
- Construction Site Runoff Control: Minimize polluted stormwater from construction activities.
- Post-Construction Run-Off Control: Minimize impact to stormwater caused by development and redevelopment. Planning and design to minimize pollutants in any run-off.
- Pollution Prevention/Good Housekeeping: Reduction in the volume and type of stormwater and surface run-off that enters the stormwater system in the operation and maintenance of municipal activities.

The Statewide Phase II General Permit expired on May 1, 2008, and the State Board re-issued the permit until a new permit was adopted. This permit was revised in 2013 with Water Quality Order No. 2013-0001-DWQ, adopted on February 5, 2013 and effective July 1, 2013. The new Phase II MS4 Permit was effective during this study period. This permit generally has more extensive requirements than the previous permit, and a few significant items are:

- SWMPs will no longer be required; dischargers will use guidance documents developed by the Regional Board,
- Development of a program effectiveness evaluation,
- Requirements focus on water quality issues post-construction,
- Encourages the use of low impact development,
- Targets high priority waterbodies,
- Dischargers will use the SMARTS database for data management which will increase availability of public reports,
- Dischargers must submit boundary and outfall maps, and
- Water quality monitoring requirements for population greater than 50,000, waterbodies with a TMDL or a CWA Section 303(d) impairment listing with urban runoff listed as a source, and areas of special biological significance. There are none in the Sacramento River watershed.

A review of the SMARTS database showed that there were no violations or enforcement orders issued in the past five years for any Phase II permittee in the Sacramento River Watershed.

Construction Stormwater Program

The NPDES General Permit for Discharges of Storm Water Associated with Construction Activity is the Construction General Permit (Order 2009-0009-DWQ). This dictates that any development project that disturbs one or more acres of land will be subject to the requirements of this permit. Some of the construction activities subject to this permit include: clearing, grading, excavation, stockpiling, vertical structures, landscaping, and/or linear projects (i.e. wet and dry utilities). The permit provides an exclusion for projects that are considered regular maintenance activities, such as linear projects in already developed areas and relining of existing wet utility lines and/or roadway resurfacing projects.

The permit requires each project to assess its risk level to water quality based on the project's sediment discharge risk and the receiving water risk. The permit establishes three risk levels with different monitoring and sampling requirements. The permit also establishes numeric effluent parameters for discharges of risk levels 2 and 3; Numeric Action Levels (NALs) and Numeric Effluent Limitations (NELs) for pH and turbidity. The NELs for pH and turbidity at Risk Level 3 / Linear Underground/Overhead Project Type 3 construction sites contained in Order 2009-0009-DWQ are no longer in effect. These were removed on December 27, 2011 in accordance with a judgment by the Superior Court.

The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP should contain a site map(s) which shows the construction site perimeter, existing and proposed buildings,

lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list BMPs the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

In 2012 the State Board proposed amendments to the Construction General Permit. Those have not been finalized or adopted.

A review of the SMARTS databased showed that there were many violations (1,329) and enforcement orders (1,707) issued in the past five years in the Central Valley to the Construction Order permittees. It could not be readily determined how many of those were located in the Sacramento River watershed. The majority of these were related to late submittal or deficient annual reporting. Also, there was some identification of deficient BMPs, notices of non-compliance, and notices of violation.

Industrial Stormwater Program

Federal regulations require that stormwater associated with industrial activity that discharges either directly to surface waters or indirectly through municipal separate storm sewers must be regulated by an NPDES permit. The regulations allow states to issue general permits or individual permits to regulate stormwater discharges. The State Board issued the first Statewide General Permit on November 19, 1991, and then amended it in 1992 and 1997 (Order No. 97-03-DWQ). In 2014 the State Board adopted an updated General Permit for Stormwater Associated with Industrial Activity (Order 2014-0057-DWQ).

The basis of this program is implementation of BMPs to prevent discharge of pollutants. The General Permit generally requires facility operators to:

- Eliminate unauthorized non-stormwater discharges;
- Develop and implement a SWPPP; and
- Perform monitoring of stormwater discharges and authorized non-stormwater discharges. This includes two events per year for total suspended solids (TSS), TOC, pH, and electrical conductivity. Additional parameters can be added based on the Standard Industry Code of the facility.

Significant changes in the new Industrial General Permit include:

- Electronic Reporting Requirements; requires Dischargers to submit and certify all reports electronically via the SMARTS database.
- Minimum BMPs: requires Dischargers to implement a set of minimum BMPs.

- Conditional Exclusion - No Exposure Certification; applies USEPA Phase II regulations regarding a conditional exclusion for facilities that have no exposure of industrial activities and materials to storm water.
- Notice of Non-Applicability: allows industrial facilities to submit a Technical Report claiming either they have designed their facility to contain storm water so that there is no discharge of storm water to waters of the United States or their facility is not hydrologically connected to waters of the United States.
- Training Expectations and Roles: requires that Dischargers have appropriately trained personnel implementing this General Permit's requirements at each facility.
- NALs and NAL Exceedances: contains two types of NAL exceedances: (1) an annual NAL and (2) an instantaneous maximum NAL. Instantaneous maximum NALs are only for total suspended solids and oil and grease.
- Exceedence Response Actions (ERA): requires Dischargers to develop and implement ERAs, when an annual NAL or instantaneous maximum NAL exceedance occurs during a reporting year.
- CWA section 303(d) Impairment and TMDLs: requires a Discharger to monitor additional parameters if the discharge(s) from its facility contributes pollutants to receiving waters that are listed as impaired for those pollutants.
- Design Storm Standards for Treatment Control BMPs: includes design storm standards for Dischargers implementing treatment control BMPs.
- Qualifying Storm Event (QSE): defines a QSE as a precipitation event that produces a discharge for at least one drainage area and is preceded by 48 hours with no discharge from any drainage area.
- Sampling Protocols: requires Dischargers to collect samples during scheduled facility operating hours from each drainage location within four hours of either the start of the discharge or the start of scheduled facility operating hours if the QSE occurred in the previous twelve hours.
- Compliance Groups: allows the formation of Compliance Groups and Compliance Group Leaders. Dischargers participating in a Compliance Group are required to sample twice a year at each facility.
- Discharges to Ocean Waters: Dischargers with ocean-discharging outfalls subject to model monitoring provisions of the California Ocean Plan shall develop and implement a monitoring plan in compliance with the monitoring requirements established pursuant to Water Code section 13383.

A review of the SMARTS database showed that there were many violations (775) and enforcement orders (940) issued in the past five years in the Central Valley to Industrial Order permittees. It could not be readily determined how many of those were located in

the Sacramento River watershed. The majority of these were related to late submittal or deficient annual reporting. Also, there was some identification of missing SWPPP.

Total Maximum Daily Loads

There are multiple TMDLs established for pesticides in the watershed, including one for diazinon and chlorpyrifos in six Sacramento area urban creeks. A TMDL is implemented through a Basin Plan Amendment to include site-specific numerical objectives, water quality management strategies to reduce runoff, monitoring, and a plan to reduce levels in the water bodies. The Regional Board has worked the TMDLs into existing regulatory programs, such as the stormwater permits.

There are three additional TMDLs that may impact urban runoff in development at the Regional Board, as follows:

- Central Valley Pyrethroid TMDL – The Regional Board provided an update on the status and schedule for the Pyrethroid TMDL and Basin Plan Amendment in May 2015. This reviewed and discussed the updated UC Davis water quality criteria and changes to the draft proposed Basin Plan Amendment language, which include water quality objectives, actions for the Regional Board, DPR, USEPA, implementation provisions, and surveillance and monitoring. The draft staff report will be available for public comment toward the end of 2015. It is anticipated to be brought to the Regional Board for potential adoption in Spring 2016.
- Central Valley Diuron TMDL – This program focuses on Diuron in Central Valley Section 303(d) listed waterbodies including Stony Creek, Comanche Creek and Main Drainage Canal in the Sacramento Valley. The Basin Plan Amendment is in development and is expected to include water quality objectives, a TMDL, and a control program. The draft staff report is scheduled for public review in Spring 2016 and for potential adoption by the Regional Board in the summer or fall of 2016.
- Central Valley Organochlorine Pesticide TMDL – This program continues to be on hold and is being re-evaluated. There has been no action since late 2010.

Water Quality Issues and Data Review

The SSQP has a monitoring program that includes receiving water monitoring where rivers, creeks, and urban runoff discharge are sampled during three wet and one dry events. River monitoring was presented and discussed in **Section 3**. The urban creek site tributary to the Sacramento River (Arcade Creek) had few detected concentrations above applicable water quality objectives of interest to drinking water. The urban runoff monitoring site that discharges to the Sacramento River (Natomas Basin No. 4) was monitored in two of every three years (2009/2010, 2011/2012, and 2012/2013). The Arcade Creek and Natomas Basin No. 4 data is presented herein.

Constituents include general parameters, nutrients, organic carbon, metals, bacteria, pesticides, and selected VOCs and SOCs. The SSQP presents this data in its Annual Monitoring Report, as an Urban Tributary Monitoring Report and an Urban Discharge Monitoring Report.

Detections above water quality objectives are not violations of an MS4 permit. These exceedences require follow-up by the permittees to determine if urban runoff is contributing to the exceedence and if so, to identify control measures to address the exceedences unless measures are already in place.

The urban runoff tributary monitoring resulted in high levels of some drinking water constituents that were present, as well as low levels of a variety of polycyclic aromatic hydrocarbons and pyrethroids. **Table 4-20** presents a summary of the range of values each monitoring season for selected constituents in the urban runoff tributary monitoring for the Arcade Creek monitoring site. Peaks of *E. coli*, organic carbon, and iron can be significant.

Table 4-20
Summary of SSQP Urban Runoff Tributary Monitoring for Selected Constituents

Constituent	Arcade Creek				
	2009/2010	**2010/2011**	**2011/2012**	**2012/2013**	**2013/2014**
E. coli, MPN/100 mL	1,700 – 50,000	800 – 170,000	800 – 50,000	78 – 24,000	200 – 54,000
Turbidity, NTU	30 – 130	4.8 – 140	11 – 270	2.3 – 240	4.1 – 150
TOC, mg/L	5 – 23	4.7 – 16	7.9 – 51	9.7 – 70	8.7 – 24
DOC, mg/L	4.6 – 22	4.6 – 13	6.6 – 51	8.4 – 69	7.8 – 24
Total Iron, ug/L	981 – 10,000	447 – 3,560	446 – 8,480	241 – 9,680	372 – 7,100
Dissolved Iron, ug/L	133 – 350	97.8 – 302	129 – 388	140 – 700	126 – 249
Chlorpyrifos, ng/L	<1 – 27.4	<30	<5	<5	<0.5 – 0.9
Diazinon, ng/L	<2	<20	<7	<7	<0.2
Malathion, ng/L	<3 – 108.2	<19 – 80	<8	<5	<3

The urban runoff discharge monitoring also resulted in high levels of some drinking water constituents that were present, as well as low levels of a variety of polycyclic aromatic hydrocarbons and pyrethroids. **Table 4-21** presents a summary of the range of values each monitoring season for selected constituents in the urban runoff discharge monitoring for the Natomas Basin No. 4 monitoring site. Peaks of *E. coli*, organic carbon, and iron can be significant.

Table 4-21
Summary of SSQP Urban Runoff Discharge Monitoring for Selected Constituents

Constituent	Natomas Basin No. 4		
	2009/2010	2011/2012	2012/2013
E. coli, MPN/100 mL	40 – 17,000	20 – 50,000	68 – 13,000
Turbidity, NTU	5 – 9.2	2.7 – 8.2	3.2 – 7.4
TOC, mg/L	5.7 – 12	5.7 – 25	5.4 – 36
DOC, mg/L	4.5 – 8.6	5.4 – 23	4.8 – 28
Total Iron, ug/L	292 – 533	313 – 391	241 – 329
Dissolved Iron, ug/L	17.5 – 102	31.2 – 69.1	85 – 205
Chlorpyrifos, ng/L	<1 – 11.6	<5	<5
Diazinon, ng/L	<2 – 16.9	<7	<7
Malathion, ng/L	<3 – 56.5	<8 – 70	<5

Sacramento River Source Water Protection Program Activities

The City of Sacramento and SCWA's source water protection and stormwater program staff coordinate and share information on an on-going basis. This included preparation of source water protection materials for the City of Sacramento's Stormwater Quality Improvement Program's municipal element Fire Department training program

INDUSTRIAL NPDES DISCHARGERS

Overall, the relative risk for the Sacramento River drinking water supply from industrial dischargers is low due to regulation and management. Facilities that are located closer to the drinking water intakes, have higher discharge flows, contain constituents at higher levels, or are waived from meeting water quality objectives are dischargers of most interest.

Background

Industrial dischargers are potential contaminant sources for the drinking water supply since they discharge treated waste flows from industrial facilities to receiving waters. Industrial discharges may include flow-through water used during processing, a waste stream generated at the facility, or stormwater runoff from the facility. This includes several Superfund Sites located in the watershed. Superfund is the name given to the environmental program that the USEPA established to address abandoned hazardous waste sites. It is also the name of the fund established by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The funding under this Act allows the USEPA to clean up such sites and to compel responsible parties to perform cleanups or reimburse the government for USEPA-led cleanups. The Superfund cleanup process is complex and involves many steps to assess sites, place them on the National Priorities List, and establish and implement appropriate cleanup plans. This is a long-term cleanup process.

Seasonal Patterns

The timing of discharge from industrial facilities varies depending on the type of industrial activity. Some facilities have consistent flow throughout the year, such as mines, water treatment plants, groundwater extraction and treatment facilities, and geothermal projects. Other facilities have discharges that peak seasonally depending on their activity, such as processing facilities for produce, wood, and fish; cooling systems; and stormwater facilities.

Related Constituents

The constituents discharged are dependent on the type of industry or hazardous waste site and the source of the flow. This can range from general physical parameters to VOCs and SOCs.

Presence in the Watershed

Currently, there are 40 NPDES permits for various industrial facilities within the Sacramento River watershed. Many of the facilities listed are the same as the ones from the 2010 Update, and several others were discovered during this evaluation that are existing facilities. Two industrial NPDES permits in the Near-Intake Protection Zones were formally rescinded since the 2010 Update: the California Department of General Services, Central Plant Operations, Heating and Cooling Facility (December 2009) and the California Department of General Services, Office of State Publishing (December 2010). See **Appendix D** for a detailed listing.

The types of industrial facilities in the study area have generally remained the same since 1995. Thirty-four of the NDPES permitted facilities are located in the study area upstream of the City of West Sacramento's GKWTP, and six of the NPDES permitted facilities are located between GKWTP intake and the new FRWA diversion at Freeport. These facilities discharge either to the Sacramento or American rivers, or a tributary.

The 24 facilities located upstream of GKWTP intake include;

- twelve fish hatcheries/ concentrated aquatic animal production (CAAP) facilities,
- eight wood/paper industries,
- three quarries,
- six mines,
- one water treatment plant,
- one wood-fired electrical generating facility,
- one olive processing facility, and
- two geothermal projects.

The six facilities located between GKWTP and Freeport intakes include;

- two fish hatcheries/CAAP facilities,
- two Superfund sites' groundwater extraction and treatment systems,
- one stormwater permit for Aerojet Rocketdyne, and

- one mine.

After a review of the 40 NPDES permitted facilities, six industrial facilities were selected for a detailed investigation. These facilities were selected based on a number of factors including: discharge of constituents of interest for drinking water, proximity to drinking water intakes, facility regulatory compliance history, and historical significance from the previous inventory completed in 2010.

Two facilities are located upstream of GKWTP:

- Empire Mine State Historic Park
- Original Sixteen to One Mine

Four facilities are located between GKWTP and FRWA diversion:

- Sterling Caviar
- Former McClellan Air Force Base (AFB)
- Aerojet Rocketdyne (both treated groundwater and stormwater)
- Sliger Mine

Regulation and Management

Industrial dischargers are regulated by the Regional Board through NPDES permits. Final effluent limits are set if there is reasonable potential for that constituent to violate a water quality objective or standard in the receiving water. In general, the facilities were in compliance with the terms of their NPDES permit, with few effluent violations noted.

Empire Mine State Historic Park

The State of California, Department of Parks and Recreation owns and operates the Empire Mine State Historic Park, located approximately 50 miles northeast of Sacramento in Nevada County. There has been no active mining or mine processing activities since the mine closed in 1956. Mine drainage is discharged from a constructed mine drain, called the Magenta Drain Tunnel Portal to an unnamed tributary to the South Fork of Wolf Creek, which is tributary to Wolf Creek, which is tributary to the Bear River, which feeds Camp Far West Reservoir, which flows into the Feather River, which is tributary to the Sacramento River. Currently, there are no treatment processes or controls to address this mine discharge. Flows from the Magenta Drain were measured on a weekly basis in 2008 to assess the volume of the overall discharge, which ranged from 24 to 379 gallons per minute (gpm).

The State of California, Department of Parks and Recreation was previously discharging pursuant to Order No. R5-2012-0050 and Time Schedule Order No. R5-2006-0059 which set interim effluent limitations for aluminum, antimony, arsenic, barium, cobalt, color, dissolved oxygen, iron, manganese, pH, settable solids, total suspended solids, turbidity, and vanadium for the mine drainage discharge.

The discharger installed a new passive treatment system that began operation in November 2011. The mine drainage enters a settling pond and flows by gravity through two aerobic wetlands, operated in series, and treated water from the second wetland gravity flows back into the Magenta Drain Channel. The design flow of the system is 2.3 million gallons per day (mgd) and is designed to remove arsenic, iron, and manganese. The system is also expected to result in reductions in color, turbidity, and other metals. The settling pond and two wetlands are completely lined with plastic geomembrane liners.

After the treatment system was installed, the discharger requested that it be allowed until June 2015 to achieve compliance with the final effluent limitations for arsenic, dissolved oxygen, iron, manganese, and turbidity. The discharger proposed that an additional three years is necessary to allow at least two growing seasons for wetland plants to grow and an additional year afterwards to provide time for biogenic processes to become well-established to achieve compliance with the final effluent limitations.

The Regional Board issued and updated NPDES permit (R5-2012-0050) and Time Schedule Order (R5-2012-0051). The following interim effluent limitations existed until May 31, 2015 for arsenic, iron, and manganese:

- Total arsenic in the effluent shall not exceed a maximum daily of 600 µg/L and an average monthly of 400 µg/L.
- Total iron in the effluent shall not exceed an annual average of 11,000 µg/L.
- Total manganese in the effluent shall not exceed an annual average of 3,000 µg/L.

The final effluent limitations, as set in WDR R5-2012-0050, are:

- Total arsenic shall not exceed a maximum daily of 29 µg/L and an average monthly of 10 µg/L.
- Total iron shall not exceed an annual average of 300 µg/L.
- Total manganese shall not exceed an annual average of 50 µg/L.
- Turbidity shall not exceed an annual average of 5 NTU
- pH shall be within 6.5 and 8.5
- There are also limitations for color, dissolved oxygen, acute toxicity, and chronic toxicity.

Available water quality data from 2008 through 2014 was compiled for arsenic, iron, and manganese from 2008 to 2012 in the Magenta Drain effluent, as shown in **Figure 4-4**. The passive treatment system has shown a dramatic decrease in arsenic, iron, and manganese. It appears that the discharger will be able to comply with the final effluent

limitations for arsenic, iron, and manganese as the arsenic levels are now below 10 µg/L, manganese levels are below 50 µg/L, and iron is below 300 µg/L.

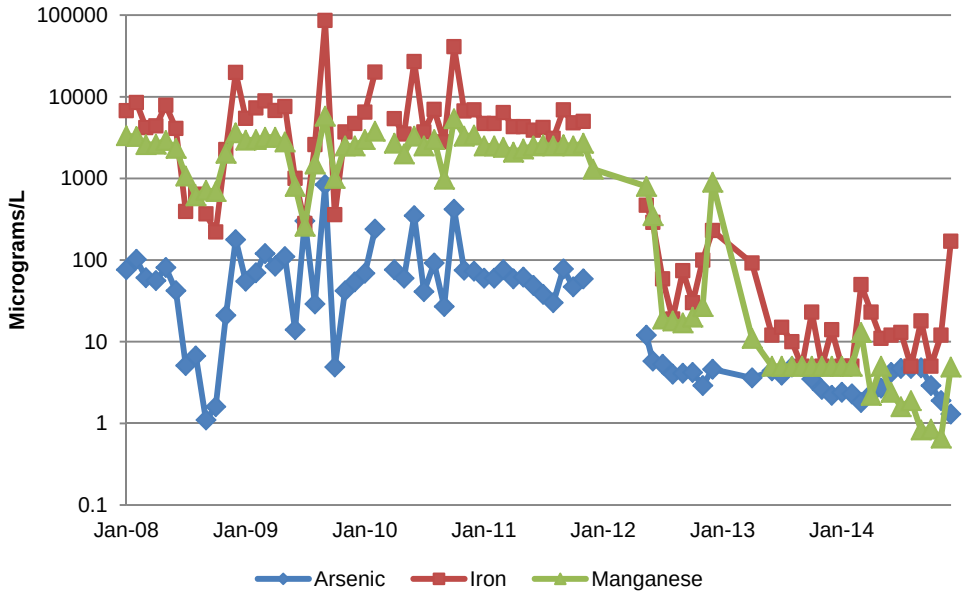


Figure 4-4. Levels of Arsenic, Iron, and Manganese in Magenta Drain Effluent, Empire Mine State Historic Park, 2008-2014

There have been four Administrative Civil Liability Complaints (ACLC) filed since the 2010 Update. There were no violations in 2014.

- ACLC R5-2011-0501 was issued in November 2010 to cover violations from August 1, 2010 to September 30, 2010. The discharger paid the $54,000 penalty.
- ACLC R5-2011-0567 was issued in March 2011 to cover violations from October 1, 2010 to December 31, 2010. The discharger paid the $120,000 penalty.
- ACLC R5-2012-0518 was issued in March 2012 to cover violations from January 1, 2011 to December 31, 2011. The discharger paid the $423,000 penalty.
- ACLC R5-2013-0556 was issued in September 2013 to cover violations from January 1, 2012 to June 30, 2013. The discharger paid the $45,000 penalty. It should be noted that all of the violations in this ACLC occurred in 2012.

Original Sixteen to One Mine

The Original Sixteen to One Mine covers approximately 40 acres near the town of Alleghany in Sierra County. This facility was issued a new NPDES permit in 2015 (Order No. R5-2015-0002) for discharges to Kanaka Creek, which is tributary to the Middle Yuba River, then to the Yuba River, then to the Feather River, then to the Sacramento River. The facility had a historic NPDES permit (Order No. R5-2002-0043)

for ore process wastewater and discharge from the mine, but when the permit expired the discharger did not apply for renewal of their permit. After a lengthy appeal process, the Regional Board decided it does need an NPDES permit.

The mine is an underground hardrock mine that discharges approximately 0.28 mgd of mine drainage continuously. The new NPDES permit includes new final water quality based effluent limitations for arsenic, cadmium, copper, lead, nickel, and pH, as well as technology based effluent limits for mercury, zinc, and total suspended solids. The NPDES permit reduces the receiving water monitoring frequency to quarterly monitoring because the mine drainage data has been consistent, and therefore, once per quarter is sufficient to assess impacts. The effluent discharge shall be monitored biannually for priority pollutants.

Treatment or other compliance alternative for the mine drainage will be necessary, and that cannot be designed, financed, and constructed immediately. A Time Schedule Order (R5-2015-0035) was also adopted which sets interim limits for most of the effluent limits and allows until 2020 for implementation and compliance.

Sterling Caviar

Sterling Caviar operates a CAAP facility (fish farm) located in Elverta, California. The facility is composed of main production tanks, intermediate grow-out tanks, and nursery tanks. Process water is obtained from four wells located near the facility. The facility discharges wastewater to the Betts-Kismat-Silva (BKS) preserve wetlands, which are constructed wetlands that were developed by the Natomas Basin Conservancy. Flow drains naturally into Reclamation District No. 1000's drainage system that collects stormwater and agriculture drainage for eventual discharge into the Sacramento River. From the Reclamation District 1000, the wastewater flows to the Natomas Cross Canal and Natomas East Main Drainage Canal, and ultimately to the Sacramento River.

A Cease and Desist Order (CDO) (R5-2007-0012) was adopted in 2007 for Sterling Caviar for exceeding the effluent limitations for arsenic, nitrate, and manganese. As a result, interim effluent limitations for arsenic, nitrate (as N), and manganese were adopted as part of the CDO. The facility was to work towards a long-term solution to lower arsenic, nitrate, and manganese in their discharge with a target date to comply with the final effluent limitations of March 1, 2012. This Order included discharge of up to 3.67 mgd of treated wastewater.

On July 20, 2011 Sterling Caviar submitted a letter requesting an extension of the March 1, 2012 deadline to March 1, 2015. Sterling Caviar conducted water quality monitoring and evaluated project alternatives and concluded that treatment for removal of arsenic and manganese to meet the final effluent limitations would not be economically feasible. It was determined that the most cost-effective solution would be to reuse their discharge for irrigation of an agricultural crop.

Sterling Caviar requested an additional three years to establish contracts with an outside party, secure necessary permits, and develop the agricultural operation. The Regional Board found that Sterling Caviar is demonstrating due diligence to comply with the final effluent limits and develop a compliance alternative that will maximize the beneficial reuse of water and reduce/eliminate a surface water discharge. Therefore, the Regional Board amended CDO R5-2007-0013 as Order R5-2012-0007 to extend the date to comply with the final arsenic, manganese, and nitrate effluent limitations until March 1, 2015. Sterling Caviar was to continue to submit annual progress reports and an Agricultural Operation Workplan/Schedule by September 1, 2012.

In March 2015, the Regional Board adopted CDO No. R5-2015-0042 to extend the interim limits for arsenic and manganese through March 1, 2017. Sterling Caviar has completed several operational changes and facility upgrades that have resulted in compliance with the final nitrate limits. However, these changes and upgrades have not resulted in compliance with the final effluent limits for arsenic and manganese, and it was determined to not be economically feasible to treat for these trace metals. Therefore, Sterling Caviar is implementing an alternative project to reuse the fish hatchery wastewater for irrigation of an agricultural operation.

The Regional Board also issued ACLC R5-2015-0515, in the amount of $9,000, for effluent pH violations and late reporting.

McClellan Air Force Base

The former McClellan AFB is approximately eight miles northeast of downtown Sacramento in North Highlands. The site was historically used as a plane cleanup and decommissioning facility, so solvents are the primary constituents of concern in the groundwater contamination. The AFB was officially closed on July 13, 2001. Clean-up of the base is currently supervised by the Department of Defense (DOD) Installation and Restoration Program, and is being directed by the United States Department of the Air Force (Air Force).

As McClellan AFB is a Federal Superfund site, it must meet the CERCLA requirements. According to the Air Force, they do not have to comply with the specific terms of the NPDES permit issued by the Regional Board since they are a DOD facility. However, the facility has maintained compliance with the terms of the NPDES permit. According to the Regional Board, there have been periodic violations in the receiving water during the study period for dissolved oxygen, pH, and temperature. These violations have occurred in the summer months, as the base flow in Magpie Creek is minimal and it is effluent dominated.

In September 2009 the Air Force issued an Amendment to the Base Groundwater Record of Decision (ROD) to add the clean-up of groundwater contaminated with non-VOCs at the base. The non-VOCs addressed in the plan are 1,4-dioxane (VOC stabilizer during transport), total and hexavalent chromium (from metal plating shops), and perchlorate (from laboratories). According to the Air Force, the maximum

concentrations detected to date in the groundwater at McClellan of the three non-VOCs are as follows:

- Hexavalent chromium at 580 µg/L at monitoring well (MW)-235 in 2005 and at extraction well (EW)-320 in 2003,
- 1,4-dioxane at 257 µg/L at EW-84 in 2004, and
- Perchlorate at 170 µg/L at MW-640 in 2014.

As part of the Amendment it was decided that the current VOC treatment strategy (extract, treat, and monitor) would be sufficient for non-VOC constituents as well. In order to fully address the non-VOCs contamination on the base, the Air Force installed an additional extraction well. The new extraction well is located to address a small plume of hexavalent chromium from a former plating shop. The non-VOC remediation plan indicates that the clean-up will continue until the following MCLs, or preliminary remediation goal (PRGs), if an MCL does not exist, are met in the groundwater:

- Total (including hexavalent) chromium to its MCL of 50 µg/L
- 1,4-dioxane to its PRG of 6.1 µg/L (based on risk to human health)
- Perchlorate to its MCL of 6 µg/L

According to the Air Force, levels of perchlorate and 1,4-dioxane are below the clean-up goals in the Groundwater Treatment System (GWTS) influent so no additional treatment technologies are in place to specifically address removal of 1,4-dioxane and perchlorate from the extracted groundwater, rather dilution is relied upon to blend the non-VOC waters to lower concentrations with the VOC waters, which do not have perchlorate or 1,4-dioxane.

The Air Force is discharging treated groundwater pursuant to Order No. R5-2014-0055, issued in March 2014 for the discharge of up to 2,000 gpm of treated groundwater. The 2014 NPDES permit does not reflect the recent MCL for hexavalent chromium, and perchlorate was not included in the Reasonable Potential Analysis (RPA). There are some slight changes in the NPDES effluent limitations between the current permit and the previous permit. These changes are:

- Maximum Daily Limitation for hexavalent chromium changed from 13 to 12 µg/L, based only on aquatic life water quality objectives.
- Maximum Daily Limitation for 1,1-Dichloroethylene changed from 0.11 to 0.5 µg/L, which is still lower than the primary MCL of 6 µg/L.
- Average Monthly Limitations for Carbon Tetrachloride, 1,2-Dichloroethane, and 1,1-Dichloroethylene were eliminated, but maximum daily limits remain for technology-based standards.

- Effluent limitation for total selenium was eliminated since the maximum effluent concentration was 0.75 µg/L, which was well below the aquatic life water quality objective of 5 µg/L. This is also well below the primary MCL of 50 µg/L.

Most importantly, there are still no permit discharge limits for 1,4-dioxane or perchlorate. 1,4-dioxane is only required to be monitored in the GWTS influent and effluent annually, and there are no monitoring requirements for perchlorate. According to the Regional Board, this is because the areas contaminated by 1,4-dioxane and perchlorate constitute a very small percentage of the overall groundwater extracted for removal of VOCs. Also, the maximum effluent concentrations of 1,4-dioxane are less than the water quality objective and perchlorate concentrations are low as well. There is no analysis of perchlorate in the NPDES permit, which seems inconsistent with the Amendment to the ROD since it clearly identifies perchlorate as a non-VOC constituent of concern in the groundwater.

The Air Force Real Property Agency owns and operates a GWTS designed to extract groundwater contaminated with VOCs, remove contaminants, and then discharge the treated groundwater to surface water. The VOC constituents of concern in the groundwater are trichloroethene (TCE), tetrachloroethene (PCE), 1,2-dichloroethane, cis-1,2-dichloroethene, 1,1-dichloroethane, 1,1-dichloroethene, vinyl chloride, and 1,1,1-trichloroethane. PCE and TCE are the most common VOCs detected in the influent groundwater.

The treatment system consists of a 64,000-gallon influent tank, an air stripping tower to remove VOCs (capacity of 2,000 gpm up to 167 µg/L of TCE), six 20,000-pound liquid-phase granular activated carbon (GAC) vessels (not currently utilized due to the low influent VOC concentration), and one ion exchange resin vessel (60 cubic-foot) to remove hexavalent chromium.

The ion exchange system treats a slipstream (part of the flow) of the total flow after the air stripper. Upon rejoining the main flow, the treated slipstream reduces the hexavalent chromium concentration of the total flow, thereby meeting current effluent discharge limits. It should be noted that the NPDES effluent limit (12 µg/L) is higher than the new primary MCL for hexavalent chromium, 10 µg/L.

The treated groundwater is discharged at two locations, with one discharge point (No. 001) to Magpie Creek and another discharge point (No. 002) to Beaver Pond (a wetlands area adjacent to Don Julio Creek which is tributary to Magpie Creek). Discharge point 001 is the primary discharge location. Magpie Creek is tributary to the Magpie Creek Diversion, which is tributary to Robla (Rio Linda) Creek, which is tributary to the Natomas East Main Drainage Canal, which drains to the Sacramento River under the majority of hydrologic conditions, but can discharge to the Lower American River just upstream of the confluence under high flow scenarios. The permitted daily average discharge flow from Discharge Point No. 001 shall not exceed 2.88 mgd. The permitted flow for Discharge Point No. 002 is 0.144 mgd. The total combined daily average discharge flow from Discharge Point Nos. 001 and 002 shall not exceed 2.88 mgd. The

GWTS is configured to allow for discharge to the municipal sewer system if there is potential to exceed limitations or if the effluent quality is uncertain.

The Air Force is required under the NPDES permit to monitor the influent to the facility, two effluent sample points, and three receiving water locations. The influent sites are required to be monitored at a minimum of once per year. Effluent limitations for Discharge No. 001 (Magpie Creek) include pH, carbon tetrachloride, hexavalent chromium, dichlorobromomethane, 1,1-dichloroethane, 1,2-dichloroethane, PCE, TCE, vinyl chloride, and cis-1,2-dichloroethylene. The effluent limitations for Discharge No. 002 (Beaver Pond and Don Julio Creek) are exactly the same, except the daily average discharge at No. 002 cannot exceed 0.144 mgd.

A review of 1,4-dioxane data for GWTS samples collected from January 2003 to December 2008 identified a maximum effluent concentration of 3.9 µg/L and an effluent result of 2.7 µg/L in 2013. A review of 1,4-dioxane data for GWTS effluent samples collected from January 2009 through July 2013 identified a range from 0.93 to 3.5 µg/L. There is no treatment provided for 1,4-dioxane at the GWTS so it is possible that influent levels are similar. These effluent concentrations are greater than the 1,4-dioxane DDW Notification Level of 1 µg/L, but it is not included in the NPDES permit as a water quality objective.

The Air Force has indicated that the highest recorded level for perchlorate in the GWTS effluent since monitoring began in 2007 was 3.5 µg/L. According to the Regional Board, perchlorate is sampled periodically but they were only able to readily provide information on one data point; perchlorate was detected at 0.67 µg/L in the GWTS effluent in 2007.

A Five-Year Review for McClellan AFB was completed in September 2014 by the Air Force and MWH. The Executive Summary of the Five-Year Review states that the remedy is functioning as intended by the Groundwater VOC ROD and the non-VOC ROD amendment. Hydraulic control of VOC plumes has been achieved and is being maintained, and contaminant mass is being removed by the groundwater remedy. Hydraulic capture of non-VOCs has not been completely demonstrated, particularly for 1,4-dioxane (Operable Unit C West plume) and chromium (near PRL S-008). However, effluent from the groundwater treatment plant meets applicable effluent guidelines.

According to the information in the Five-Year Review, there is no discharge limit for 1,4-dioxane because the influent concentration is below CalEPA's de minimis ($1X10^{-6}$) cancer risk criterion (0.35 µg/L). Examination of the 1,4-dioxane concentrations in GWTS effluent indicated that the effluent concentrations were above the DDW Notification Level of 1 µg/L, but below the clean-up level of 6.1 µg/L, which is a risk-based value set by the USEPA. The statement regarding low influent values and the higher effluent results are inconsistent.

The Five-Year Review indicates that the new hexavalent chromium MCL has the potential to impact both the substantive requirements for the GWTS discharge to

Magpie Creek contained in the GWTS Operation and Maintenance Manual, and the groundwater cleanup levels established in the ROD. The Air Force is aware that the new hexavalent chromium MCL of 10 µg/L became effective July 1, 2014, however the cutoff date for data and information to be included in the Five-Year Review was June 30, 2013.

CH2MHill is currently under contract to the Air Force to evaluate the new hexavalent chromium MCL. There are three documents in progress to support this evaluation: a background level report, an evaluation of the protectiveness of the current remedy, and an Explanation of Significant Findings.

In June 2015 the Air Force submitted a report on background hexavalent chromium levels for the McClellan site which is currently being reviewed by the USEPA, the Department of Toxic Substances Control, and the Regional Board. Remediation goals are required to be either the MCL, or background levels in groundwater, whatever is higher. Background concentration is defined as the 95th confidence limit on the 95th percentile of a sample set designated to be representative of the background concentrations. The findings of the background report show that the background levels of hexavalent chromium in groundwater are higher than the new 10 µg/L MCL for hexavalent chromium. The second two documents are expected in late 2015. The GWTS Operation and Maintenance Manual and the non-VOC ROD Amendment are expected to be updated to reflect the new hexavalent chromium MCL.

Aerojet Rocketdyne

The Aerojet Rocketdyne site covers 5,900 acres and is located near Rancho Cordova, California about one half mile south of the American River. Aerojet Rocketdyne has developed, manufactured, and tested liquid and solid rocket motors as well as rocket propellants, agricultural chemicals, and pharmaceuticals since the 1950's. Groundwater contamination has been defined in a number of discrete plumes on and off-site. **Table 4-22** provides a list of the principal contaminants in the groundwater and their associated sources and human health thresholds.

Cleanup efforts at the site are jointly administered by the USEPA, the Regional Board, and the Department of Toxic Substances Control (DTSC) for soil contamination sites. The USEPA has classified the site as a Superfund Site and divided the site into operating units (OUs) and the remedies for each have been prioritized to capture and treat contaminated groundwater to try and minimize the migration of contamination off the site. Soon, the remediation will include larger efforts to remove and reduce contamination in the source areas of the site. A key component of the groundwater remedy is to extract contaminated groundwater, treat it, and then discharge it to surface water. The site was evaluated extensively as part of the 2013 Update to the American River Watershed Sanitary Survey and some key highlights are presented herein.

The Regional Board has adopted two NPDES permits for the Aerojet Rocketdyne site; the Groundwater Extraction and Treatment System and the Stormwater System.

Table 4-22
Aerojet Rocketdyne Contaminants of Concern

Contaminant	Source	MCL, µg/L	PHG, µg/L
Perchlorate - Inorganic anion	Component of solid rocket propellant	6	1
N-nitrosomodimethylamine (NDMA) – Semi volatile organic compound	Combustion product of liquid rocket fuel	0.01 [1]	0.003
1,4-dioxane	Stabilizer in solvents	1 [1]	None
Trichloroethylene (TCE)	Solvent	5	1.7
Tetrachloroethylene (PCE)	Solvent	5	0.06
1,1-dichloroethene	Solvent	6	10
cis-1,2 – dichloroethene	Solvent	6	100
trans-1,2 – dichloroethene	Solvent	10	60
1,1-dichloroethane	Solvent	5	3
1,2-dichloroethane	Solvent	0.5	0.4
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)	Solvent	1,200	4,000
Carbon tetrachloride	Solvent, refrigerant, propellant	0.5	0.1
Chloroform	Solvent	80 [2]	None
Vinyl chloride	VOC degradation product	0.5	0.05

[1] DDW Notification Level – the 1,4-dioxane level was revised down in November 2010
[2] The MCL is 80 µg/L for the sum of total trihalomethanes (as disinfection by-products) chloroform, dibromochloromethane, bromodichloromethane, and bromoform.

Groundwater Extraction and Treatment System NPDES

The Regional Board manages the NPDES permit for treated groundwater discharged to the Lower American River. There are 14 groundwater extraction and treatment (GET) facilities operated by Aerojet Rocketdyne, and 12 of these discharge to the Lower American River for a total flow of nearly 48 mgd, a 45 percent increase over the 2011 discharge amounts (33 mgd). These are listed in **Table 4-23**.

The current NPDES permit for the GET facilities (R5-2014-0126) has effluent discharge limits for each GET facility. The constituents of interest vary by facility based on the source water quality, but includes; VOCs, 1,2-Dichloroethane, chloroform, PCE, TCE, cis-1,2-dichloroethylene, 1,4-Dioxane, NDMA, perchlorate, acetaldehyde, formaldehyde, acrylamide, chlorine residual, and pH.

Table 4-23
Aerojet Rocketdyne GET Facilities Summary

Operating Unit	Name of Facility	Target Contaminants	Permit Flow (mgd)	Discharge Location
Western Groundwater – OU3	GET E/F	Perchlorate, NDMA, VOCs	11.52	Buffalo Creek/ American River
	GET H-A	Perchlorate, VOCs	3.46	Morrison Creek or Boyd Station Channel/ American River
	GET J	Perchlorate, NDMA, VOCs	6.75	Buffalo Creek/ American River
	GET K-A	NDMA, VOCs	4.03	American River
	GET LB (Bajamont)	NDMA, VOCs	1.44	American River
	GET LA (Ancil Hoffman)	NDMA	2.88	American River/ Irrigation
Perimeter Groundwater – OU5	Sailor Bar Park	VOCs	0.58	Sailor Bar Park Pond
	GET AB	Perchlorate, NDMA, VOCs	5.76	Buffalo Creek/ American River or Aerojet Industrial Supply
	White Rock	Perchlorate, VOCs	1.3	Buffalo Creek/ American River
	Well 4665	TCE, NDMA, Chloroform	1.15	Buffalo Creek/ American River
	ARGET[1]	VOCs, 1,4-Dioxane, Perchlorate	5.04	Buffalo Creek/ American River
Golden State Water Company	AC-6	Perchlorate	1.08	American River
	AC-18	Perchlorate	2.59	Morrison Creek
	AC-23	Perchlorate	3.17	Boyd Station Channel/ American River
All Areas	Low Threat Discharges	Varies	No Limit	Any

[1] Now includes flows from GET D.

The permit requires Aerojet Rocketdyne to provide notification to applicable downstream water agencies within 24-hours after Aerojet Rocketdyne has received information that its discharge exceeds effluent limitations, or if operational monitoring of the treatment facilities indicates that there is a potential for effluent limitations to be exceeded.

The treated groundwater discharges generally meet the NPDES permit effluent limits, which the Regional Board set at or below the DDW MCLs or Notification Levels. The Regional Board issued an ACLC (Order No. R5-2014-0504) in March 2014 to cover permit violations from May 1, 2008 through October 31, 2013. In addition, a data query of CIWQS was conducted for the Aerojet GET Facilities NPDES permit from November 2013 through December 2014. A review of these two sources revealed the following facility effluent violations of potential interest to drinking water:

- GET H-A: 1 - perchlorate
- GET E/F: 2 - cis-1,2-dichloroethylene, 3 - perchlorate, 2 - acetaldehyde, 1 – NDMA, 4 - chloroform
- Sailor Bar Park: 2 – TCE, 1 – 1,1-dichloroethylene

Other detections of interest from the CIWQS database include:

- Low level detects of acetone (less than 320 µg/L) in various GET influent and effluent waters and receiving water sites. There is no effluent limitation for acetone. There are no drinking water standards or advisories for acetone. These detects are all well below the USGS HBSL of 6,000 µg/L.
- Low level detects of methylene chloride, or dichloromethane, (less than 1.7 µg/L) in various GET waters and receiving water sites. There is no effluent limitation for methylene chloride. These detects are below the primary MCL of 5 µg/L.
- White Rock GET effluent detect of bis-(2-ethylhexyl) phthalate at 27 µg/L on January 6, 2014. There is no effluent limitation for this constituent. This is above the primary MCL of 4 µg/L. The influent value was only 5.8 µg/L, so Aerojet noted that it is possible that the detect was from laboratory or sampling contamination or bottle switching.
- GET AB effluent detect of NDMA at 3.6 ng/L on September 3, 2014. This is above the average monthly limitation of 2 ng/L. This could be a permit violation unless additional samples were collected to reduce the average monthly result. The influent level was 8.9 ng/L. This is below the NL of 10 ng/L, but above the PHG of 3 ng/L.
- AC-6 showed increasing source concentrations of perchlorate through 2014. NDMA does not have an effluent limit for this facility, but it was detectable in both the influent and effluent at levels not exceeding 2.1 ng/L. These are all below the NL of 10 ng/L and the PHG of 3 ng/L.
- The Low Threat discharges under monitoring site M-012 have detectable perchlorate up to 10 µg/L, which is below their limit of 12 µg/L, and NDMA up to 2.3 ng/L, which is below their limit of 20 ng/L.
- GET E/F effluent detects of acetaldehyde of 13, 5.2, and 220 µg/L on May 8, 2012, April 1, 2013, and October 17, 2013, respectively. These are above the effluent limits for acetaldehyde of 5 µg/L. There are no human health standards, advisories, or benchmarks for acetaldehyde, but there is a taste and odor threshold of 34 µg/L listed in the Compilation of Water Quality Goals for the Regional Board.
- GET E/F effluent detect of formaldehyde of 88 and 13 µg/L on September 9, 2013 for an average of 50.5 µg/L. This is above the effluent limitation of 50 µg/L. There is a NL of 100 µg/L for formaldehyde.
- GET E/F effluent detects of glyoxal ranging from 12 to 270 µg/L. There are no permit effluent limitations for glyoxal. This is an oxidation product from acetaldehyde, from the biological treatment process. There are no standards, advisories, or benchmarks for glyoxal.

- American River GET (ARGET) effluent detects of perchlorate of 5.6 and 5.0 on July 8, 2013 and 5.4 µg/L on December 3, 2013. These detects occurred prior to the ARGET perchlorate effluent limit being reduced so these values were compared with the interim effluent limit of 8 µg/L and are below this value.
- American River site downstream of Buffalo Creek had September 3, 2014 low level detects of acetaldehyde and formaldehyde. All were below effluent limitations and applicable drinking water standards.
- NDMA was periodically detected at all American River monitoring sites, at low levels less than 3 ng/L. This is less than the NL of 10 ng/L and the PHG of 3 ng/L.
- Perchlorate was detected in the American River at two locations, downstream of GET LA and upstream of AC-23, three times in 2013 with all levels less than 1 µg/L. These are below the primary MCL and PHG of 6 µg/L.

Stormwater System NPDES

The Regional Board also manages a Stormwater System NPDES permit for untreated stormwater and other low-threat waters collected on their site. The discharges include stormwater, cooling tower overflow, boiler blowdown and low-threat discharges such as eyewash/safety showers, condensate, roof drains, compressor blowdowns, and chiller waters. The majority of these flows go directly into infiltration zones not directly connected to surface waters. There are retention ponds on the site that collect and hold the runoff and act to reduce suspended materials and sediments. During significant storm events there can be permitted discharges from the retention ponds to the American River via Buffalo Creek. These discharges are infrequent, but can last for several days and have discharged up to 14 mg of stormwater in an event.

The current NPDES permit for the Stormwater System (R5-2013-0156) sets effluent discharge limits for the retention pond discharges, including perchlorate, copper, total dissolved solids, total suspended solids, chemical oxygen demand, and pH. Historic data shows that there can be detects of these constituents in the discharge, including the potential for low levels of perchlorate (less than 4 µg/L). The permit requires Aerojet Rocketdyne to notify the City of Sacramento before beginning discharge from the storm water detention basins. During the study period there have been no violations or enforcement orders for the stormwater system.

Sliger Mine

The US Bureau of Reclamation (USBR) owns the inactive Sliger Mine in El Dorado County. This mine encompasses six acres located in unincorporated El Dorado County and is discharging mine drainage. The mine was founded in 1864 for gold mining. The original milling process consisted of two-stage crushing, flotation, and gravity concentration. The table tailing was sent to a conditioner and treated by flotation. The mine was closed for a period and was inactive until 1922. When it was reopened, the

shaft was deepened to approximately 2,000 feet and a 15-stamp mill was added. From 1934 through 1953 the mine went through various owners and operations. By 1953, most of the surface equipment had been sold.

The mine site consists of underground workings, mine openings, concrete foundations, and waste rock on the east wall of the river canyon. A former mill located on site was used to process ore removed from the Sliger Mine. Water that contains arsenic and other metals is discharged continuously from an adit (small passage for mine drainage), at approximately 0.1 cubic feet per second (cfs), west in a drainage channel to the Middle Fork of the American River.

In 2008 a passive biological treatment system was installed, utilizing sulfide-reducing bacteria to precipitate the metals, prior to discharge to the Middle Fork of the American River. The facility is currently operating under an NPDES permit (Order No. R5-2008-0168) with a permitted discharge flow of 0.194 mgd.

Under low flow conditions most of the water is expected be consumed in the treatment system. Under average flow conditions, the water is expected to infiltrate into the soil underlying the discharge trench, preventing a direct discharge to the Middle Fork of the American River. During wet weather, storm water runoff from adjacent areas can infiltrate the treatment system, so an influent weir will direct flows in excess of 0.3 cfs away from the reactor to protect the treatment system from exceeding its capacity. The redirected flows, consisting of a portion of the adit drainage mixed with infiltrating storm water, will flow directly to the Middle Fork of the American River. High flows are anticipated to occur during significant rainfall events and during high rainfall years. Under these conditions, the flow in the Middle Fork of the American River would also be increased resulting in an increased dilution capacity and minimal if any impact.

Under its NPDES permit, the mine has seasonal effluent limits. The two seasons are dry (June 1 to November 30) and wet (December 1 to May 31). Limits are set for arsenic, pH, flow, iron, and electrical conductivity. The dry season limits are more conservative, likely due to reduced dilution capacity of receiving waters. Biannual monitoring is required on the mine effluent, as well as upstream and downstream receiving waters.

The effluent has consistently violated the arsenic effluent limit, and at times the iron effluent limit. Inspections by the Regional Board in 2013 and 2014 discovered that the treatment system has become in disrepair and arsenic, iron, and electrical conductivity levels are above effluent limits. The USBR did not submit a ROWD prior to the NPDES permit expiring, and monitoring was not conducted in accordance with the terms of the permit. A Notice of Violation was issued by the Regional Board in June 2013.

The Regional Board has drafted a tentative revised NPDES for the Sliger Mine and it is currently in review by the Board. This new Order will require upgrades and maintenance to the existing bioreactor/infiltration gallery and/or installation of new treatment units.

Water Quality Issues and Data Review

The key constituents of interest for these industrial facility discharges include selected metals, VOCs, 1,4-dioxane, NDMA, and perchlorate. The discharge data for the selected sites was presented above and showed that some of the discharges had levels above the drinking water standards which could potentially impact source water quality.

A review of Consumer Confidence Reports (CCRs) for the cities of Sacramento and West Sacramento and SCWA was conducted and presented in **Section 3**. This review indicated that the existing water treatment plants have had no reported detections of metals, VOCs, 1,4-dioxane, NDMA, or perchlorate at levels of concern in their treated water. An investigation on the source water levels of aluminum, iron, and manganese was also conducted in **Section 3**. On occasion, levels of aluminum, iron, and manganese can be well above their respective primary and secondary MCLs in the Sacramento River. Although levels in the source water can be elevated, aluminum, iron, and manganese, have been either non-detectable or detectable at very low levels in treated water from GKWTP, SRWTP, and SCWA's Vineyard Surface Water Treatment Plant (VSWTP).

Sacramento River Source Water Protection Program Activities

In 2010, the SRSWPP conducted an investigation of Industrial Dischargers in watershed, which included development of a master list of current facilities and prioritized them for review and tracking. The participating water agencies have conducted follow-up tracking and outreach on the following sites:

- McClellan AFB was tracked annually, including contact with Regional Board staff and McClellan staff and consultants. This also included a site visit in May 2011, review of the updated NPDES permit, and coordination on consideration of drinking water impacts on permit requirements.
- Department of General Services, offices of State Publishing and Heating and Cooling, were both tracked to ensure that the facilities were closed as proposed and NPDES permits were rescinded.
- Empire Mine State Historic Park was tracked to follow implementation of advanced treatment process and NPDES permit updating.
- Sterling Caviar was tracked to follow completion of alternative compliance plan and potential rescission of surface water discharge.
- Aerojet Rocketdyne was tracked continuously by the City of Sacramento, including on-going discharge notifications. This included coordination with Regional Board staff and Aerojet Rocketdyne staff. Key activities included review and comment on USEPA and Regional Board regulatory documents (Proposed Plans and NPDES permits), follow up on discharge violations, tracking of the Community Advisory Group, site visits, and preparation of a Summary

Sheet, Fact Sheet, and Action Plan. Information from the tracking efforts is shared with other applicable water agencies downstream of the Aerojet discharges.

WASTEWATER FACILITIES

Background

Wastewater is known to contain pathogenic microorganisms. Wastewater treatment plants remove and/or inactivate some, though not all, of these organisms through various treatment processes. Secondary treatment of domestic sewage is expected to remove 75 to 99 percent of enteric viruses[8], 85 to 99 percent of heterotrophic bacteria[9], and 92[10] percent of *Giardia* cysts. Wastewater discharges occur throughout the watershed. The largest discharges to surface waters are located near the Sacramento metropolitan area as shown on the Watershed Map; see **Figure 2-1**.

Seasonal Patterns

Municipal wastewater treatment plants discharge throughout the year. The City of Sacramento operates a Combined Sewer System. This is a collection system which contains both stormwater and wastewater. The system is described in more detail later, but it does not typically discharge to the Sacramento River. It is designed to send its collections to the Sacramento Regional County Sanitation District (Regional San) Regional Wastewater Treatment Plant (Regional Plant) under most conditions, and to store some excess volume if the conveyance capacity to the Regional Plant is exceeded. If storage capacity is reached during a storm event, primary treated and disinfected effluent from the treatment plants will occur, typically for just a few hours, until sufficient storage capacity is reestablished to accommodate the remaining volume from the storm event. During rare high intensity and/or long duration storm events, when conveyance, storage, and treatment capacities are exceeded, discharge of untreated combined sewage can also occur.

Related Constituents

Wastewater is a blend of sewage, washwater from showers, kitchens, etc., and any effluent from industrial facilities within the sewer collection system. Potential contaminants of concern in wastewater include microbial pathogens (such as bacteria, viruses, and protozoa), inorganics (such as metals and nutrients), TOC, VOCs, and SOCs. Many types of industrial effluent discharges are regulated by the wastewater treatment plants and must meet effluent limits set, including pretreatment if necessary.

[8] National Research Council, 1998. Issues in Potable Reuse: The Viability of Augmenting Drinking Water Supplies with Reclaimed Water. National Academy Press.
[9] Chauret, C. et al., 1999. Fate of *Cryptosporidum oocypts*, *Giardia cysts*, and microbial indicators during wastewater treatment and anaerobic sludge digestion. Canadian Journal of Microbiology, 45: 257-262.
[10] www.Rangelandwatersheds.ucdavis.edu/MWQIC/MWQIC/Indicators_Giardia_window.html.

Presence in the Watershed and Protection Zones

Table 4-24 provides a list of the existing wastewater treatment plants located downstream of major reservoirs, along with the current design capacity.

There were two facilities that ceased discharging during the study period (Maxwell Public Utilities District, December 2011 to land and Placer County Sewer Maintenance District No. 3, December 2014 to City of Lincoln facility). It was discovered that two facilities only discharge in the winter months (Mineral and Hammonton Gold Village). The Chico facility was expanded from nine to 12 mgd.

A review of the enforcement orders from the Regional Board was conducted. Numerous facilities had discharge violations, typically related to pH, coliform, chlorine residual, disinfection byproducts, and nitrate. Implementation of the California Toxics Rule for chronic toxicity in the water quality effluent limitations for wastewater treatment plants is difficult for many of these facilities. A general approach that the Regional Board is to issue Time Schedule Orders, which implement interim permit standards and allow the dischargers more time to comply or to prepare constituent specific Pollution Prevention Plans in lieu of meeting the more stringent standards.

A few noteworthy items include the following:

- The Williams Wastewater Treatment Plant (WWTP) was replaced with a new treatment facility in June 2011 that provides tertiary treatment.
- The City of Live Oak WWTP was replaced with a new treatment facility in September 2012 that provides tertiary treatment.
- The Linda County Water District WWTP was replaced with a new treatment facility in December 2012 that provides tertiary treatment.
- The Hammonton Gold Village WWTP was replaced with a new treatment facility in July 2012 that provides tertiary treatment.
- The Lake Wildwood WWTP was upgraded in February 2013 to include ultraviolet light disinfection.
- The Placer County Sewer Maintenance District No. 1 WWTP ceased discharging in July 2015 and all flows are directed to the City of Lincoln Wastewater Treatment and Reclamation Facility (WWTRF).
- The Lake California WWTP is planning to convert to land disposal by November 2017.
- The Cascade Shores WWTP is planning to convert to land disposal by 2018.

Table 4-24
Wastewater Treatment Plants in the Sacramento River Watershed[1]

County	Facility Name	City	2015 Design Flow (mgd) [2]	Level of Treatment Provided
Shasta	Clear Creek WWTP	Redding	8.8	Advanced Secondary
Shasta	Stillwater WWTF	Anderson	3.4	Advanced Secondary
Shasta	Anderson WPCP	Anderson	2	Advanced Secondary
Shasta	Cottonwood WWTP	Cottonwood	0.43	Advanced Secondary
Shasta	City of Shasta Lake WWTF	Shasta Lake	1.3	Advanced Secondary
Tehama	Lake California WWTP	Cottonwood	0.64	Advanced Secondary
Tehama	Red Bluff WWTP	Red Bluff	2.5	Advanced Secondary
Tehama	Corning WWTP	Corning	1.4	Secondary
Tehama	Mineral WWTP	Mineral	0.07	Advanced Secondary[3]
Butte	Chico WPCP	Chico	12	Secondary
Butte	Oroville Region WWTP	Oroville	6.5	Advanced Secondary
Butte	City of Biggs WWTP	Biggs	0.38	Secondary
Glenn	Willows WWTP	Willows	1.2	Secondary[3]
Colusa	Williams WWTP	Williams	0.5	Tertiary
Colusa	City of Colusa WWTP	Colusa	0.7	Secondary[3]
Sutter	City of Live Oak WWTP	Live Oak	1.4	Tertiary
Sutter	City of Yuba City WWTF	Yuba City	10.5	Secondary
Sutter	Linda County Water District WWTP	Marysville	5	Tertiary
Yuba	Olivehurst Public Utilities District WWTP	Olivehurst	3	Tertiary
Yuba	Hammonton Gold Village WWTP	Smartville	0.026	Tertiary
Nevada	Lake Wildwood WWTP	Lake Wildwood	1.12	Secondary
Nevada	City of Nevada City WWTP	Nevada City	0.69	Tertiary
Nevada	City of Grass Valley WWTP	Grass Valley	2.78	Tertiary
Nevada	Cascade Shores WWTP	Nevada City	0.026	Tertiary
Nevada	Lake of the Pines WWTP	Lake of the Pines	0.72	Tertiary
Placer	Placer County Sewer Maintenance District No. 1 WWTP	Auburn	2.18	Tertiary (Secondary if Plant Flow >3.5 mgd)
Placer	City of Auburn WWTP	Auburn	1.67	Tertiary
Placer	Thunder Valley Casino WWTP	Lincoln	0.875	Tertiary
Placer	City of Lincoln WWTRF	Lincoln	8.4	Tertiary
Placer	Pleasant Grove WWTP	Roseville	12	Tertiary
Placer	Dry Creek WWTP	Roseville	18	Tertiary
Sacramento	City of Sacramento Combined Wastewater Collection System	Sacramento	380 [4]	Primary or Untreated
Sacramento	Sacramento Regional County Sanitation District Regional WWTP	Elk Grove	181	Secondary[5]

[1] This list represents only those Municipal NPDES Facilities in the Sacramento River Watershed Downstream of Major Reservoirs
[2] Represents permitted average dry weather flow
[3] Currently under time schedule order to construct tertiary treatment or obtain de-designation of MUN beneficial use from receiving water
[4] Represents permitted treated flow. Discharges from this facility are prohibited during dry weather
[5] Currently under compliance schedule to construct tertiary treatment and implement seasonal effluent limits
(WWTP – wastewater treatment plant, WWTF – wastewater treatment facility, WPCP – water pollution control plant, WWTRF – wastewater treatment and reclamation facility)

Since most of these discharges are further upstream, located outside of the protection zones, only the Sacramento Area Sewer District collection system, the City of Sacramento's Combined Sewer System, and the Regional San's Regional Plant were selected for detailed review.

Sacramento Area Sewer District

Sacramento Area Sewer District (SASD) owns and operates a wastewater collection system that serves the urbanized areas of unincorporated Sacramento County as well as some additional areas within the cities of Rancho Cordova and Sacramento, covering an area of more than 250 square miles. The collection system conveys an average of 165 million gallons of wastewater per day through more than 3,000 miles of pipe with approximately 100 miles of interceptor pipelines to the Regional Plant.

SASD is regulated by State Board Order No. 2006-0003. SASD is responsible for compliance with the WDRs and must operate and maintain its sewage collection system to prevent sanitary sewer overflows and spills.

Combined Sewer System for the City of Sacramento

The City of Sacramento operates its Combined Sewer System (CSS) in compliance with a NPDES permit issued to the City of Sacramento by the Regional Board. During the study period the City was discharging under Order No. R5-2010-0004. The CSS only covers a portion of the City, as shown in **Figure 4-5**. The NPDES permit specifies operating parameters, effluent limits for certain constituents, and monitoring requirements. The CSS contains both urban runoff and wastewater.

Both urban runoff and wastewater contribute to the CSS. The ratio of urban runoff to wastewater within the CSS changes continuously, primarily because the volume of urban runoff changes continuously. A very important characteristic of the CSS is that discharges occur only as a result of high intensity and/or long duration storm events creating an especially high volume of urban runoff. Thus, during discharge events, the volume of wastewater relative to urban runoff can be low. Another factor that influences the ratio of urban runoff to wastewater is the practice of pumping out the collection system to the degree possible in anticipation of major storm events; this may also reduce the volume of wastewater relative to urban runoff during discharge events.

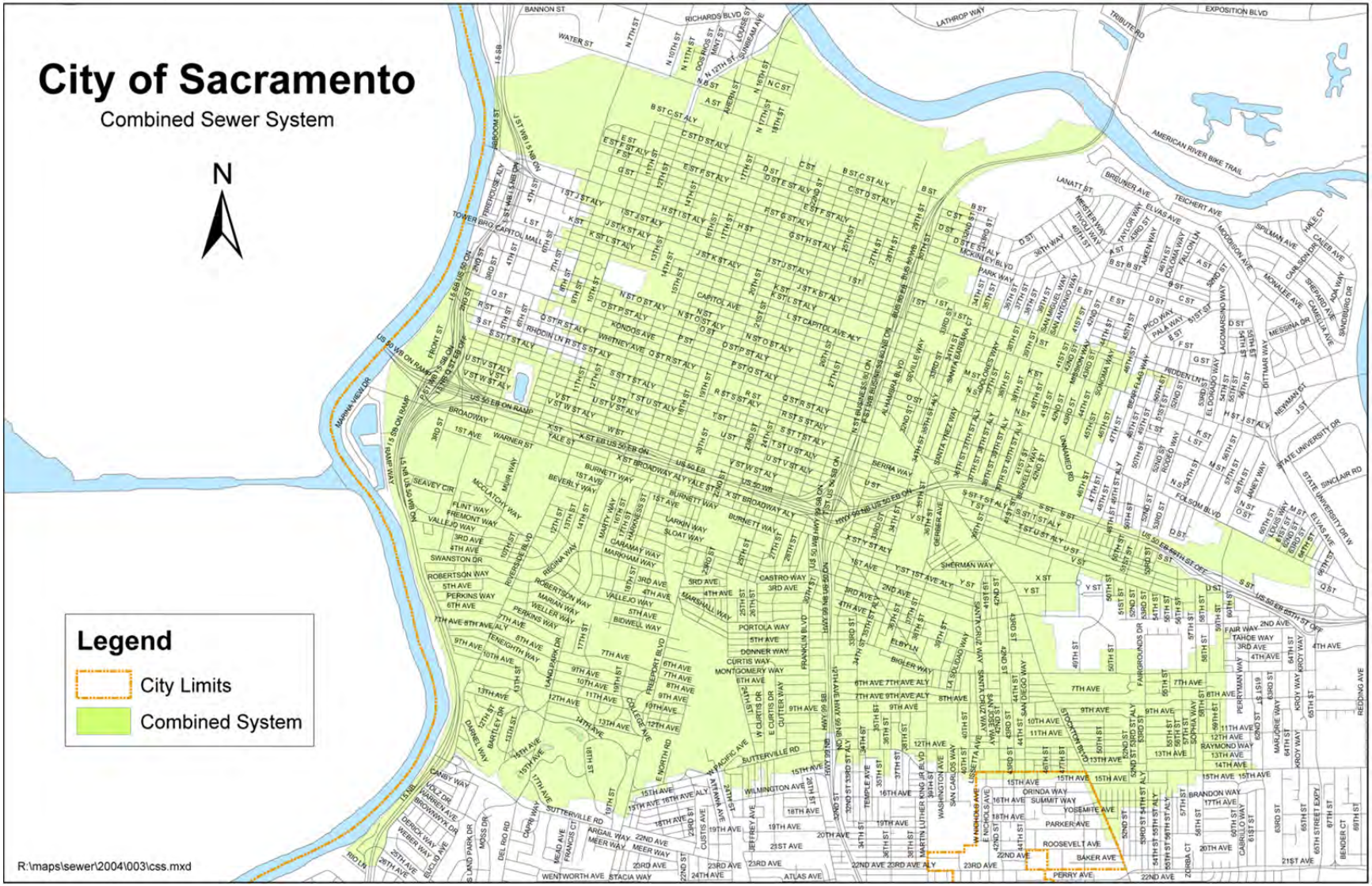


Figure 4-5. City of Sacramento Combined Sewer System

The CSS consists of four main facilities to manage the combined sewage: Sumps 1/1A, Sumps 2/2A, the Pioneer Reservoir Treatment Plant, and the Combined Wastewater Treatment Plant (CWTP). The CSS conveys the first 60 mgd to the Regional San Regional Plant for secondary treatment prior to discharge to the Sacramento River. When a storm occurs that results in flows exceeding the 60 mgd conveyance capacity to Regional San's Regional Plant, the City of Sacramento will commence storage of excess flows at its various treatment and storage facilities. Once the storage capacity is reached, both the CWTP and Pioneer Reservoir facilities can provide primary treatment and disinfection for up to 130 mgd and 250 mgd, respectively. Both treatment facilities have permitted discharge outfalls to the Sacramento River. As flows increase and once treatment capacity limits for Pioneer Reservoir and CWTP are reached, flows above 250 mgd (and up to 450 mgd) are routed through Pioneer Reservoir for at least partial primary treatment and then discharge to the Sacramento River. During extreme high flow conditions, which occur extremely infrequently, discharges of untreated combined wastewater may occur at Sumps 2/2A and at the Sump 1A bypass.

Regional San Regional Wastewater Treatment Plant

The effluent pipe for the Regional San Regional Plant is located approximately at River Mile 45.5 on the Sacramento River, just approximately 1.7 miles downstream of the new FRWA intake diversion. Although this is located downstream of the new FRWA diversion, it is possible for the discharge to reach the intake location during an extreme reverse flow event.

In January 2004 the Regional San, FRWA, and SCWA adopted the Principles of Agreement (POA). Two elements of the POA are that FRWA and Regional San will (1) model the effect of FRWA's intake operations on the Regional San's effluent diversions and (2) work to reduce the potential to divert diluted Regional Plant effluent while meeting water delivery objectives. The agencies have developed a communications plan to allow for effective coordination of operations.

The Regional Plant is owned and operated by Regional San and currently provides secondary treatment using a high purity oxygen activated sludge treatment process. The collection system services most of the Sacramento metropolitan area, approximately 300 square miles. **Figure 4-6** provides a schematic of the collection system that feeds the Regional Plant, including the contribution from the City of West Sacramento.

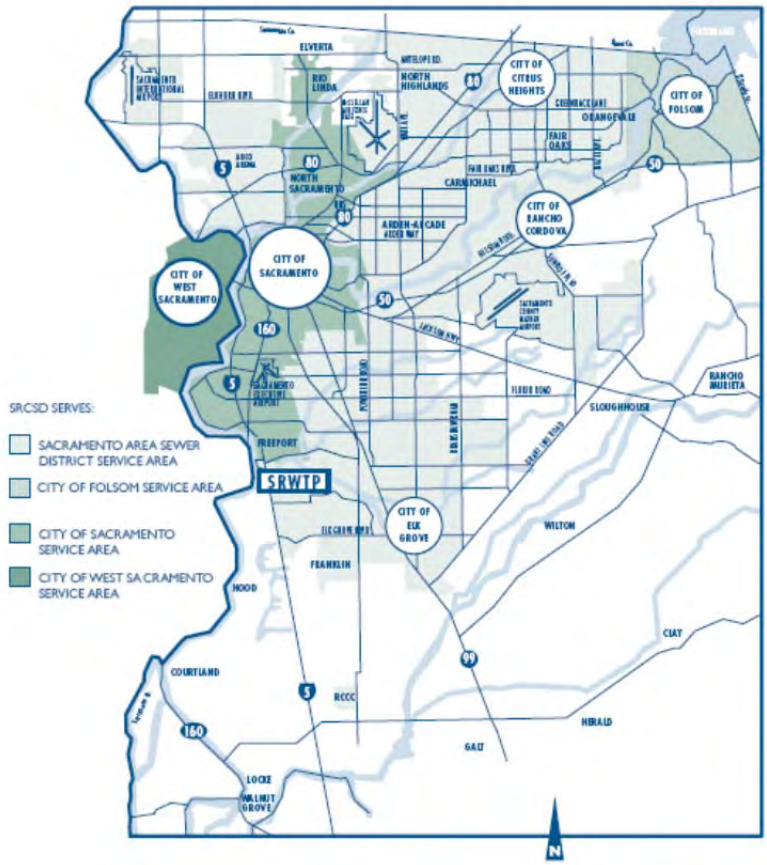


Figure 4-6. Regional Plant Collection System

Regulation and Management

Sanitary Sewer Overflow Program

To provide a consistent, statewide regulatory approach to address sanitary sewer overflows (SSOs), the State Board adopted Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003 (Sanitary Sewer Order) on May 2, 2006. The MRP for the Order was amended in 2008 to clarify deficiencies in timely notification and again in 2013 to further improve the program.

The Sanitary Sewer Order and its amendments require public agencies that own or operate sanitary sewer systems to develop and implement sewer system management plans (SSMPs) and report all SSOs to the State Board's online SSO database. SSOs in the Central Valley have been uploaded to the State Board's online CIWQS database since September 2007.

The Sanitary Sewer Order and its amendments require the owners and operators of sanitary sewer systems to take all feasible steps to eliminate SSOs and to develop and implement a system-specific SSMP. SSMPs must include provisions to provide proper operation and maintenance while considering risk management and cost. The SSMP must contain a spill response plan that establishes standard procedures for immediate

response to an SSO in a manner designed to minimize water quality impacts and potential nuisance conditions. The SSMPs must be updated every five years.

Notification Requirements

When a spill of untreated or partially treated wastewater occurs, the owner or operator of the collection system or wastewater treatment plant is required to provide notice of the spill to the California State Warning Center when certain criteria are met, and they must provide updates if there are substantial changes to the spill report.

The Sanitary Sewer Order and NPDES permits contain the most stringent reporting requirements. Wastewater spills greater than 1,000 gallons, all wastewater spills that enter waters of the state (surface and groundwater), and spills that occur where public contact is likely, regardless of the volume, must be reported to the Regional Board by telephone as soon as notification is possible and will not substantially impede cleanup or other emergency measures. The notification must occur within 24 hours of detection of the spill. In addition to oral notification, for spills larger than 50,000 gallons a written report must be submitted to the Regional Board within 45 days of the spill.

A key requirement of the Sanitary Sewer Order is that SSOs must be entered into the State Board's SSO online database. The Central Valley region began reporting in September 2007. Under the initial Order, there were Category 1 and Category 2 spills. Wastewater spills greater than 1,000 gallons, all wastewater spills that enter waters of the state, and spills that occur where public contact is likely, regardless of the volume are classified as Category 1 SSOs. Category 1 SSOs were to be reported to the SSO database as soon as possible but no later than three business days after the SSO is detected. Category 2 spills were all other spills greater than 1,000 gallons. Under the 2013 MRP amendments, there are now three categories of SSOs: Category 1 – spills of any volume that reach surface water, Category 2 – spills greater than 1,000 gallons that don't reach surface water, Category 3 – spills less than 1,000 gallons that don't reach surface water.

Table 4-25 presents a summary by agency of the Category 1 SSOs reported between January 1, 2010 and December 31, 2014 in the counties in the Sacramento River watershed. This includes all collection systems in the Sacramento River watershed, and therefore may be an overestimate as some discharges may have been outside the watershed. There were a total of 270 Category 1 SSO events that contributed just over 1.2 mg of wastewater to the Sacramento River or its tributaries, in some cases quite distant from the intakes, over the study period. This is less volume than the discharges from the September 2007 – December 2009 period.

Table 4-25
Category 1 SSOs Reported to Regional Board, January 2010 – December 2014[1]

Collection System (CS)	Total Number of SSOs	Total Volume of SSOs (gallons)	Total Volume to Reach Surface Water (gallons)
Sacramento Area Sewer District CS	87	516,581	490,096
Redding City CS	11	134,562	131,981
City Of Oroville CS	8	109,408	109,108
Mt Shasta CS	9	100,929	100,489
Grass Valley City CS	19	104,386	99,172
Yuba City CS	2	86,036	86,036
Red Bluff CS	20	65,336	53,031
Sacramento Regional CS	2	31,520	31,481
Burney CS	2	26,050	24,040
Hangtown Creek CS	27	23,890	22,401
City Of Auburn CS	7	13,218	11,493
Placer County Sewer Maintenance District (SMD) No. 2 CS	4	9,670	8,915
City Of Folsom CS	8	6,759	6,127
Colfax CS	3	6,175	6,102
Placer County SMD No. 1 CS	8	6,240	5,718
Palo Cedro CS	2	5,800	5,300
South Placer Mud CS	1	5,000	4,763
Portola CS	2	4,600	4,525
El Dorado Hills CS	8	4,310	4,080
Corning Indust/Domestic CS	3	9,620	2,615
Folsom State Prison CS	2	1,700	1,700
Lake Wildwood CS	5	2,100	1,525
City of Sacramento Utilities CS	5	3,861	1,495
Marysville CS	1	1,125	1,125
Placer County SMD No. 3 CS	1	750	710
Delleker CS	2	700	700
Dry Creek CS	5	705	635
Shasta Lake CS	2	350	350
Lake of The Pines CS	2	320	320
Soda Springs CS	1	300	300
California State University, Sacramento CS	1	250	150
California State Prison, Sacramento CS	4	485	71
Cascade Shores CS	1	60	60
City of Chico CS	1	150	35
Stirling City Ponds CS	1	850	25
Discovery Park	1	25	25
City Of Willows CS	1	10	2
Quincy CS	1	11	1
TOTAL	**270**	**1,283,842**	**1,216,702**

[1] Data retrieved for the 17 counties in the Sacramento River watershed from State Board CIWQS Database

The Regional Board issued an ACLC (Order No. R5-2012-0566) to the City of Grass Valley for its SSOs, in the amount of $110,850. Half the money was paid to the Regional Board and half the money was used by the City of Grass Valley to purchase an upgraded vacuum/jet truck to manage SSOs.

Sacramento Area Sewer District

The SASD collection system is regulated by State Board Order No. 2006-0003. They had 87 Category 1 SSOs reported during the study period. Many of those discharges were small in nature. There were 53 SSOs that were greater than 1,000 gallons that reached surface water. There were 22 SSOs that were greater than 5,000 gallons that reach surface water. A summary of those spills is provided in **Table 4-26**. The exact location of the SSOs could not be identified based on information in CIWQS, so it is possible that some of these discharged to waterbodies downstream of the Sacramento River at Freeport.

Table 4-26
Category 1 SSOs Greater than 5,000 Gallons for SASD (gallons)

Date	Total Volume Spill	Volume Reached Surface Water
6/21/10	8,040	8,040
10/29/10	5,550	5,550
12/18/10	51,034	49,034
12/19/10	8,012	8,000
1/11/11	73,580	73,580
3/24/11	21,115	21,115
3/24/11	15,855	15,855
3/24/11	12,350	12,350
3/24/11	9,837	9,837
6/6/11	11,400	11,400
11/24/11	15,500	15,400
12/27/11	7,100	7,100
3/20/12	8,897	8,897
2/10/13	7,449	6,840
8/19/13	16,371	16,371
10/14/13	19,800	18,300
11/12/13	25,140	25,030
12/20/13	11,100	11,100
4/15/14	11,840	9,351
5/20/14	16,996	12,156
5/26/14	11,500	11,500
6/24/14	43,364	43,364

As per CIWQS, the Regional Board identified 63 violations and issued 11 Notice of Violations to SASD during the study period.

National Pollutant Discharge Elimination System

Direct discharges of wastewater to surface water are regulated by the Regional Board through the NPDES permit system. A discharge is regulated through requirements to meet effluent discharge limits and receiving water limits. Effluent limits are typically site specific, but usually include biochemical oxygen demand, total suspended solids, settleable matter, total coliform levels, and chlorine residual. Receiving waters are typically monitored upstream and downstream of the discharge for constituents such as pH, dissolved oxygen, ammonia, temperature, turbidity, and electrical conductivity. NPDES Permits issued by the Regional Board for wastewater treatment plant discharges contain standard provisions that prohibit the discharge of wastewater that has not been treated to the level required by the permit. The standard provisions also require that the discharger provide safeguards, such as alternate power supplies and emergency storage basins, to prevent discharges of untreated or partially treated wastewater in the event of an electrical power failure. Upon request of the Regional Board, a discharger must file a report on the measures to prevent and clean up spills.

In August 2008 the Regional Board issued Spill Reporting Procedures for wastewater treatment plant spills. This was issued to ensure consistency in notification procedures with the State Board Order for Sanitary Sewer Systems. This requires facilities to notify the California Office of Emergency Services (Cal OES), the local health department, and the Regional Board within two hours of a spill or discharge. The spill notification must be certified within 24 hours, and a written report documenting the event must be submitted to the Regional Board within five days.

Combined Sewer System for the City of Sacramento

The City of Sacramento operates a CSS year-round that conveys domestic and commercial wastewater and stormwater runoff from downtown Sacramento, East Sacramento, and Land Park areas. The City operated the CSS in compliance with NPDES permit Order No. R5-2010-0004. The City was issued an updated permit in 2015, Order No. R5-2015-0045. The NPDES Permit specifies operating parameters, effluent limits, and monitoring requirements. The CSS has a normal dry weather flow that ranges from 15 to 18 mgd.

The permit applicable during the study period had limited water quality monitoring requirements, but required a Water Quality Assessment. Routine monitoring included; effluent monitoring during discharge events for total suspended solids, pH, dissolved oxygen, fecal coliform, chlorine residual, mercury, chlorpyrifos, diazinon, and ammonia. Also, the effluent must be monitored annually for priority pollutants, including VOCs, pesticides, metals, and nutrients. The Water Quality Assessment, completed in June 2013, included annual sample collection for priority pollutants at the receiving water locations and evaluated impacts to beneficial uses. Because of the relatively short

period of discharges, no significant impacts were identified. The City of Sacramento is participating in the Delta RMP, specifically supporting the Pathogen Work Plan elements. As part of the new NPDES permit, the City of Sacramento will participate in the Delta RMP in lieu of some routine sample collection requirements.

There continued to be a lower number of combined sewer overflow (CSO) discharges, both treated and untreated, during the study period, as shown in **Table 4-27**. There was only one untreated CSO discharge during the study period, which accounted for less than 0.5 percent of total volume of discharge during the study period.

Table 4-27
City of Sacramento CSS Discharges, 2010 - 2014[1]

Date	Discharge Location	Type Discharge	Discharge Volume (million gallons)
12/19/2010	Pioneer	Treated	57
2/25/2011	Pioneer	Treated	27.9
3/14/2011	Pioneer	Treated	35
3/14/2011	CWTP	Treated	25
3/24/2011	Pioneer	Treated	56.5
3/24/2011	CWTP	Treated	35
1/21/2012	Pioneer	Treated	24.7
1/23/2012	Pioneer	Treated	16.4
3/28/2012	Pioneer	Treated	47.5
4/13/2012	Pioneer	Treated	28.3
11/30/2012	Pioneer	Treated	37.6
11/30/2012	CWTP	Treated	27.8
12/1/2012	CWTP	Treated	64
12/2/2012	Pioneer	Treated	53.4
12/2/2012	Sump 2	Untreated	3.8
12/22/2012	Pioneer	Treated	17.7
12/23/2012	Pioneer	Treated	42.6
12/25/2012	Pioneer	Treated	23.5
2/8/2014	Pioneer	Treated	28.4
2/9/2014	CWTP	Treated	23
12/3/14	Pioneer	Treated	46.2
12/3/14	Pioneer	Treated	62.3
12/3/14	CWTP	Treated	8
12/11/14	Pioneer	Treated	193
12/16/14	Pioneer	Treated	25.7

[1] From Attachment F – Fact Sheet, Order R5-2015-0045 and City of Sacramento

As per CIWQS, there were 21 violations to the permit, the City of Sacramento was issued 12 Notice of Violations during the study period, and issued one ACLC (Order No. R5-2013-0562) for seven discharge violations between 2010 and 2012. These

violations were related to total suspended solids and pH. This resulted in a $6,000 fine. The new NPDES permit has lower pH effluent limits and provides clarification on the solids sample collection and analysis approach, which would eliminate many of these violations.

The basic management parameters for the City of Sacramento's CSS during large, high-intensity storm events are as follows:

1. When storm events that could cause CSS discharges are anticipated, the City of Sacramento pumps down the system as much as possible, sending existing flow within the collection system to the Regional San Regional Plant. This practice minimizes the ratio of wastewater relative to urban runoff; implementation of this practice has resulted in measurable decreased levels of TSS and settleable solids in CSS discharges. This practice also maximizes available storage in the collection system.

2. A baseline CSS flow of 60 mgd is conveyed throughout the storm event to the Regional Plant where it receives primary and secondary treatment, chlorination, and dechlorination before discharge to the Sacramento River downstream of the Freeport Bridge.

3. When CSS flows exceed the baseline 60 mgd to the Regional Plant, the City initially commences storage of excess flows within the collection system. Once the collection system storage reaches operational storage capacity, CWTP is filled. This sequence of operations is followed by the wastewater flows being diverted to Pioneer Reservoir and/or remote CSS storage for later transmission to the Regional Plant. Sumps 1/1A/1B can be used to pump up to 200 mgd to Pioneer Reservoir. Storage capacity is as follows:

    - CWTP - 7 million gallons (mg)
    - CWTP In-line Storage – 2.5 mg
    - Pioneer Reservoir - 23 mg
    - Pioneer Interceptor In-line Storage - 5 mg
    - Remote CSS storage in collection system – 10.6 mg

4. When CSS flows exceed the baseline 60 mgd to the Regional Plant and the storage capacity at Pioneer Reservoir, CWTP, and collection system storage is exceeded, up to 250 mgd can be treated at Pioneer Reservoir with primary treatment, chlorination, and dechlorination and then discharged to the Sacramento River at the Pioneer Reservoir location.

5. When CSS flows exceed the baseline 60 mgd to the Regional Plant, the storage capacity at Pioneer Reservoir, CWTP, and collection system storage, and the Pioneer treatment capacity of 250 mgd, up to 130 mgd can be treated at the CWTP with primary treatment, chlorination, and dechlorination and then discharged to the Sacramento River at the CWTP location. Sludge removal is also provided at CWTP.

CWTP Basins can also be used to store up to 9.5 mg of flow. The Pioneer facility can discharge up to 450 mgd, but at flows above 250 mgd only partial primary treatment is proved.

6. When the volume of CSS flows exceeds all of the capacities described above, the flow can be discharged as untreated CSOs to the Sacramento River at the Sump 2/2A or Sump 1/1A Pioneer Bypass locations.

An important characteristic of the CSS discharges is the fact that discharges do not occur during the initial period of storm-induced runoff, and all non-wet weather stormwater flows receive full secondary treatment at the Regional Plant. A dye dispersion tracer study was conducted in 1991 by the City of Sacramento to evaluate how the CSS flow discharges from the CWTP mix with the Sacramento River. The results showed that discharges from the CSS are fully mixed with the Sacramento River about 9,000 feet (about 1.7 miles) downstream of the CWTP discharge location. The total distance from the CWTP to the new FRWA diversion site is nearly seven river miles, so the CSS discharge would be expected to be fully mixed more than five river miles upstream of the new FRWA diversion site. The City provides direct notification to FRWA and other downstream water utilities when there are discharges from the CSS to the Sacramento River.

Regional San Regional Wastewater Treatment Plant

The Regional Plant has a treatment capacity of 181 mgd. The effluent is located about 300 feet downstream of the Freeport Bridge, and downstream of all the participating agencies. Discharge of treated wastewater effluent is limited to the condition that a dilution ratio of 14:1 be met in the Sacramento River, or a minimum flow of 1,300 cfs. The Regional Plant continuously monitors flow in the Sacramento River and their effluent, and then uses a 60-minute average dilution ratio for compliance. In the event that discharge cannot occur, the effluent is diverted to onsite storage basins. Diversion can occur during any year, but has most commonly occurred during drought years and in the spring and summer months. There are times where the flow down the Sacramento River is overwhelmed by high tides from the Delta resulting in a reverse flow effect. This could result in the discharge effluent from the Regional Plant moving upstream.

The Regional Plant is operated throughout the year. Regional San operates the Regional Plant in compliance with a NPDES permit issued by the Regional Board, Order No. R5-2010-0114-003. This permit was originally adopted on December 9, 2010 but it was amended by orders R5-2011-0083, R5-2013-0124, R5-2014-0102, and WQ 2012-0013. Effluent discharge limits are set for a wide variety of constituents, including; conventional pollutants, non-conventional pollutants, and priority pollutants. Interim effluent limits exist through 2021 for biochemical oxygen demand, total suspended solids, ammonia, chlorine residual, and total coliform. The effluent is monitored for all constituents with effluent limits, with frequencies ranging from continuous to monthly.

Effluent characterization monitoring is also required for an expanded list of constituents, monitoring monthly every other year.

The Regional Plant currently consists of mechanical bar screens, aerated grit removal, primary sedimentation, pure oxygen activated sludge aeration, secondary clarification, chlorine disinfection with de-chlorination, and a diffuser for river discharge. Solids handling consists of dissolved air flotation thickeners, gravity belt thickeners, anaerobic digesters and sludge stabilization basins with disposal on-site through land application or biosolids recycling facility.

In the future the Regional Plant will be modified, in both design and operation, in order to comply with requirements of Order R5-2010-0114-003. The permitted capacity will remain unchanged at 181 mgd. The Regional Plant will be modified by;

- Replacement of the existing pure oxygen biological treatment facilities with biological nutrient removal (BNR) air activated treatment facilities capable of removing ammonia and nitrate nitrogen,
- Addition of tertiary treatment in the form of filtration with granular media filters, and
- Increase in storage facilities.

The Regional Plant will continue to be staffed and operated 24 hours per day and will consist of mechanical bar screening, aerated grit handling, grit classifiers that wash and dewater grit, covered primary sedimentation tanks, primary effluent peak-shaving facilities, BNR air activated sludge treatment, nitrifying sequencing batch reactor for treating high ammonia concentration waste streams from solids storage basins and biosolids reclamation facility, secondary sedimentation, granular media filtration, disinfection with chlorine liquid, and de-chlorination with sodium bisulfite.

The BNR activated sludge treatment facilities will be designed to process up to 330 mgd. Flows in excess of 330 mgd will be stored in peak-shaving storage facilities and returned for processing through the activated sludge treatment facilities when capacity is available. All wastewater will receive secondary treatment through the BNRs. The tertiary filters will be designed to process flows up to 217 mgd. Order No. R5-2010-0114-003 implements seasonal disinfection requirements, as follows:

- May – 31 October. The Facility will be operated to meet Title 22 or equivalent disinfection criteria.
- November – 30 April (commences 1 November 2023); i. When discharge to the river is 217 mgd, or less: The entire treated effluent discharge will be filtered (tertiary filtration of BNR effluent to comply with Title 22 or equivalent disinfection criteria) or ii. When discharge to the river exceeds 217 mgd, discharge flows to the river up to 217 mgd will be filtered, and remaining wastewater will not be

filtered. Filtered and non-filtered wastewater will be combined prior to disinfection by the chlorination/de-chlorination facilities.

As per CIWQS, there were 92 violations to the permit, Regional San was issued 18 Notice of Violations during the study period, and issued two ACLCs (Order Nos. R5-2013-0502 and R5-2014-0554). Order No. R5-2013-0502 included discharges through August 2012 in the amount of $21,000, related to violations for manganese, dichlorobromomethane, chlorine residual, copper, and bis-(2-ethylhexyl) phthalate. Order No. R5-2014-0554 included discharges from September 2012 through March 2014 in the amount of $6,000, related to violations for temperature and ammonia.

Water Quality Issues and Data Review

The most significant wastewater constituents of interest to source water are microbial constituents, specifically *E. coli, Giardia,* and *Cryptosporidium*. During the study period, only *E. coli* data was available in the Sacramento metropolitan area. The *E. coli* levels were relatively low, but the most frequent and more significant *E. coli* peaks at the SRWTP intake, Discovery Park, and Freeport occurred during the winter months, as discussed in **Section 3**. Plots of coliform levels and local precipitation at the water treatment plant intakes show that high coliform levels are frequently associated with high precipitation, which are associated with high river flow events. There is a potential for wastewater discharges, from either the treatment plants or the collection systems, to impact source water coliform levels. A comparison of peak *E. coli* levels at the various monitoring sites to reported SSOs was conducted. There were 20 *E. coli* results greater than 200 MPN/100 mL at SRWTP and 14 at VSWTP; ten could possibly be related to local wastewater discharge events based on timing. **Table 4-28** presents the peak *E. coli* levels and the possible related wastewater discharges. SASD reporting through CIWQS does not provide exact locations for discharges.

City of Sacramento Combined Sewer System

Order No. R5-2015-0045 included Appendix F - Fact Sheet with a summary of the effluent water quality data from 2010 through 2014. The data show general compliance with the water quality effluent, with few violations (as discussed previously). A Water Quality Assessment was submitted to the Regional Board in June 2013 and it concluded that the CSS discharges do not impact the receiving water beneficial uses. Diazinon and chlorpyrifos were not detected in the effluent or the receiving water during the study period. Dissolved metals, instead of total metals, were used in the Reasonable Potential Analysis and they were determined to not be of concern. Total metals are significantly higher than the dissolved levels.

Table 4-28
***E. coli* and Wastewater or CSS Discharge Correlations**

Wastewater Discharge (gallons)			*E. coli* Monitoring (MPN/100 mL)		
Date	**Location/Discharger**	**Amount**	**Date**	**Location**	**Level**
11/24/11	SASD	15,400	11/28/11	SRWTP Intake	>2,400
1/21/12	CSS - Pioneer	24,700,000	1/25/12	VSWTP Intake	2,000
1/23/12	CSS - Pioneer	16,400,000			
3/19/12	SASD	1,120	3/19/12	SRWTP Intake VSWTP Intake	300 230
12/2/12	SASD	4,215	12/3/12	SRWTP Intake	2,400
11/30/12	CSS – Pioneer	37,600,000	12/3/12	VSWTP Intake	1,700
11/30/12	CSS – CWTP	27,800,000			
12/1/12	CSS – CWTP	64,000,000			
12/2/12	CSS – Pioneer	53,400,000			
12/2/12	CSS – Sump 2	3,800,000			
12/23/12	SASD	803	12/24/12	SRWTP Intake	1,396
12/24/12	SASD	155			
12/22/12	CSS – Pioneer	17,700,000	12/24/12	VSWTP Intake	1,300
12/23/12	CSS – Pioneer	42,600,000			
12/3/14	CSS – Pioneer	46,150,000	12/8/14	VSWTP Intake	500
12/3/14	CSS – Pioneer	62,250,000			
12/3/14	CSS - CWTP	8,000,000			
12/11/14	CSS - Pioneer	193,000,000	12/15/14	VSWTP Intake	1,300

Sacramento River Source Water Protection Program Activities

As part of the operation of the FRWA intake and the VSWTP, SCWA and EBMUD coordinate reverse flow condition operations closely with the City of Sacramento and Regional San.

The SRSWPP voluntary spill notification program in the Sacramento River watershed includes direct contact with, and obtaining voluntary notification from, wastewater agencies in the event of a potentially significant discharge (greater than 1,000 gallons) to the Sacramento River. This has been very effective at providing advance notification. This is discussed below in the Watershed Spills subsection.

WATERSHED SPILLS

Background

A hazardous material spill or leak into the river system could occur as a result of a vehicular traffic accident, railroad accident, pipeline leak or spill, wastewater treatment plant spill, or other incident. In the event of a leak or spill, timely notification is critical to

ensure that the water treatment plant operators are provided with sufficient time and information to best respond to potential treatment concerns or plan measures to protect the water supply. Formal notification to potentially impacted water utilities is provided by DDW, if DDW is apprised of a hazardous material spill with risk to drinking water through the Cal OES State Warning Center. The Sacramento River Water Utilities have established voluntary direct notification agreements and procedures to create additional assurance that each of the water treatment plants will receive notification in the event of a spill upstream of its intake.

Sewage spills typically occur during wet weather as a result of capacity exceedences, facility failures, or power outages affecting wastewater treatment plant operations, but they can also occur during other seasons. Wastewater treatment plants and collection system pipelines are present in the watershed and were previously discussed in the Wastewater subsection above as SSOs. Only selected events related to the SRSWPP Voluntary Spill Notification Program are discussed again herein.

Seasonal Patterns

Spills associated with vehicular traffic, railroads, and pipelines could occur at any time of the year.

Related Constituents

The most common spills are related to oil and petroleum products. Therefore, typical constituents of concern include VOCs and hydrocarbons. However, hazardous materials emergencies can involve a virtually infinite number of chemicals or chemical combinations.

Presence in the Watershed and Protection Zones

There are a tremendous number of roadways in the watershed, many of which cross either the rivers, creeks, or canals associated with the Sacramento River water supply. The main truck transportation routes through the watershed are Interstate 5 in the north-south direction and Interstate 80 and Highway 50 in the east-west direction. There are no restrictions on transport of hazardous materials in the watershed. The greatest threat is near bridge crossings because of the immediate potential for spilled material to enter the river system. There is also concern for the levee roads located along various reaches of the protection zones.

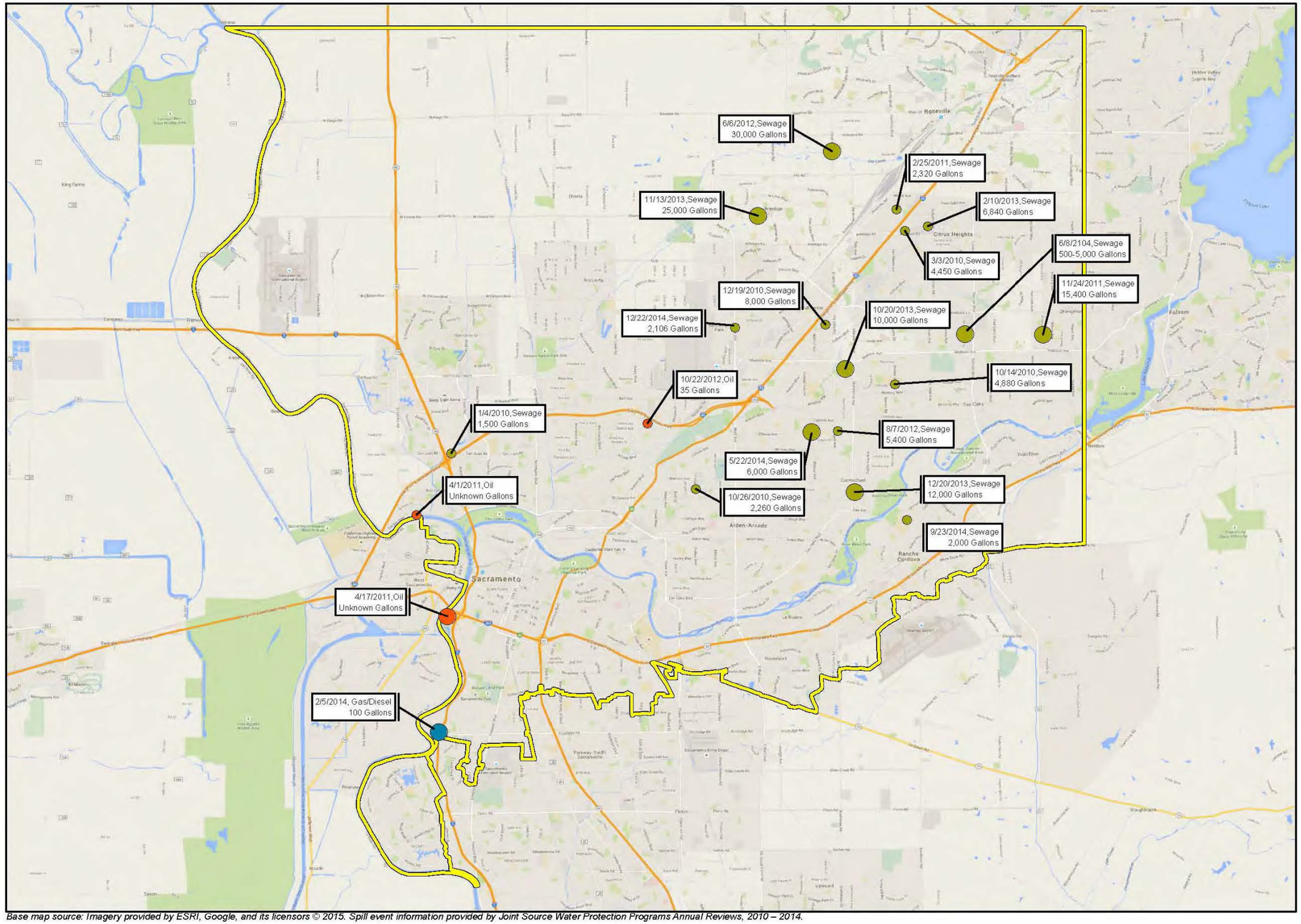
Union Pacific Rail Road (UPRR) and BNSF Railway Company own and operate the railroad tracks throughout Northern California. Both railroad lines are allowed to transport hazardous materials as long as they follow the Federal Department of Transportation guidelines for the transportation of hazardous materials. This includes an increase in the amount of Bakken crude oil transported into California via rail. Spills could occur at any time, and at any location.

Kinder Morgan owns a petroleum product pipeline that crosses the Sacramento River just downstream of the SRWTP and the petroleum product pipelines that cross the American River.

The Joint Sacramento and Lower American Source Water Protection Programs conduct an annual review of spills that were reported to the Cal OES in the seven counties upstream of Freeport, including Sacramento, Placer, El Dorado, Yolo, Sutter, Yuba, and Colusa counties. The annual reports were reviewed and it was found that there were 104 spills in 2010, 73 spills in 2011, 108 spills in 2012, 95 in 2013, and 109 in 2014 that reached receiving waters. A complete list of all the Cal OES-reported spill events in the near intake zone during the study period is provided in **Appendix D**. As part of preparing the summary of watershed spills, the list was narrowed 21 spills located within the near intake protection zones and they were plotted on a map to display the relative location and size of the event. This is shown on **Figure 4-7**. This mapping is not intended to provide any assessment of the relative risk of each of the spill events, rather just document the proximity to the existing drinking water treatment plants. The majority of spills were small or medium sized wastewater discharges. There was no pattern of repeating events.

Provided below are highlights of the various spill events noted on **Figure 4-7**.

- January 4, 2010: SASD had a wastewater collection system failure which resulted in approximately 1,500 gallons of untreated sewage being discharged into an unnamed creek and then into the Sacramento River via the Natomas East Main Drain. The participating water agencies have a voluntary notification agreement with SASD, but a call was not received on this spill event.
- March 3, 2010: SASD had a wastewater collection system failure which resulted in approximately 4,450 gallons of untreated sewage being discharged into Arcade Creek and then into the Sacramento River via the Natomas East Main Drain. The participating water agencies have a voluntary notification agreement with SASD, but a call was not received on this spill event.
- October 14, 2010: SASD had a wastewater collection system failure which resulted in approximately 4,880 gallons of untreated sewage being discharged into Verde Cruz Creek and then into the Sacramento River via the Natomas East Main Drain. The participating water agencies have a voluntary notification agreement with SASD, but a call was not received on this spill event.
- October 26, 2010: SASD had a wastewater collection system failure which resulted in approximately 1,420 gallons of untreated sewage being discharged into Chicken Ranch Slough and then into the American River. The participating water agencies have a voluntary notification agreement with SASD, but a call was not received on this spill event.



REGIONAL LOCATION



Near Intake Zone

Selected Spill Events*

Type, Category

- Gas/Diesel, Medium
- Oil, Medium
- Oil, Small
- Sewage, Medium
- Sewage, Small

Types	Small (gal)	Medium (gal)	Large (gal)
Gas/Diese	<42	43-100	>100
Oil	<42	43-100	>100
Sewage	1,000-10,000	10,001-50,000	>50,001

Map represents only the magnitude of the spill events.

N

0 1.25 2.5 Miles

Base map source: Imagery provided by ESRI, Google, and its licensors © 2015. Spill event information provided by Joint Source Water Protection Programs Annual Reviews, 2010 – 2014.

Figure 4-7. Selected Watershed Spills in the Near Intake Protection Zones

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- December 19, 2010: SASD had a wastewater collection system failure which resulted in approximately 8,000 gallons of untreated sewage being discharged into a storm drain and then into the Sacramento River. The participating water agencies have a voluntary notification agreement with SASD, and a call was received on this spill event.
- February 25, 2011: SASD had a wastewater collection system failure which resulted in approximately 2,330 gallons of untreated sewage being discharged into an unnamed creek and then into the American River. The participating water agencies have a voluntary notification agreement with SASD, but a call was not received on this spill event.
- April 1, 2011: A mile-long oil sheen on the Sacramento River near the Riverview Marina was reported by the public. This call went directly to Cal OES, and no notification was received by the participating water agencies on this spill event.
- April 17, 2011: A bubbling of petroleum in the Sacramento River near the confluence with the American River was reported by the public, expected to be from the Kinder Morgan pipeline crossing. This call went directly to Cal OES, and no notification was received by the participating water agencies on this spill event.
- November 24, 2011: SASD had a wastewater collection system failure which resulted in approximately 15,400 gallons of untreated sewage being discharged into a drainage channel and then into the American River via Arcade Creek. The participating water agencies have a voluntary notification agreement with SASD, and a call was received on this spill event.
- June 6, 2012: The Placer County Facility Services had a collection system failure caused by an air valve failure which resulted in approximately 30,000 gallons of raw sewage discharging to Dry Creek, and then into the Natomas East Main Drain Canal and the Sacramento River. The participating water agencies have a voluntary notification agreement with the Placer County Facility Services, and a call was received on this spill event.
- August 7, 2012: The SASD had a collection system failure which resulted in approximately 5,400 gallons of raw sewage discharging to a storm drain, and then into the Sacramento River. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.
- October 22, 2012: Sacramento Municipal Utility District had a power-pole failure that resulted in a transformer leaking approximately 30-35 gallons of petroleum product into a local storm drain, and then into the Sacramento River. The participating water agencies do not have a voluntary notification agreement with the District, but a call was received from them on this event.
- February 10, 2013: The SASD had a collection system failure which resulted in 8,034 gallons of raw sewage discharging to Cripple Creek, and then into the Sacramento River. The Cal OES report indicates that SASD was attempting to

contain the spill to Cripple Creek and it was recovered. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.

- October 20, 2013: The SASD had a collection system failure which resulted in approximately 10,000 gallons of raw sewage discharging to Arcade Creek, and then into the Sacramento River. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.
- November 13, 2013: The SASD had a collection system failure which resulted in approximately 25,000 gallons of raw sewage discharging to Goat Creek, and then into the Sacramento River. The Cal OES report indicates that SASD contained the spill to Goat Creek and it was recovered. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.
- December 20, 2013: The SASD had a collection system failure which resulted in approximately 12,000 gallons of raw sewage discharging to a storm drain, and then into the American River. The Cal OES report indicates that cleanup was in progress and it would be recovered to the sewer. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.
- February 5, 2014: Caltrans District 3 reported a vehicular accident including a semi-truck that resulted in approximately 100 gallons of fuel being discharged into a storm drain near Interstate 5 at Seamas Road in Sacramento. It was not recovered and is assumed to have eventually flowed to the Sacramento River. The participating water agencies have a voluntary notification agreement with Caltrans, but no call was received on this spill event.
- May 22, 2014: The SASD had a collection system failure which resulted in approximately 6,000 gallons of raw sewage discharging to Arcade Creek, and then into the Sacramento River. It is unclear if any was recovered. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.
- June 8, 2014: The SASD had a collection system failure which resulted in between 500 and 5,000 gallons of raw sewage discharging to a storm drain, and then into the Sacramento River. It is unclear if any was recovered. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.
- September 23, 2014: Sacramento County Environmental Health Hazmat reported a discharge of approximately 2,000 gallons of sewage to a storm drain that leads to the American River. Cleanup occurred, but it was uncertain how much may have reached the surface water. The participating water agencies have a voluntary notification agreement with the Sacramento County, but no call was received on this spill event.

- December 22, 2014: The SASD had a collection system failure which resulted in 2,106 gallons of raw sewage discharging to a storm drain, and then into the Sacramento River. It is unclear if any was recovered. The participating water agencies have a voluntary notification agreement with the SASD, but no call was received on this spill event.

Regulation and Management

UPRR inspects the train tracks regularly and conducts inspections whenever a problem is detected. There have also been improvements to the train tracks in areas where there have been historical problems, such as in the mountains along the American River, Feather River, and Sacramento River.

The California Department of Forestry and Fire Protection, Office of the State Fire Marshal, Pipeline Safety Division currently regulates the safety of intrastate hazardous liquid transportation pipelines. Staff inspect pipeline operators to ensure compliance with federal and state pipeline safety laws and regulations. The Division is also responsible for the investigation of all spills, ruptures, fires, or pipeline incidents. California pipeline safety standards exceed the minimum federal standards by mandating that a pipeline system be hydrostatically tested before initial operation begins; they must then be tested at least every five years by an independent third-party approved by the Division. In these hydrostatic tests the hazardous liquid is removed from the pipe and replaced with water. The pipe is then pressurized to 125 percent of the maximum pipeline operating pressure and held for eight hours. Testing results are submitted to the Division for review and concurrence. Tests are randomly witnessed by Division engineers. In certain cases, the Division has approved the use of internal inspection tools "smart pigs" in lieu of hydrostatic testing. In these cases, the test results are also submitted to the Division for review and concurrence. Kinder Morgan has installed cathodic protection on each of these pipelines. The lines are inspected regularly and are also inspected whenever a problem is detected or construction occurs near the pipelines. Kinder Morgan monitors the pipelines for spills by checking for pressure changes along the pipeline and also by comparing flow in and flow out. If these show discontinuities, the pipeline is inspected.

When a hazardous material spill or leak of a reportable quantity occurs, notification to emergency response agencies is required by state and federal law. In California, Cal OES Hazardous Materials Section coordinates statewide implementation of hazardous materials accident prevention and emergency response programs for all types of hazardous materials incidents and threats. In response to any hazardous materials emergency, the Section staff is called upon to provide state and local emergency managers with emergency coordination and technical assistance.

A sewage spill is required to be reported if 1,000 gallons or more are released, and any amount that reaches a water of the United States. An oil or petroleum product spill is required to be reported if 42 gallons or more are released. Any other hazardous material spill is required to be reported if there is a reasonable belief that the release

poses a significant present or potential hazard to human health and safety, property, or the environment.

Notification must also be made to the Cal OES State Warning Center for the following:

- Discharges that may threaten or impact water quality.
- Discharges of any hazardous substances or sewage, into or on any waters of the state.
- Discharges or threatened discharges of oil in marine waters.
- Discharges of oil or petroleum products, into or on any waters of the state.
- Any spill or other release of one barrel or more of petroleum products at a tank facility.
- Hazardous Liquid Pipeline releases and every rupture, explosion or fire involving a pipeline.
- Any found or lost radioactive materials.

Other considerations for reporting to Cal OES State Warning Center include discharges such as:

- Biological agents;
- Infectious wastes;
- Industrial and Agricultural chemicals (pesticides, herbicides, fungicides, etc.);
- Explosives; or
- Air contaminants.

Hazardous Materials Incidents are Classified in the following descriptions, consistent with *NFPA 471: Recommended Practice for Responding to Hazardous Materials Incidents (1997 Edition)*:

- Level One Incident (Minor): An incident that can be easily handled using resources immediately available to first responders having jurisdiction. Significant human health and safety and/or environmental issues do not arise.
- Level Two Incident (Moderate): An incident that is beyond the capabilities of a local jurisdiction that may require the use of mutual aid, either for operational assistance or logistical support. A declaration of a local emergency may be issued, a Governor's Proclamation may be issued, and the local Emergency Operations Center (EOC) may be partially or fully activated. Human health and safety and/or the environment are affected.

- Level Three Incident (Major – Catastrophic): An incident that significantly exceeds local capabilities. Considerable environmental and/or public health impacts have occurred or are expected. A local emergency is usually declared; a Governor's Proclamation may be issued, along with a request for a Presidential Declaration; and the local EOC and the State Operations Center are fully activated.

When a hazardous material spill or leak occurs, it is the owner's or operator's responsibility to notify the local designated emergency response agency, which is called the Certified Unified Program Agency (CUPA), as well as the Cal OES. There are 19 CUPAs governing discharges that enter the watershed. They are responsible for the following local "unified programs":

- Hazardous Materials Release Response Plans and Inventories
- California Accidental Release Prevention Program
- Underground Storage Tank Program
- Aboveground Petroleum Storage Act Program
- Hazardous Waste Generator and Onsite Hazardous Waste Treatment (tiered permitting) Programs
- California International Fire Code: Hazardous Material Management Plans and Hazardous Material Inventory Statements
- Hazardous waste generator regulation, including most of the state's "tiered permit" requirements.
- California Accidental Release Prevention program.

Cal OES Oil by Rail

Historically oil has come into California for refining by marine vessels. California is the third-largest refining state in the US. Cal OES expects a significant increase in the quantity of oil being delivered in to California by rail. The oil is coming from increased drilling in Canada and North Dakota. Between 2012 and 2013 there was an increase of approximately five million barrels of oil delivered to California by rail. Cal OES is currently projecting that quantity to increase to 150 to 200 million barrels annually. The oil being shipped from Canada and North Dakota, specifically the Bakken Shale production area, is unique in that it is highly flammable "light" crude oil, known as Bakken Crude oil. There have been numerous rail accidents associated with the Bakken Shale that have been more devastating due to the flammable nature of the oil. This quality of the Bakken Crude oil has raised concern over the potential for increased risk of derailments, explosions, fires, accidental releases, and the potential for crimes and terrorist acts.

The US Department of Transportation issued an Emergency Order (DOT-OST-2014-0067) in May 2014 that requires transporters to provide notification to States if they intend to ship greater than 1,000,000 gallons of Bakken Shale through them. The transporters are required to disclose the number of trains, per week, per county. The Cal OES, Fire and Rescue Branch, Hazardous Materials Section manages California's Oil by Rail program and receives these notifications. Cal OES has identified all the possible oil by rail routes in the State and the location of the various types of certified Hazardous Materials teams that could respond to an incident. These are shown in **Figure 4-8**.

There are two transporters in the Sacramento River watershed: UPRR and BNSF Railway Company. Cal OES then shares the notifications with the public and first responders by posting on its website. First responders are required to be prepared for any emergency incidents. To date, there have been a few notifications provided to Cal OES for the railway lines in Northern California. Notifications are not required for smaller loads (less than 1,000,000 gallons) or blended oils, so it is uncertain how accurate and effective the notification requirement is.

Cal OES State Warning Center

There is a 24-hour telephone number for the Cal OES State Warning Center. The Cal OES State Warning Center is a single point of notification for all state agencies, as well as federal and local agencies. When spill information is received, the Cal OES State Warning Center will assign a spill control number to the incident that can be used to track various activities associated with the incident.

At a minimum, the Cal OES State Warning Center is looking for this information:

- Who is making the notification and who is the responsible party, if different - name, address, and phone number;
- Where did the release occur? (exact location, address, and county)
- What was the material involved in the release/threatened release?
- What was the quantity released/threatened to be released?
- What are the potential hazards presented by this release/potential release, if known?
- How did the release happen?
- Whether or not a body of water is affected.
- Local agencies that are on-scene and/or notified.
- What containment and/or cleanup actions have been taken?



Figure 4-8. Cal OES Oil By Rail Routes and Hazardous Materials Teams

Figure 4-9 illustrates the decision-making process for determining emergency response notification requirements if an incident occurs. **Figure 4-10** illustrates the decision-making process for notification, and the list of agencies that are contacted by the Cal OES State Warning Center. It should be noted that in the event of a hazardous materials incident, the Cal OES State Warning Center can also assist responding agencies in contacting other response agencies during business hours and after-hours.

On July 1, 2014, the administration of the California Drinking Water Program was transferred from the Department of Public Health to the State Board. This transfer was done to align the state's drinking water and water quality programs to effectively protect water quality and the public health as it relates to water quality, while meeting current needs and future demands on water supplies. With regard to emergency notification the procedures have not changed, just a revision to the names of the programs being notified.

State Board/Regional Board

Notification Requirements for Cal OES Notification to the State Board/Regional Board: Immediate verbal notification is required by the Cal OES State Warning Center to the Regional Board of all hazardous materials spills that enter or threaten to enter in, or on, any waters of the state.

Follow-up Reports: A Damage Assessment Report or Remedial Action Plan may be required of the responsible party. The responsible party will also report accumulated petroleum and heavy metal concentrations in drainage systems to the Cal OES State Warning Center via written follow-up reports.

Capabilities and Limitations: Support functions include the following:

- Conduct water sampling, analysis, and monitoring activities to assist in hazardous materials release evaluation and mitigation.
- In cooperation with DTSC, designate sites for disposal of hazardous materials.
- Assist DDW in advising water users of potential adverse impacts of a spill.

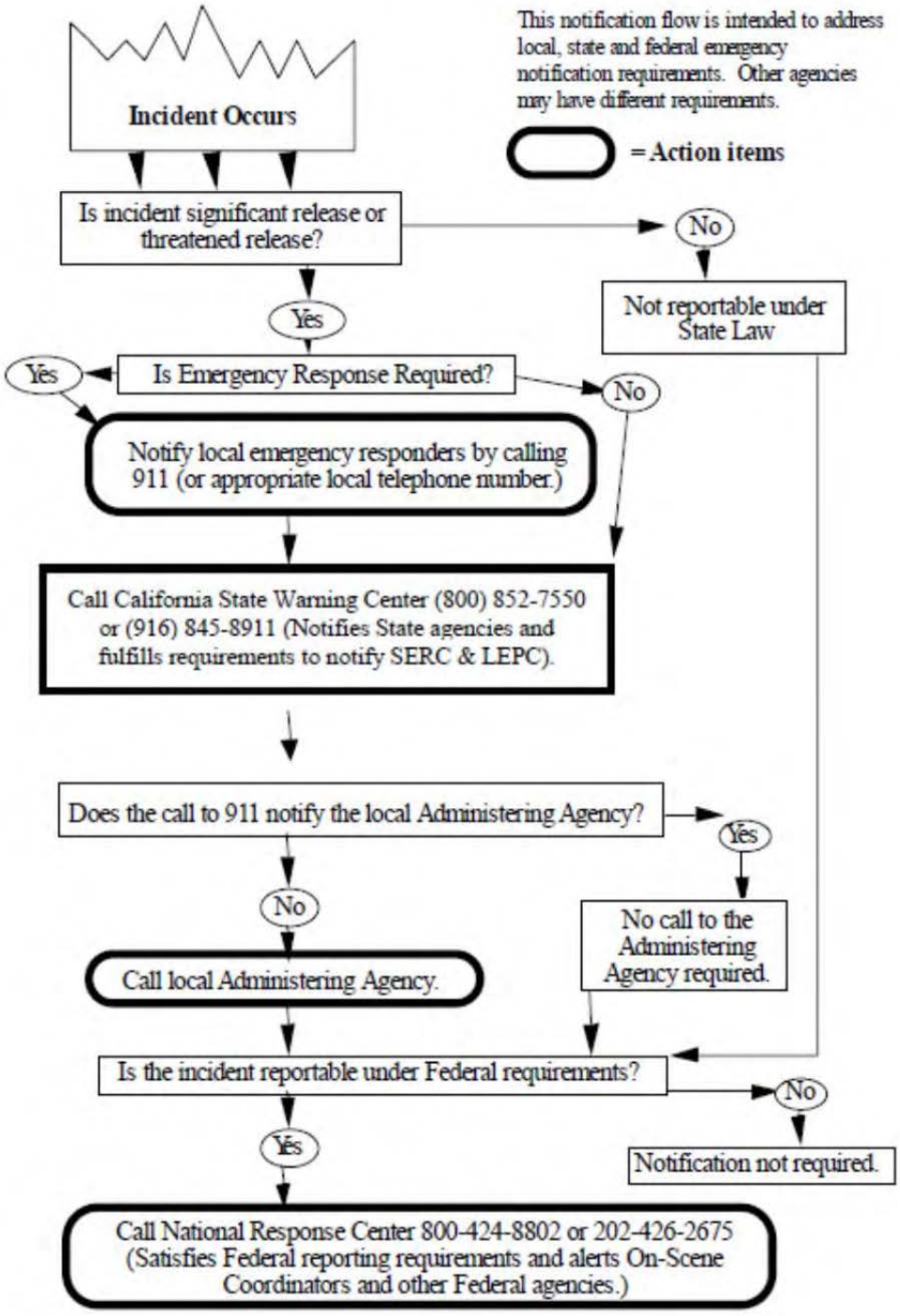


Figure 4-9. Cal OES State Warning Center Notification Determination

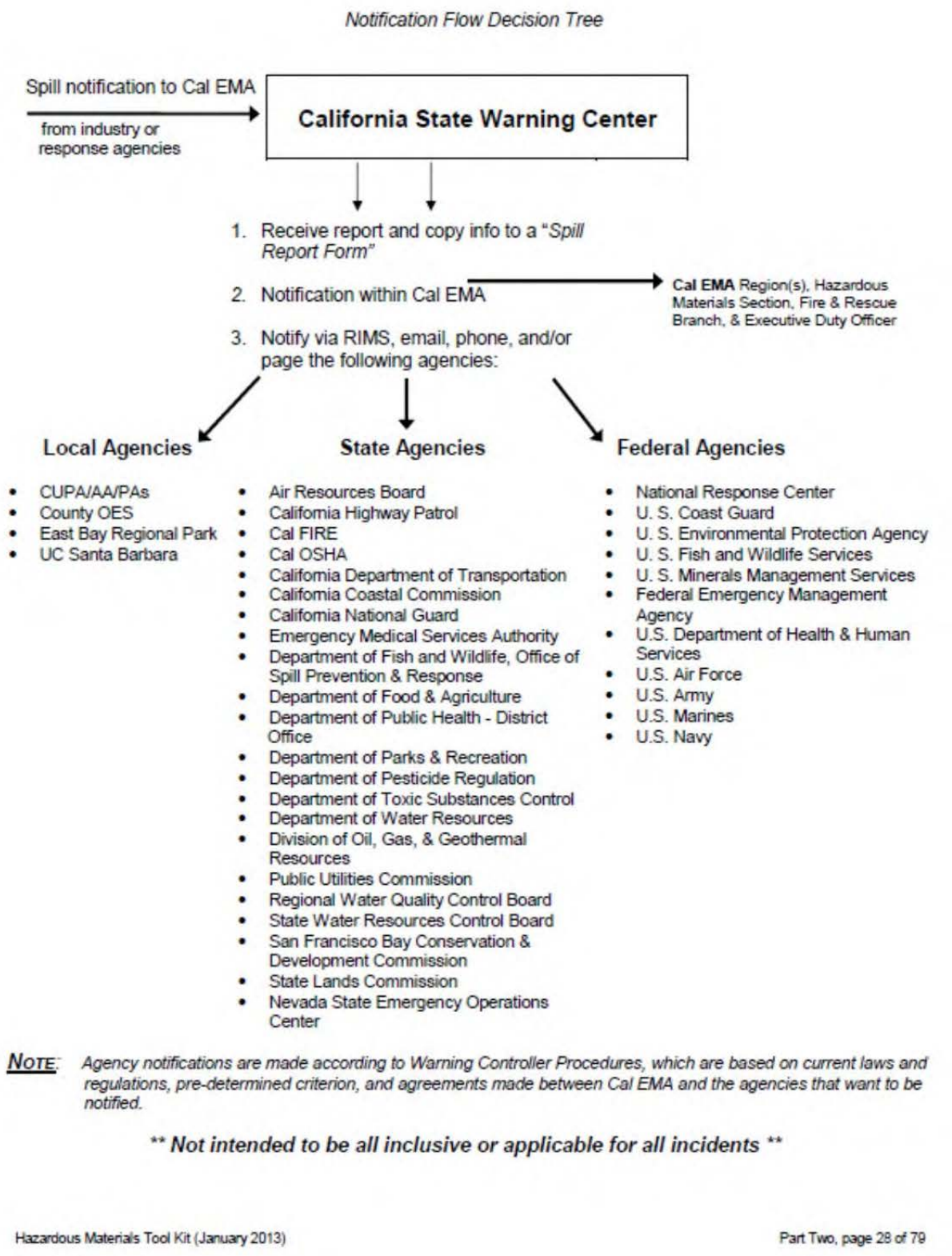


Figure 4-10. Cal OES State Warning Center Notification Flow Decision Tree

State Board, Division of Drinking Water

The DDW has statutory responsibility for the regulation of public water systems to ensure that drinking water is safe, wholesome, and potable. In the event of a hazardous materials spill or threatened release which affects a public water system or source of drinking water such as a lake, river, or aqueduct, the DDW Duty Officer is notified of the impact to the source. Generally, Cal OES makes this determination if Section 2.k. "Drinking Water Impacted" is reported as "Yes" by the notifying entity on the Hazardous Materials Spill Report. (Often, this is reported as "Unknown".) The DDW Duty Officer would then notify the DDW Duty Officer of the spill. The DDW Duty Officer then notifies the DDW District Engineer for the impacted source. The District Engineers have call down lists to assist with notifying DDW staff engineers and water utilities. District Engineers will work with the water utility to prevent contamination of the water system. The District Engineers will also issue recommendations to the public in coordination with the utility and local health department to prevent use of contaminated water.

Notification Requirements for Cal OES Notification to DDW: Immediate verbal notification is required for radioactive material incidents; releases involving a public water system or drinking water source; releases affecting a food, drug, medical device, cosmetic, or bottled water manufacturer or wholesaler; or significant releases affecting a large population or involving deaths, serious injuries, evacuations or in-place sheltering.

Response Information Management System (RIMS)

Cal OES developed the RIMS as part of the development of the State's Standardized Emergency Management System (SEMS). This was developed in response to the US Department of Homeland Security's National Incident Management System (NIMS). NIMS was developed so responders from different jurisdictions and disciplines can work together better to respond to natural disasters and emergencies, including acts of terrorism. NIMS benefits include:

- Unified approach to incident management;
- Standard command and management structures; and
- Emphasis on preparedness, mutual aid, and resource management.

The purpose of RIMS is to provide a single point for tracking the status and progress of hazardous materials spills statewide; this is the Spill/Release Reporting notification website. Only registered users can input data into the website, but anyone can access the website to review current or archived Cal OES cases. The current cases can be accessed at:

http://w3.calema.ca.gov/operational/malhaz.nsf/$defaultview

Water Quality Issues and Data Review

A review of the available water quality data, as presented in **Sections 3** and **5** showed that detections of organic constituents in ambient samples did not coincide with the watershed spills in the RIMS website. Also, none of the water treatment plants had detects of organic constituents. A separate discussion was presented in the Wastewater subsection previously for the wastewater related spill events.

Sacramento River Source Water Protection Program Activities

Because the potential for spills exists, the cities of West Sacramento and Sacramento, SCWA, and EBMUD have established their own voluntary spill notification program consisting of direct notification and inter-notification agreements, internal procedures for routing of spill information, and internal response procedures. WCDWA joined the program in 2015. The City of Sacramento, SCWA, and EBMUD also conduct a voluntary spill notification program for the Lower American River, along with Carmichael Water District.

Establishing direct notification agreements with upstream CUPAs and various other emergency response agencies provide additional opportunity for the water treatment plants to receive timely notification in the event of a spill upstream of their intakes. These notification agreements are voluntary and extend upstream on the Sacramento River to Colusa and Sutter Counties and include all CUPAs on the American River system, except El Dorado County Environmental Management Department. This program also includes voluntary direct notification agreements with other upstream facilities that are potential responsible parties for a spill incident such as wastewater treatment plants and wastewater collection systems with facilities along the river system. State and Sacramento County parks and recreation departments and water related agencies with field staff who may observe contamination from hazardous spills have also agreed to provide notification.

The Lower American River and Sacramento River Voluntary Spill Notification programs conduct an annual review of their program. This includes; updating contacts for all of the emergency response, wastewater, and other notifying agencies on the Emergency Notification Charts, dry runs, and a table top exercise for the Sacramento River water utilities. They also coordinate with the American River Water Utilities Voluntary Spill notification program. A special coordination meeting was held with the Sacramento County Environmental Health Department, the City of Sacramento Fire Department, and the Sacramento Regional Communication Center to improve coordination and communication.

The City of Sacramento has created a River Travel Time tool to assist in roughly estimating travel times for spills on the Lower American River and Sacramento River. The tool materials can also be used to estimate concentrations and provide resources for response. Outreach was conducted to the National Oceanic and Atmospheric

Administration to obtain a better understanding of available travel time models for the Sacramento Valley.

In addition, the City of Sacramento has developed numerous documents and tools for its water treatment plant operators to assist in locating spills, waterways, and wastewater treatment plants, as well as responding to spill events. This included a potential contaminating activity table and associated map for the near-intake protection zones, updated table and map of wastewater dischargers in the Sacramento Valley, and a written summary for water treatment plant operators to locate a wastewater spill or SSO in the watershed. The City of Sacramento shares various information with other Sacramento and American River water utilities.

SPECIAL TOPICS

Population Growth

Growth trends were examined in order to identify the potential long-term impacts of growth on the related potential contaminant sources being investigated. The estimated total population of the counties in the Sacramento River watershed was over 3.1 million in 2014**.** Much of the growth has occurred as extensions of existing urban areas.

The total population of the counties in the Sacramento River watershed for 2005, 2009, and 2014 is shown in **Table 4-29.** Overall, there was only a two percent increase in population in the past five years (2009 – 2014), which was a slower growth rate than the previous five year period (2005 – 2009). The greatest decreases were seen in the mountain counties: Lassen, Modoc, Nevada, Plumas, and Sierra. These counties are furthest from the intakes and above the major reservoirs. The greatest increases were seen in Placer and Sacramento counties. These counties are closest to the intakes.

Table 4-30 provides information on population projections by the Department of Finance through 2060. The population of the counties within the watershed is projected to increase approximately 47 percent, to nearly 4.5 million, during the next 45 years. These projections have been revised down from the projections in the 2010 Update.

This increasing human population in the watershed will likely mean an increasing urbanization of the watershed as well as the potential for new industrial discharges. The change in land use may be significant in terms of the potential contaminating activities and resultant impact on source water quality. It is uncertain as to whether this shift will result in quantifiable changes in source water quality. Most of the potential contaminating activities in the watershed are regulated now, so that should minimize the impact of growth. As development occurs in the middle and upper watershed it will be important for upstream communities to implement measures to protect water quality, such as those identified in the Phase II MS4 permits like source controls, encouraging low impact development, and potentially implementing hydromodification management.

Table 4-29
Population Change in Watershed Counties[1]

County	January 2005	January 2009	January 2014	Five Year Change	Nine Year Change
Butte	214,422	220,748	222,901	1%	4%
Colusa	20,892	21,997	21,783	-1%	4%
El Dorado	172,987	180,185	183,287	2%	6%
Glenn	28,068	29,239	28,694	-2%	2%
Lassen	35,001	35,550	32,367	-9%	-8%
Modoc	9,636	9,698	9,481	-2%	-2%
Nevada	98,464	98,718	97,823	-1%	-1%
Placer	307,987	339,577	366,678	8%	19%
Plumas	21,100	20,632	19,682	-5%	-7%
Sacramento	1,368,333	1,433,187	1,456,230	2%	6%
Shasta	177,804	183,023	178,742	-2%	1%
Sierra	3,492	3,358	3,125	-7%	-11%
Siskiyou	45,489	45,973	45,311	-1%	0%
Sutter	88,762	96,554	95,739	-1%	8%
Tehama	59,876	62,836	64,209	2%	7%
Yolo	188,207	200,709	208,246	4%	11%
Yuba	67,165	72,900	73,690	1%	10%
TOTAL	**2,907,685**	**3,054,884**	**3,107,988**	**2%**	**7%**

[1] Based on data from the California Department of Finance

Table 4-30
Population Projections for the Watershed Through 2060

County	2010	2020	2030	2040	2050	2060	Net Change
Butte	220,273	236,936	254,725	267,852	276,117	286,660	30%
Colusa	21,642	24,291	27,258	29,688	31,327	32,581	51%
El Dorado	181,567	190,850	201,509	208,092	206,977	205,052	13%
Glenn	28,292	30,466	32,945	34,959	36,729	38,648	37%
Lassen	35,030	36,386	38,224	39,073	39,891	40,941	17%
Modoc	9,802	9,691	9,852	9,770	9,343	8,875	-9%
Nevada	98,938	101,767	108,111	111,885	115,350	121,517	23%
Placer	350,230	396,203	447,625	509,936	566,954	620,037	77%
Plumas	20,098	19,284	19,256	18,419	17,485	17,037	-15%
Sacramento	1,421,236	1,554,022	1,730,276	1,912,838	2,047,662	2,153,833	52%
Shasta	177,538	187,524	202,156	212,264	220,252	228,897	29%
Sierra	3,319	3,174	3,008	2,830	2,697	2,677	-19%
Siskiyou	45,019	46,217	47,013	46,445	44,920	44,148	-2%
Sutter	95,085	105,107	120,071	137,228	153,462	170,377	79%
Tehama	63,710	67,336	71,118	73,196	73,975	75,460	18%
Yolo	201,651	219,415	241,898	267,268	285,453	298,451	48%
Yuba	72,498	81,467	95,445	110,285	122,049	130,166	80%
Watershed	**3,045,928**	**3,310,136**	**3,650,490**	**3,992,028**	**4,250,643**	**4,475,357**	**47%**

[1] Based on data from the California Department of Finance

Central Valley Regional Water Quality Control Board Policies and Programs

There are three Regional Board policies or programs that are currently of key interest to drinking water utilities: the Drinking Water Policy for Surface Waters of the Delta and Its Upstream Tributaries, the MUN Beneficial Use Designation Programs, and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS). Each of these has the opportunity to affect the management of receiving waters in the Central Valley, which could then result in impacts to source water quality. Some of the participating water agencies have been acting as stakeholders in the development of these policies or programs to ensure the long-term protection of the MUN Beneficial Use.

Drinking Water Policy for Surface Waters of the Delta and Its Upstream Tributaries

The Regional Board has adopted the Basin Plan Amendment to Establish a Drinking Water Policy for Surface Waters of the Delta and Its Upstream Tributaries (Drinking Water Policy). This policy was developed as required by the CALFED ROD for the Programmatic Environmental Impact Report/Environmental Impact Statement (EIR/EIS). Many constituents that threaten drinking water supplies are addressed in the Basin Plans, so this policy focused on high priority constituents that were not addressed: salt (including bromide), nutrients, organic carbon, and pathogens such as *Cryptosporidium* and *Giardia*. In 2010, the Regional Board directed staff to focus the

policy on organic carbon, *Cryptosporidium,* and *Giardia* as the other constituents were being addressed in other programs.

The Drinking Water Policy addresses organic carbon by modifying the Basin Plan to clarify the existing water quality objective for chemical constituents with a footnote stating that the existing objective applies to drinking water chemical constituents, such as organic carbon. During the course of work to develop the policy, source control evaluations were conducted based on 2011 permit conditions for publicly owned treatment works, urban runoff, and irrigated agriculture these indicated that concentrations of organic carbon at public water system intakes are not projected to increase through the 2030 planning horizon.

The Drinking Water Policy addresses pathogens by establishing a new narrative water quality objective for *Cryptosporidium* and *Giardia* to protect the public water system component of the MUN beneficial use. This narrative water quality objective for *Cryptosporidium* and *Giardia* is only applied within the Sacramento-San Joaquin Delta and its tributaries below the first major dams. Compliance with this objective will be assessed at existing and new public water system intakes.

The Drinking Water Policy requires an Implementation Program for the proposed narrative water quality objective for *Cryptosporidium* and *Giardia* that describes the actions that the Regional Board will take to maintain existing water quality if trigger values for *Cryptosporidium* are exceeded at water treatment plant intakes and the impacted water agency requests Regional Board action. **Table 4-31** shows the 2013 Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) bin classifications and the 80 percent trigger levels.

Table 4-31
***Cryptosporidium* Ambient Trigger Exceedence**

Bin	Maximum Running Annual Average (oocysts/L)	80 Percent Trigger (oocysts/L)
1	< 0.075	0.06
2	0.075 to < 1.0	0.80
3	1.0 to < 3.0	2.40

If *Cryptosporidium* monitoring data from an existing public water system intake indicate that the maximum running annual average (MRAA) has reached 80 percent of the next highest bin, as existed in 2013, the affected public water system may request that the Regional Board initiate an investigation. If the affected public water system requests assistance, the Regional Board should coordinate with DDW, the affected public water system, and potential sources to assess the data and evaluate the need to conduct source evaluations and implement control options. The Delta RMP is performing a pathogen study to support any findings of trigger exceedences during the current LT2ESWTR assessment period.

MUN Beneficial Use Designation Programs

The State Board Sources of Drinking Water Policy (Resolution No. 88-63) designates the MUN beneficial use to all water bodies unless they are specifically listed in the Basin Plan as water bodies that are not designated with MUN. Beneficial uses are designated by the State and Regional Boards to receiving waters to protect the use of the waterbody for that purpose. The MUN use is defined as; "*Uses of water for community, military, or individual water supply systems, including, but not limited to, drinking water supply."* The State Board defines the principal issues for municipal water quality as protection of public health, the aesthetic acceptability of water, and economic impacts of treatment and quality[11].

The Policy does contain exceptions to remove the MUN designation, including;

- Sources with high total dissolved solids, untreatable contamination, or low yield,
- Surface waters designed or modified to collect or treat municipal or industrial wastewaters, process waters, mining wastewaters, or stormwater runoff, and
- Surface waters designed or modified for the primary purpose of conveying or holding agricultural drainage waters.

The second two exceptions also require "…that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards". In order to utilize the exception the Basin Plans require ". . . a formal Basin Plan amendment and public hearing, followed by approval of such an amendment by the State Water Board and the Office of Administrative Law." There had been no use of these exceptions in the Sacramento River watershed upstream of Freeport. The Basin Plans state that waters designated for MUN Beneficial Use must not exceed the Title 22 MCLs for all primary and secondary standards.

Four POTW in the Sacramento Valley, which discharge to agricultural drains, were having difficulty in meeting NPDES permits with limits for the MUN beneficial use so the Regional Board determined to use the third exception to de-designate the MUN beneficial use from the effluent receiving waters. The SRSWPP has participated in the stakeholder group for this program since 2013 to advocate for protection of the downstream MUN beneficial use. The Regional Board adopted Order No. R5-2015-0022 to amend the Basin Plan to remove the MUN designation from 12 waterbodies associated with the four POTW discharges. The Order de-designated MUN beneficial use but did not include any new monitoring requirements, rather it relies on existing programs to assess downstream impacts. The SRSWPP assessed the quality and quantity of the four POTW discharges included in the Order determined that there was a low likelihood of a significant impact to source water quality of the Sacramento River; however, the SRSWPP provided significant comment to the Regional Board on a variety

[11] http://www.swrcb.ca.gov/rwqcb2/water_issues/programs/planningtmdls/basinplan/web/bp_ch2.shtml

of concerns on the proposed Order because of the Regional Board's plan to use the approach as a template for a region-wide MUN de-designation process.

As part of the CV-SALTS initiative, the Regional Board has identified the need to evaluate the protection of MUN beneficial uses in all agriculturally dominated water bodies in the Central Valley, not just those containing agricultural drainage waters and meeting the Sources of Drinking Water Policy exceptions. This could potentially include over 6,000 waterbodies in the Central Valley. This second phase of the MUN beneficial use designation program is a region-wide effort and is currently in development. The SRSWPP is also actively involved in this program in an effort to protect the downstream beneficial use and has provided significant input and comment on documents prepared by Regional Board staff. Key concerns relate to definitions of a new Limited MUN beneficial use and associated water quality objectives, creation of a robust implementation program, and adequacy of anti-degradation protection and analysis.

Central Valley Salinity Alternatives for Long-Term Sustainability

The purpose of the CV-SALTS program is to develop a Central Valley Wide Salt and Nitrate Management Plan to incorporate into the Basin Plan. The constituents of primary concern in the program include salts and nutrients, which are not currently of priority concern for surface water diverted from the Sacramento River for the participating water agencies. However, as part of developing salt and nitrate management efforts the Regional Board has decided to consider evaluation of the applicability of the secondary drinking water standards to discharges as part of the Basin Plan. The SRSWPP have provided consistent comment to the Regional Board that non-salinity secondary MCLs should not be included in this program.

The Regional Board is developing a Strawman Proposal on Revisions to Water Quality Objectives for Secondary MCLs to include in the Salt and Nitrate Management Plan. The most current version of the Strawman (August 2015) proposes to remove the references to the Title 22 secondary MCL sections (Section 64449) from the Basin Plan water quality objective section. This would include all of the secondary MCLs, including thiobencarb, iron, and manganese, not just the ones related to salinity. There is added text to prohibit exceedence of the maximum values at "…legally-authorized intake structures…", unless authorized by the Regional Board. The SRSWPP is continuing to participate as an active stakeholder to advocate for removal of the non-salinity secondary MCLs and protect the downstream MUN beneficial use.

Potential Future Central Valley Water System Modifications and Impacts

There are three key areas that may result in potential future modifications to the Central Valley water system that could result in an impact to source water quality; climate change, DWR mitigation and adaptation strategies, and Delta Management Programs. Each of these is discussed in brief below and then a summary of the potential impacts on source water quality and treatability is presented. Some of the participating water

agencies have been tracking these topics and prepared periodic updates on their status and potential for input.

Climate Change

Climate is defined as expected average conditions, plus the characteristic range of variability of those conditions. Therefore, climate change is the expected difference in the likelihood of types of weather events. The climate system includes the atmosphere, oceans, ice, land, vegetation, and freshwaters. A change in any part of the system can cause global and regional changes to climate. The sun is the energy source that drives the climate system. Greenhouse gases (GHGs) include water vapor, carbon dioxide, methane, nitrous oxides, and human-made chemicals such as chlorofluorocarbons. As these GHGs are emitted into the atmosphere they trap infrared radiation in the atmosphere and cause increases in air, land, and water temperatures, also known as global warming.

International Assessments

The United Nations Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by two organizations: the World Meteorological Organization and the United Nations Environment Program. The purpose of the IPCC was to evaluate the risk of climate change caused by human activity. Five assessment reports have been completed by the IPCC since its inception. In its Fourth Assessment Report: Climate Change 2007, the IPCC confirmed dramatic changes to our water resources and identified GHG emissions as the predominant contributor to global warming and resulting regional climate change. IPCC completed its Fifth Assessment Report, with the Synthesis Report of the various workgroup reports, in November 2014.

IPCC Fourth Assessment Report

The IPCC's Fourth Assessment Report presented the Earth's average temperature data over 140 years. The data showed that since the late 1970s there has been a consistently increasing trend in temperature, about 1.3 degrees Fahrenheit (°F) over the 20th century. This increasing trend has been accelerating faster in more recent years. The IPCC concluded in the report that within 90 percent certainty the warming over the last 50 years is human induced, attributable to the increased level of GHGs in the atmosphere. The IPCC documented seven global temperature models that estimate the Earth's average temperature, with the increase ranging from 2.7 to 8.1°F over the next century. Some regional models show temperatures in California increasing as much as 10.8°F. If the Earth's temperature rises, it is expected that water demands would increase and that could result in a longer season of peak treated water demands. It is also possible that increased demands would need to be met through the use of alternate sources, such as recycled water.

IPCC Fifth Assessment Report

The IPCC's Fifth Assessment Report also concluded that GHG concentrations contributed to a global mean surface warming, likely to be between 0.9 and 2.3 °F over the period 1951 to 2010. This evidence for human influence has grown since the Fourth Assessment Report. Improved modeling conducted for the Fifth Assessment showed with medium confidence that the increase of global mean surface temperature for the period 2016 to 2035 relative to 1986 to 2005 will likely be in the range of 0.5 to 1.3°F. It is virtually certain that there will be more frequent hot, yet fewer cold, temperatures extremes over most land areas on daily and seasonal timescales as global mean temperatures increase. It is very likely that heat waves will occur with a higher frequency and duration. Extreme precipitation events are projected to become more intense and frequent in many regions.

Many climate stresses such as severe heat, heavy precipitation, and declining snowpack are projected to increase in frequency and/or severity in North America in the next decades. Evidence collected since the Fourth Assessment Report highlights increased vulnerability for forest ecosystems through wildfire activity, regional drought, high temperatures, and infestations.

The report states that in many regions changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality (medium confidence). In urban areas, climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise, and storm surges (very high confidence).

National Assessments

United States Environmental Protection Agency

Climate Change Indicators in the United States:

In May 2014, the USEPA released the third edition of a report, *Climate Change Indicators in the United States*. The report demonstrates that climate change is already affecting our environment and our society. The report contains over 80 maps and graphs showing long-term trends of key environmental measures, including US and global temperature and precipitation, ocean heat and ocean acidity, sea level, length of growing season, and many others. As this report is a national assessment, the figures cannot be used to extract exact data for the Sacramento River watershed, but the report shows evidence that:

- Average temperatures have risen across the contiguous 48 states since 1901, with an increased rate of warming over the past 30 years. Seven of the top ten warmest years on record have occurred since 1998. For the Sacramento River

watershed, the report indicates a 1-2°F increase in the last century. This reflects the same increase of 1°F as presented by the DWR (discussed later).

- Nationwide, unusually hot summer days (highs) have become more common over the last few decades. The occurrence of unusually hot summer nights (lows) has increased at an even faster rate. This trend indicates less "cooling off" at night. This trend is more profound in the western US. Record setting daily-high temperatures have become more common than record lows. The decade from 2000 to 2009 had twice as many record highs as record lows.
- On average, total annual precipitation has increased over land areas in the US. Since 1901, precipitation in the contiguous 48 states has increased at a rate of 0.5 percent per decade. For the Sacramento River watershed, the color shading shows a 0 to 10 percent increase since 1901.
- In recent years, a higher percentage of precipitation in the US has come in the form of intense single-day events. Nationwide, nine of the top ten years for extreme one-day precipitation events have occurred since 1990.
- There are higher average temperatures between 2000 and 2013 than the long-term average (1895 through 2013). The Sacramento River watershed was generally 1°F warmer than average.
- Total snowfall has decreased in most parts of the country since widespread records began in 1930, with 57 percent of all stations showing a decline. For the Sacramento River watershed, the color shading shows a greater than 1.2 percent decrease per year since 1930.
- Since 1983, the US has had an average of 72,000 recorded wildfires per year. Of the 10 years with the largest acreage burned, nine have occurred since 2000, with many of the largest increases occurring in western states.

Climate Ready Water Utilities:

The USEPA developed the Climate Ready Water Utilities (CRWU) initiative to assist water and wastewater utilities in becoming "climate ready." CRWU supports the implementation of plans and adaptation strategies by water and wastewater utilities through the development of tools and other resources that account for potential climate change impacts and build water sector resilience. One of the tools is the Climate Resilience Evaluation and Awareness Tool (CREAT), which provides an easy access mapping tool to provide changes in annual temperature and precipitation in two time periods (2035 and 2060) for three climate model projections (hotter and drier, central conditions, warmer and wetter). USEPA recently updated projections based on the 2014 National Climate Assessment. Two mapping areas were selected for review for this study, the Sacramento River upstream of the confluence from the American River, and the American River upstream from the Sacramento River. Each area covers an area 32 by 32 square miles. **Tables 4-32** and **4-33** summarize the changes in annual temperature and precipitation for each area.

Table 4-32
Change in Annual Air Temperatures, °F

Date	Sacramento River			American River		
	Hot/Dry	Central	Warm/Wet	Hot/Dry	Central	Warm/Wet
2035	2.07	1.94	1.71	2.18	1.98	1.80
2060	4.05	3.80	3.33	4.27	3.87	3.51

Table 4-33
Change in Annual Precipitation, percent

Date	Sacramento River			American River		
	Hot/Dry	Central	Warm/Wet	Hot/Dry	Central	Warm/Wet
2035	-3.11	1.18	9.58	-3.55	0.91	9.14
2060	-6.06	2.3	18.70	-6.94	1.78	17.83

Watershed Modeling to Assess the Sensitivity of Streamflow, Nutrient, and Sediment Loads to Potential Climate Change and Urban Development in U.S. Watersheds:

For this study, watershed modeling was conducted in 20 large, US watersheds to characterize the sensitivity of streamflow, nutrient, and sediment loading to a range of mid-21st century climate change and urban development scenarios. Six climate change scenarios were based on global climate model simulations in the North American Regional Climate Change Assessment Program. Watershed modeling was conducted using the Hydrologic Simulation Model – Fortran and Soil and Water Assessment Tool watershed models. A comparison of watershed simulations in all 20 study areas for the 2041 to 2070 timeframe suggests the following hydrologic changes of interest to the Sacramento River watershed may occur:

- Higher peak streamflow will increase erosion and sediment transport; loads of nitrogen and phosphorus are also likely to increase in many watersheds. Increase in nutrients could have a significant effect on the Sacramento River since it is generally low in nutrients and this could change the overall source water characteristics and impact water quality and treatability.
- Many watersheds are likely to experience significant changes in the timing of streamflow and pollutant delivery. In particular, there will be a tendency to shift from snowmelt-dominated spring runoff systems to rain-dominated systems with greater winter runoff.
- Changes in nutrient and sediment loads are generally correlated with changes in hydrology.

Changes in climate and hydrology will also affect water quality. Hydrologic changes associated with climate change could also influence pollutant loading from urban and agricultural lands. Previous studies illustrate the sensitivity of stream nutrient and sediment loads to changes in climate.

Modeling projections were conducted by considering the effects of climate change alone, urban and residential development alone, and the combined effects of climate change and urban development on streamflow, total nitrogen, total phosphorus, and total suspended solids loads.

It was found that the simulated responses to increased development scenarios were small relative to those resulting from climate change at the scale of modeling in this study. The finest spatial scale reported in this study is an 8-digit hydrologic unit code, which includes the Lower Sacramento River. For this study, the Sacramento River Basin is considered the portion of the Sacramento River from Lake Shasta to just before the confluence with the Feather River; the "outlet" of the Sacramento River is just upstream of the confluence with the Feather River. The following is summary of results for the Sacramento River Basin, considering the effects of climate change alone:

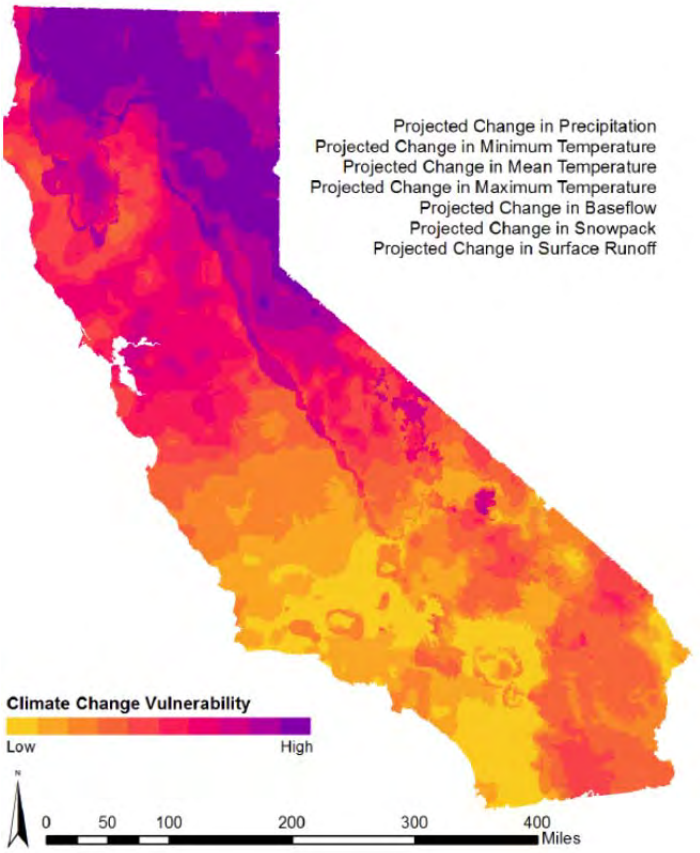
- The current conditions (1972 through 2003) annual average precipitation is 35.81 inches per year and is projected to increase by 97.7 percent by mid-21st century (2041 through 2070).
- Current average annual temperature is 58.23°F and is projected to increase by 4°F by 2041 through 2070.
- The simulated streamflow volume will increase 99 percent relative to current conditions at the outlet of the Sacramento River.
- The simulated total suspended solids load will increase 113 percent relative to current conditions at the outlet of the Sacramento River.
- The simulated total phosphorus load will increase 102 percent relative to current conditions at the outlet of the Sacramento River.
- The simulated total nitrogen load will increase 100 percent relative to current conditions at the outlet of the Sacramento River.

California Integrated Assessment of Watershed Health:

The purpose of the California Integrated Assessment of Watershed Health, published in November 2013, was to help USEPA identify healthy watersheds and characterize relative watershed health across the state to guide future protection initiatives. In regards to climate change, California watersheds were evaluated for their vulnerability to climate change based on seven climate change indicators from 2010 to 2050 (precipitation, mean temperature, minimum temperature, maximum temperature, snowpack, baseflow, and surface runoff). High climate change vulnerability scores were found in the northern third of the state (see **Figure 4-11**), where temperatures are expected to increase and climate change is projected to alter snowpacks, surface runoff, and baseflow.

US Bureau of Reclamation

The USBR has been conducting climate change related research to assist with water resources planning for the future. Generally, they have been studying how the availability of water (in terms of snowpack, precipitation, and stream flow) will be affected with climate change. The USBR has developed an on-line course "Preparing Hydro-Climate Inputs for Climate Change in Water Resource Planning" for water resource planning professionals to have access to downscaled climate and hydrology projections. Downscaling climate data is a strategy for generating locally relevant data from Global Circulation Models (GCMs). The overarching strategy is to connect global scale predictions and regional dynamics to generate regionally specific forecasts. These forecasts can be used as a resource for climate change analysis.



Source: California Integrated Assessment of Watershed Health, 2013

Figure 4-11. USEPA Climate Change Vulnerability

In addition, the USBR has made projected streamflow data available for 195 sites on streams and rivers throughout the western US, developed through its West-Wide Climate Risk Assessment effort. These projections include raw daily and monthly streamflow data, taking into account climate change impacts projected until 2099. This

data was derived from monthly gridded precipitation and temperature data from 112 contemporary climate projections (Coupled Model Intercomparison Project Phase 3) over the contiguous US. The grid size resolution of this downscaled data is approximately 12 by 12 kilometers and covers the period from 1950 to 2099. Three sites of interest are available on-line: American River at Fair Oaks, Sacramento River at Bend Bridge, and Sacramento River at Freeport.

The USBR also released the third edition of the Literature Synthesis on Climate Change Implications for Water and Environmental Resources in September 2013. The report offers a summary of recent literature on the current and projected effects of climate change on hydrology and water resources. It is organized around the five Reclamation regions, including the Sacramento-San Joaquin River basin. The mean annual air temperature will increase by 3°F by 2050 and 4.2°F by 2070 at both Bend Bridge and Freeport on the Sacramento River. According to the USBR, the changes in mean annual air temperature will generally be similar to the changes in mean annual water temperature (because surface water temperatures are based on rainfall, snowmelt, and surface temperature.) In addition, they are projecting a 23 percent decrease in April through July runoff and a 13.6 percent increase in December through March runoff by 2050 for both locations.

West-Wide Climate Risk Assessment Sacramento and San Joaquin Basins Climate Impact Assessment:

In November 2014, the USBR completed a reconnaissance-level assessment of risks to water supplies in the Sacramento and San Joaquin Basins due to climate change. The report provides an overview of the current climate and hydrology of California's Central Valley, and then presents hydrologic projections developed from global climate models to evaluate ways that projected climatic and hydrologic changes could impact water availability and management and water demands within the region. The report also analyzes impacts of future urban growth and changes in land-use within the Central Valley. This report complements and builds on several previous climate change studies performed by the USBR.

Projected changes in annual average air temperature in the Central Valley basins, relative to the 1970 to 2000 historical period, range from approximately 1.8°F in the early 21st century to slightly less than 3.6°F by mid-century. In the late 21st century, annual average air temperatures are projected to increase in excess of 5.4°F. A significant west to east geographic trend exists with greater change in air temperatures projected in the interior Central Valley and Sierra regions as the distance from the cooling effect of the Pacific Ocean increases.

The projected changes in annual average precipitation in the Central Valley basins show a clear north to south trend of decreasing precipitation, similar to historic conditions. In the northern part of Sacramento Valley, projections indicate a slight increase of a few percent in precipitation around the mid-century period.

The assessment shows a potential for significant implications for water management. Due to the warming conditions, runoff will increase in winter and decrease in spring as more precipitation falls as rain instead of snow. Reservoirs may fill earlier and excess runoff would have to be released earlier to ensure proper flood protection is maintained. This may lead to reduced storage in reservoirs when the summer irrigation season begins. Water demands are also projected to increase at the same time. Urban water use is expected to increase due to population increases in the Central Valley while agricultural uses are projected to decrease because of a decline in irrigated acreage. River water temperatures may increase because cold water availability from reservoir storage would be reduced. Only salinity was evaluated for water quality, which is projected to increase 33 percent over the century.

This study supports another broader study also being conducted by the USBR: the Sacramento and San Joaquin Basins Study. This study, expected to be completed in 2015, is a partnership between USBR, DWR, California Partnership for the San Joaquin Valley, Stockton East Water District, El Dorado County Water Agency, Madera County Resources Management Agency, Friant Water Authority, and the Mountain Counties Water Resources Association. Stakeholder involvement in the study will assist in identifying mitigation or adaptation strategies to address negative impacts of climate change and meet future water demands. The study will encompass the entire Central Valley, from the Tehachapi Range in the South to the Klamath Mountains in the north. The study area includes the Sacramento River.

California Assessments

Department of Water Resources

Since the climate system includes freshwaters, changes to air and land temperatures will have an impact on the timing, amount, type, and location of precipitation and runoff in the Sacramento River watershed. In fact, DWR has documented a slight increase in temperature (1°F) and an increase in annual precipitation (one inch) in the Sacramento River watershed over the 20th century. DWR research from 1901 to 2000 shows that the Sacramento River system runoff volume has remained stable on an annual basis, but there has been a nine percent reduction in runoff from April through July. This is likely the result of increased winter rainfall and less snowpack storage. DWR also estimate that for each 1.8°F increase in Earth's temperature, the Sierra snowpack will retreat 500 feet. This will mean an increase in wet season runoff and less available storage under current operations.

California Climate Change Adaptation

The Adaptation Planning Guide (APG) was finalized in July 2012 and provides guidance to support regional and local communities in proactively addressing the unavoidable consequences of climate change. It was developed cooperatively by the California Natural Resources Agency, California Emergency Management Agency, with support from California Polytechnic State University–San Luis Obispo, and with funding through

the Federal Emergency Management Agency and the California Energy Commission. The APG consists of the Planning Guide overview document and three companion documents. California communities can use this APG and the Cal-Adapt website as their primary resources for analyzing the impacts of climate change and preparing adaptation strategies.

Within the overview document, the plan introduces a range of possibilities available for communities to take action on climate change. Some common ways include:

1. Administrative policy, procedures, and initiatives.
2. General Plan.
3. Local hazard Mitigation Plan.
4. Climate Action Plan.
5. Zoning Code and other land development codes, ordinances, and resolutions.
6. Local Coastal Program.
7. Capital Improvement Plan/Program.
8. Climate Change Adaptation Plan.
9. Integrated Regional Water Management groups.

One of the companion APG documents, "Understanding Regional Characteristics", contained some information specific to the Northern Central Valley Region. **Table 4-34** shows a summary of Cal-Adapt Climate Projections for Northern Central Valley. Northern Central Valley region communities will need to assess temperature increases (particularly nighttime temperature), reduced precipitation, flooding, reduced agricultural productivity, reduced water supply, wildfire in the Sierra Foothills, public health and heat, and reduced tourism.

Table 4-34
Summary of Cal-Adapt Climate Projections for Northern Central Valley

EFFECT	RANGES
Temperature Change, 1990-2100	January increase in average temperature of 4°F to 6°F and between 8°F and 12°F by 2100. July increase in average temperature of 6°F to 7°F in 2050 and 12°F to 15°F by 2100. (Modeled high temperatures – average of all models; high carbon emissions scenario)
Precipitation	Annual precipitation is projected to decline by approximately one to two inches by 2050 and three to six inches by 2100. (CCSM3 climate model; high carbon emissions scenario)
Heat Wave	Heat wave is defined as five days over 102°F to 105°F, except in the mountainous areas to the east. Two to three more heat waves per year are expected by 2050 with five to eight more by 2100.
Wildfire Risk	By 2085, the north and eastern portions of the region will experience an increase in wildfire risk, more than 4 times current levels in some areas. (GFDL model, high emissions scenario)

[Public Interest Energy Research, 2011. Cal-Adapt. Retrieved from http://cal-adapt.org]

DWR Adaptation and Mitigation Strategies

2013 Water Plan

Within the 2013 Water Plan, the Sacramento River Region is discussed as one of the regional reports in Volume 2. Climate change is discussed for the Sacramento River region. Climate projections for the region are similar to the information presented in the two previous reports discussed (California Climate Change Adaptation Policy Guide and USEPA Modeling Report). A recent study by Scripps Institution of Oceanography indicates that annual mean temperatures by 2060 through 2069 are projected to increase by 4°F for the Western Region Climate Center North Central climate region, with increases of 3.1°F during the winter months and 5.2°F during summer. Other sources of information project similar climate changes outcomes as discussed in previous write-ups:

- Modeling results by Huang et al. 2012 suggest the Upper Feather River watershed April 1st snowpack would be diminished by 63 percent with 3.6°F of warming.
- Extreme precipitation events are projected to increase with climate change.
- Researchers at Scripps Institute of Oceanography project that by the end of the 21st Century, the Sierra snowpack will experience a 48 to 65 percent loss from its average at the end of the 20th Century.

Volumes 1 and 3 of the 2013 Water Plan were also reviewed. The 2013 Update, which is a joint work of DWR and the University of California at Irvine, projects that the Sacramento River Hydrologic Region shall remain highly reliable, including climate change projections. To evaluate the vulnerabilities and response packages, a robust decision making (RDM) model was used. The RDM model is a quantitative decision support methodology that runs models over different sets of assumptions. The RDM model predicts high urban supply reliability for all scenarios and response strategies. Historically, the Oroville region has shown a minimum precipitation value of 42 inches in the driest 30-year period and a maximum of 49 inches in the wettest 30-year period (running average precipitation for historical record 1915-2003). However, for a few alternative scenarios, the model shows a minimum value of 33 inches during the driest period and maximum precipitation of 57 inches during the wettest period for the 2011 to 2099 future period. The Sacramento hydrologic shows high instream flow requirements, exceeding a reliability of more than 90 percent for most objectives identified in the 2013 Water Plan.

Some key recommendations presented in the 2013 Water Plan to address quantity and quality of water supplies and water resource management are:

- Identifying and understanding change is crucial in preparing for uncertainties. This may include variation in population, type and amount of crops grown,

changes in snowpack and precipitation, and episodic events such as chemical spills, drought, etc.

- Encouraging and adopting data driven approaches to deal with uncertainty through incorporation of climate change data, and land use change; and understanding risks through analytical tools to reduce uncertainty associated with how climate change will affect the state's water resources.
- Implementing local strategies such as water use efficiency improvements, recycling programs, regional coordination, and infrastructure to reduce vulnerability.
- Developing local water supplies to achieve reliability and reduce the energy demand for water transportation.
- Creating a comprehensive approach identifying the system interconnections and interactions between groundwater and surface water, and water quantity and water quality.
- Developing and supporting awareness programs to foster public support and facilitate better informed decisions for water management.

DWR System Reoperation Study

Senate Bill X2 1 (Water Quality, Flood Control, Water Storage, and Wildlife Preservation) directed DWR to conduct feasibility studies to identify potential options for reoperation of the state's flood protection and water supply systems that will optimize the use of existing facilities and groundwater storage capacity. The studies will incorporate appropriate climate change scenarios and conditions. There are four phases for the study:

- Phase 1 – Plan of Study (Completed 2011)
- Phase 2 – Strategies Formulation and Refinement (Completed 2014)
- Phase 3 – Preliminary Assessments of Strategies (Expected fall 2015)
- Phase 4 – Reconnaissance-Level Assessments of Strategies (Expected mid-2016)

The System Reoperation program website, live in May 2011, has links to completed documents such as the 2011 Phase 1 - Plan of Study and the 2014 Phase 2 Report. The Phase 2 Report, "System Reoperation Study Strategy Formulation and Refinement", was completed by DWR in February 2014. The outcome of Phase 2 was to identify four to five strategies for reconnaissance-level assessment in Phase 3. After contacting various facility owners and operators (i.e., private water districts), and state and federal agencies, the four strategies identified to be modeled were:

1. Reoperation of Shasta Reservoir (Central Valley Project)
2. Reoperation of Oroville Reservoir (State Water Project)

3. Reoperation of Lake McClure in Mariposa County (Merced Irrigation District)
4. Integration of the State Water Project and Central Valley Project Systems

Some of the operational components being considered in reservoir reoperation are: 1) Forecast-based Operations, 2) Conjunctive Management, 3) System Integration, and 4) Environmental Flows.

- Forecast-based operations means that as techniques for storm predictions improve, it becomes possible to defer reservoir releases to preserve flood reservation until the probability of a storm event reaches a particular threshold. This could result in increases in reservoir storage at the end of a refill period. Overall, these concepts demonstrate the ability to store more water in either surface storage or groundwater banking.

- Conjunctive management includes moving water from surface storage to groundwater banking sites in the fall such that reservoir levels could be lowered farther in the winter and spring to capture excess water. This early reservoir drawdown would increase flood storage capacity and therefore improve flood protection. In turn, the water stored in groundwater banking sites would help supplement summer water supplies and decrease reliance on projected reduced snowpack runoff.

- System integration includes evaluating operations as a single project. The Central Valley Project has greater upstream storage capacity than the State Water Project, but the Central Valley Project has less capacity than the State Water Project to convey stored water south of the Delta to project users. By integrating the projects, water stored in upstream Central Valley Project reservoirs can be conveyed through State Water Project facilities. System integration includes coordinating State Water Project and Central Valley Projects even closer so that Shasta and Oroville reservoirs can lower their carryover storage levels relative to current operations and increase flood reservation by conveying additional water to either an existing or future groundwater bank located in the Sacramento Valley or south of the Delta with available capacity.

Modeling Conducted for Phase 2 Report

Initial modeling of two potential reoperational strategies for Shasta and Oroville was completed in Phase 2 to help illustrate how operational changes in one area affect other areas. For example, how Central Valley Project operations (Shasta and Folsom) could affect State Water Project operations (Oroville). The two reoperational strategies modeled in Phase 2 were: 1) additional spring releases from reservoirs for ecosystem benefits and 2) expanded conjunctive management in the Sacramento Valley.

For the first reoperation strategy, a range of springtime release volumes from Shasta and Oroville reservoirs between 25 thousand acre-feet (TAF) and 500 TAF from March through May were modeled. See **Table 4-35** for Scenarios 1 through 7 for releases

from Shasta, and Scenarios 8 through 14 for releases from Oroville. The model assumed that releases would only occur if the reservoir storage plus inflow met a certain storage threshold (developed by DWR) for the individual months of March, April, and May. This constraint was designed to protect end-of-September (EOS) carryover storage to limit adverse effects of spring pulse flows on water supply reliability and cold water availability in subsequent years.

Table 4-35
Tradeoff Analysis Scenario Matrix and Modeling Results

Scenario	River System	Scenario Number	Target Pulse Volume	Target Conjunctive Management Volume	Pulse Release	Expanded Groundwater Pumping	Shasta EOS Storage	Trinity EOS Storage	Folsom EOS Storage	Oroville EOS Storage	Delta Inflow (Sacramento R.)	Delta Outflow	Jones Pumping Plant	Banks Pumping Plant	North-of-Delta Agricultural Service Deliveries
							Avg. Annual Storage (TAF)				Avg. Annual Flow (TAF)				
		Base	–	–	–	–	2,680	1,396	517	1,836	17,913	15,802	2,252	2,630	233
			Additional Volume (TAF)				Change in Storage (TAF)				Change in Flow (TAF)				
Pulse Flow Only (PFO)	Sacramento	1	25	--	13	--	-3	2	0	1	1	4	-2	0	0
		2	50	--	25	--	-10	-5	-1	-2	4	6	-3	1	-1
		3	100	--	47	--	-24	-13	-2	-3	8	12	-5	1	-2
		4	200	--	87	--	-42	-25	-5	-3	14	25	-11	0	-5
		5	300	--	126	--	-64	-37	-7	0	18	31	-13	1	-6
		6	400	--	156	--	-79	-48	-6	4	22	39	-17	0	-9
		7	500	--	171	--	-85	-50	-5	3	22	40	-17	-1	-9
	Feather	8	25	--	7	--	0	2	0	-5	0	1	0	-2	0
		9	50	--	14	--	3	5	0	-12	-1	5	-1	-4	1
		10	100	--	27	--	1	3	1	-25	0	8	0	-7	0
		11	200	--	45	--	0	0	0	-40	1	14	0	-12	0
		12	300	--	59	--	-1	2	1	-52	0	18	0	-17	0
		13	400	--	56	--	-1	0	1	-49	2	21	0	-18	0
		14	500	--	49	--	0	1	1	-42	3	18	0	-15	0
Conjunctive Management Only (CM)	Sac.	15	–	25	–	5	6	2	2	0	3	1	2	0	1
		16	–	50	–	9	8	6	2	0	7	2	3	1	1
		17	–	100	–	18	19	8	7	0	14	5	7	2	2
	Feather	18	–	25	–	8	-1	1	0	6	7	1	1	5	0
		19	–	50	–	16	0	1	0	10	15	2	1	11	0
		20	–	100	–	30	-2	1	2	16	29	6	1	21	0
Pulse Flow with CM	Sac.	21	25	25	13	4	1	4	2	1	4	5	-1	0	0
		22	50	50	25	7	0	0	1	-2	9	8	1	1	0
		23	100	100	48	14	-8	-7	4	-4	18	15	1	2	-1
	Feather	24	25	25	7	9	-1	3	0	1	8	3	1	4	0
		25	50	50	14	18	3	3	0	0	17	8	-1	10	0
		26	100	100	27	37	0	0	2	-3	37	14	0	22	0

Source: System Reoperation Study Tradeoff Analysis Technical Report, prepared for Department of Water Resources, prepared by MBK Engineers, January 2014

The outcome showed that additional spring releases from Shasta increased flow at Keswick Dam on the Sacramento River in April and May, and reduced EOS carryover storage in Shasta, Trinity, and Folsom. If Shasta is releasing additional flows in the spring for ecosystem benefits, there are lower allocations to Central Valley Project water service contractors, and other Central Valley Project facilities, such as Trinity and Folsom, are burdened to meet Central Valley Project requirements. Conversely, EOS storage in Oroville Reservoir (State Water Project) will increase. This is because

springtime releases from Shasta reduce State Water Project obligations for certain Delta environmental requirements, such as maintaining the "X2" (salinity location), in the months when releases are made.

Interestingly, when additional spring releases from Oroville were modeled between 25 and 500 TAF from March through May, flow increased downstream at Thermalito Afterbay as expected; however, State Water Project operation is less impacted compared to releases from a Central Valley Project reservoir, as there are only a few State Water Project contractors located upstream of the Delta, and there are no other State Water Project reservoirs that would be affected by additional releases from Oroville. Although it may seem more promising to utilize Oroville over Shasta to address ecosystem benefits, DWR staff stated that they would need to consult with fisheries agencies for confirmation (Personal Communication, Sean Sou, May 9, 2014).

For the second reoperation strategy, conjunctive management is groundwater pumping in-lieu of surface water diversions during periods of reduced surface water availability. Groundwater pumping would only be initiated in years when 2.2 million acre feet (MAF), or less, EOS carryover storage target for Shasta Reservoir was met. Groundwater pumping is assumed to be performed by willing participants in the Sacramento Valley. According to DWR, there would be monitoring programs set up to verify that the groundwater pumping operations are actually occurring. On the Sacramento River system, groundwater pumping is assumed to occur in the Colusa Basin and reduce Sacramento River diversions between Red Bluff and Wilkins Slough. On the Feather River system, groundwater pumping is assumed to occur in the Feather River service area and reduce surface water diversions from Thermalito Afterbay. Conjunctive management scenarios between 25 and 100 TAF were modeled, with scenarios 15 through 17 in **Table 4-35** modeling groundwater pumping for the Sacramento River system, and scenarios 18 through 20 in **Table 4-35** modeling groundwater pumping for the Feather River system. The modeling results showed that groundwater pumping in the Sacramento River Basin during periods of reduced surface water availability increases carryover storage in Shasta, Trinity, and Folsom. There were insignificant changes to Oroville storage under Sacramento River conjunctive management scenarios. In addition to increases in water supply deliveries, there may be benefits to cold-water storage in Shasta in future years. Groundwater pumping in the Feather River Basin during periods of reduced surface water availability increases carryover storage at Oroville and did not change storage in Shasta, Trinity, or Folsom Reservoirs.

Finally, modeling runs (scenarios 21 through 26 in **Table 4-35**) were completed which combined conjunctive management with additional springtime releases from Shasta or Oroville to understand if some of the benefits of conjunctive management can be used to offset impacts of additional spring releases, and they can. For example, if springtime flows from Shasta were 100 TAF, the average EOS storage at Folsom would be decreased by 2 TAF, but if coupled with 100 TAF of groundwater pumping, the average EOS storage at Folsom would be increased by 4 TAF. The results are more dramatic for Shasta EOS storage; if springtime flows from Shasta were 100 TAF, the average EOS storage at Shasta would be decreased by 24 TAF, but if coupled with 100 TAF of

groundwater pumping, the average EOS storage at Shasta would only decrease by 8 TAF.

Modeling results were also presented for the Sacramento River at Freeport. If springtime flows from Shasta were 100 TAF, the average annual flow on the Sacramento River at Freeport would increase by 8 TAF, but if coupled with 100 TAF of groundwater pumping, the average annual flow at Freeport would increase by 18 TAF.

The Phase 2 Report mentions that numerous related studies, such as the Central Valley Flood Protection Plan, Bay Delta Conservation Plan (now known as California Water Fix and EcoRestore), and the USBR's Central Valley Basin Study, are being undertaken simultaneously with similar goals and objectives; therefore the System Reoperation Study is being developed in the context of, and in coordination with, these studies to the maximum extent feasible. In addition, the report acknowledges that major new facilities in the planning stages, such as Shasta Dam and Shasta Lake enlargement, Sites Reservoir, and the California Water Fix, could affect reoperation. The System Reoperation Study will also coordinate with the Folsom Dam Joint Federal Project (JFP) when considering system reoperational strategies that could be influenced by, or dependent on, Folsom Dam operations.

DWR staff is currently working on Phase 3 – Preliminary Assessment, and expect it to be complete in late 2015. The purpose of Phase 3 is to evaluate, sort, and rank the reoperational strategies based on their performance in meeting the goals of the study, which are: to improve water system reliability, improve flood protection, and provide for ecosystem protection and restoration. Phase 4 will evaluate benefits and costs, develop conceptual designs for facilities modifications, and identify funding and key steps necessary for implementation; it is expected to be completed by mid-2016.

Delta Management Programs

Delta Plan

Created by the legislature in 2009, the Delta Stewardship Council (DSC) is considered the successor entity to the California Bay-Delta Authority and the CALFED program. The DSC is composed of members who represent different parts of the State and offer diverse expertise in fields such as agriculture, science, the environment, and public service. Of the seven, four are appointed by the Governor, one each by the Senate and Assembly, and the seventh is the Chair of the Delta Protection Commission.

The DSC's mission is to achieve the state's co-equal goals of: 1) enhancing the reliability of the water supply for California and 2) protecting, restoring, and enhancing the Delta ecosystem. These goals are to be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

The Final Delta Plan was completed in September 2012, and the Draft EIR for the Delta Plan was completed in November 2012. The Final Delta Plan was adopted by the DSC in May 2013 and was approved by the State OAL in August 2013. The Delta Plan and its regulatory policies took effect on September 1, 2013. State and local agencies proposing actions or projects within the Delta will need to certify for the DSC that those efforts are consistent with the Delta Plan.

The Delta Plan is intended to lay out the initial roadmap on how to achieve the co-equal goals in the years to come. It contains five core policy chapters (Chapters 3 through 7) and a chapter on Funding Principles to Support the Coequal Goals (Chapter 8). It contains 14 regulatory policies, 71 priority recommendations (non-regulatory) to achieve goals, and performance measures.

Of the 14 regulatory policies, two policies have been identified in this report as policies that could potentially impact Sacramento River source water quality.

WR P1- Regulatory Policy: Reduce Reliance on the Delta and Improve Self-Reliance

The intent of this regulatory policy is to ensure that urban and agricultural water suppliers are taking appropriate action to contribute to the achievement of reduced reliance on the Delta, and to implement projects that are locally cost effective and technologically feasible for urban and agricultural water suppliers to increase water use efficiency and conservation, and diversify local water supply portfolios. The Delta Plan states that water suppliers that have done all of the following are contributing to reduced reliance on the Delta:

- Completed a current Urban or Agricultural Management Plan which has been reviewed by the Department of Water Resources;
- Identified, and commenced all programs and projects that are locally cost-effective and technically feasible which reduce reliance on the Delta;
- Included the expected outcome for measurable reduction in Delta reliance and improvement in regional self-reliance in the Urban or Agricultural Management Plan.

ER P1 – Regulatory Policy: Delta Flow Objectives

Development, implementation, and enforcement of new and updated flow objectives for the Delta and high priority tributaries are key to the achievement of the coequal goals. The American River is one of the priority tributaries of the Sacramento-San Joaquin Delta. The Delta Plan stated that the State Board should update the Bay-Delta Water Quality Control Plan objectives as follows:

- By June 2, 2014 adopt and implement updated flow objectives for the Delta that are necessary to achieve the coequal goals. (The current drought has delayed

the development of the updated objectives for the Bay-Delta Water Quality Control Plan.)

- By June 2, 2018 adopt and, as soon as reasonably possible, implement flow objectives for high-priority tributaries in the Delta watershed that are necessary to achieve the coequal goals.

A cursory review of the Delta Plan has identified three non-regulatory recommendations that could potentially impact Sacramento River source water quality.

WR R13 – Complete Surface Water Storage Studies

This recommendation states that the DWR was to complete surface water storage investigations of proposed off-stream surface storage projects by December 31, 2012. This investigation should include an evaluation of potential additional benefits of integrating operations of new storage with proposed Delta conveyance improvements, and recommend the critical projects that need to be implemented to expand the State's surface storage.

WR R14 – Identify Near-Term Opportunities for Storage, Use and Water Transfer Projects

The DWR, in coordination with the California Water Commission, USBR, State Board, DDW, DSC, and other agencies and stakeholders, should conduct a survey to identify projects throughout California that could be implemented within the next five to ten years to expand existing surface and groundwater storage facilities, create new storage, improve operation of existing Delta conveyance facilities, and enhance opportunities for conjunctive use programs and water transfers. The California Water Commission should hold hearings and provide recommendations to DWR on priority projects and funding.

WQ R10 – Evaluate Wastewater Recycling, Reuse, or Treatment

The Regional Board, consistent with existing water quality control plan policies and water rights law, should require responsible entities that discharge wastewater treatment plant effluent or urban runoff to Delta waters to evaluate whether all or a portion of the discharge can be recycled, otherwise used, or treated in order to reduce contaminant loads to the Delta by January 1, 2014.

Other Delta Planning and Management Initiatives

There are other Delta Planning and Management Initiatives that have the potential to impact reservoir releases and/or flow changes to the Sacramento River, such as the Bay-Delta Water Quality Control Plan, the Sacramento River Temperature Management Plan, and the Folsom Dam JFP.

Bay-Delta Water Quality Control Plan

The State Water Board is in the midst of a four-phased process of developing and implementing updates to the Bay-Delta Water Quality Control Plan and flow objectives for priority tributaries to the Delta to protect beneficial uses in the Bay-Delta watershed.

Phase 1 involves updating San Joaquin River flow and southern Delta water quality requirements. Phase 2 involves other comprehensive changes to the Bay-Delta Plan to protect beneficial uses not addressed in Phase 1. According to State Water Board staff, Phase 2 will determine what inflows are needed to come into the Delta, and would likely address releases from Folsom Lake as one example (Personal communication, Daniel Schultz). Therefore, Phase 2 would be of interest to Sacramento River flows. According to State Board staff, Phase 2 will be completed on a programmatic level, and would not determine impacts to individual water agencies. Currently, the Phase 2 work is focused on the preparation of a science report to discuss whether the current flow requirements (for flows coming into the Delta) need to be changed. This science report is expected to be completed in December 2015, and environmental documentation for Phase 2 would follow.

Phase 3 involves changes to water rights and other measures to implement Phases 1 and 2 of the Bay Delta Plan. Phase 4 involves developing and implementing flow objectives for priority Delta tributaries outside of Bay-Delta Plan updates.

Sacramento River Temperature Management Plan

Drought conditions in California can also result in unexpected, short-term impacts to reservoir operations, such as impacts due to the Sacramento River Temperature Management Plan approved in June 2015. The changes in reservoir releases to protect downstream river temperatures will affect the reservoir volumes, river flows, and subsequently source water quality through the later summer and fall.

Folsom Dam Joint Federal Project

Operation of the Folsom Dam, with respect to releases for flood control purposes, will change once construction of the Folsom Dam JFP is completed. Since the JFP is being constructed for flood control purposes, this project has the potential to change the timing of releases to the Lower American River during the October through March time period. Releases that occur outside of this time period are governed by conservation, recreation, and downstream water supply, and are under the jurisdiction of the USBR.

The Folsom Dam JFP is currently under construction and consists of a new auxiliary spillway with a crest elevation 50 feet lower in elevation than the current gated spillways on the main dam. The JFP will improve the ability of Folsom Dam to manage large flood events by allowing more water to be safely released earlier in a storm event, resulting in more storage capacity remaining in the reservoir to hold back the peak inflow when it arrives. The JFP consists of a control structure containing six submerged

tainter gates, a 3,000 foot long spillway chute and stilling basin that act as an energy dissipator, and a 1,000 foot long approach channel. The JFP will be completed in 2017.

Due to the construction of the new auxiliary spillway, the current Folsom Dam and Reservoir Control Manual (WCM) must be updated. Therefore, reservoir operations will change at Folsom due to the JFP. The new Folsom Dam WCM will develop, evaluate, and recommend changes to the flood management operation of Folsom Dam and Reservoir to meet dam safety and flood risk management objectives. A number of flood risk management operational rule alternatives will be analyzed as well as their effects on Folsom Dam and Folsom Reservoir's other authorized purposes. According to the United States Army Corps of Engineers (USACE), climate change will be taken into account in the development of the plan, yet exact details/mechanisms are not known at this point in time. The WCM Update must be completed by 2017 when the JFP is scheduled to be completed. The Review Plan for the Folsom Dam WCM Update states that CALSIM II is the system model that will be used to evaluate the effects of flood operation rules on the beneficial uses of water supply provided by Folsom Dam and Reservoir.

In order to evaluate proposed changes to operations of Folsom Dam as a result of the WCM Update, the USACE will be the lead agency to prepare a joint EIS/EIR for the Folsom Dam WCM Update. The USBR will be a cooperating agency. Effects analyzed will include water supply for irrigation, municipal, and industrial uses; fish and wildlife resources; power generation; water quality; recreation; special status species; soils and levee safety; and cultural resources. The draft EIS/EIR will contain information on effects to water quality as a result of the JFP and the updated WCM.

The EIS/EIR for the Water Control Manual is scheduled to go out for review in summer 2016, and the schedule would then have a signed updated water control manual by spring 2017. According to USACE staff, it seems likely that with a lower spillway elevation, the water being released from October through March might be colder under the new operating scenario once the JFP is completed.

California WaterFix and EcoRestore

The California WaterFix (CA WaterFix) and EcoRestore, previously known as the Bay Delta Conservation Plan (BDCP), are being prepared through a collaboration of State and Federal agencies, water agencies, environmental organizations, and other interested parties with the goal of providing a more reliable water supply for the export contractors and protecting and restoring the ecological health of the Delta. The Draft EIR/EIS was originally released in May 2013. After comments were received, a Recirculated Draft Environmental Impact Report and Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS) was released in July 2015 that renamed the project and separated the construction and operation of new Delta water conveyance (now called CA WaterFix) with any associated habitat restoration that may be required from a larger critical habitat restoration initiative for at least 30,000 acres (new EcoRestore).

BDCP

The BDCP was developed in compliance with the Federal Endangered Species Act and the California Natural Communities Conservation Planning program. The BDCP provided the basis for issuance of endangered species permits for the operation of the State and Federal water projects. The goal of the BDCP was to promote the recovery of endangered, threatened, and sensitive species and their habitats in the Delta in a way that also improved the reliability of water supplies exported from the Delta. The plan proponents hoped to implement the plan over the next 50 years after approval.

The BDCP Draft EIR/EIS was released December 2013. The 20,000 page document described the potential effects of the BDCP and alternatives on water supplies, air quality, agriculture, recreation, transportation, land use, and other aspects of the natural and human environments.

The Administrative Draft EIR/EIS analyzed 15 alternatives. Most involved new water intakes, canals, or tunnels of varying capacities to divert water from the Sacramento River in the north Delta and carry it to existing pumping plants in the south Delta near Tracy. The document analyzed new facilities ranging in size from 3,000 cfs to 15,000 cfs. The document also evaluated improvements to existing levees in the Delta that are affected by the transport of water supplies, different sets of operational prescriptions for the State and Federal water projects in the Delta, including providing higher outflows to the ocean in the spring or fall, and alleviating reverse flows in the central Delta. The alternatives also varied in the amount of Delta acreage each would devote to habitat, from 8,000 additional acres in the no-action alternative to 145,000 total acres of habitat restoration and preservation.

Alternative 4 (Dual Conveyance with Pipeline Tunnel) was tentatively identified as the preferred alternative by DWR in the Draft EIR/EIS. Alternative 4 consists of three intakes capable of diverting up to 9,000 cfs and two 40-foot diameter tunnels to carry water 35 miles to the existing pumping plants in the south Delta.

Some of the participating water agencies submitted comments on the BDCP and Draft EIR/EIS, with those comments centered on a few key items:

- Analysis of surface water, groundwater, and socioeconomic impacts to the Sacramento River region were inadequate.
- Hydrologic modeling was technically flawed and was inadequate to support the Draft EIR/EIS's environmental conclusions.
- Climate change analysis did not adequately inform the public of the project's potential impacts.
- Insufficient scope of reasonable alternatives.
- Insufficient incorporation of other major programs, plans, and projects.

- Insufficient water quality analysis to support characterization of water quality impacts.

CA WaterFix

In April 2015, State and Federal agencies released the RDEIR/SDEIS. This new document presented a largely different structure for environmental compliance, including separation of the construction and operation of new water supply facilities from a larger program of environmental projects originally proposed. Environmental mitigation related to habitat restoration in the RDEIR/SDEIS included content only associated with mitigating the project construction and operation. It also proposed three new sub-alternatives, including Alternative 4A that replaces Alternative 4 as the State's preferred project.

Alternative 4A consists of the same physical facilities as Alternative 4, three intakes along the Sacramento River with a total diversion capacity of 9,000 cfs and tunnel/pipeline alignment through the Delta to the existing pumping plants. It would be operated under a new operational alternative to meet additional environmental objectives.

There have been few substantial changes to the environmental document with regards to technical work, and most of the key concerns to source water protection for the area upstream of the new intakes remain. There is still no clear definition for the scope of the project and most water quality evaluations neglect the areas upstream of the Delta. Many of the conservation measures have been removed, and little environmental mitigation commitment is made in the document.

Potential Impacts to Source Water Quality/Treatability

Climate change impacts are expected to occur incrementally over a long period of time. The impacts vary by location but are most likely to result in reduced snowpack, a change in reservoir operations, and increased fire risk in the Sacramento River watershed. Water quality impacts due to climate change could be an increase in sediment, nitrogen, and phosphorus loading. All of these water quality impacts could result in higher turbidity levels and increased nutrient, metal, and organic content, which could increase the level of treatment required, decrease treated water quality, and increase costs for treatment and residual management.

The effects of climate change are already occurring, as discussed in the 2014 USEPA Climate Change Indicators Report. The report shows the following evidence for the Sacramento River watershed: annual average air temperature has increased by 1°F since 1901, there are more unusually hot summer days and nights since 1948, total annual precipitation has had a 10 percent increase since 1901, and total snowfall has decreased 1.2 percent per year since 1930.

Modeling efforts for future climate projections have been conducted recently for the Sacramento-San Joaquin River basin region. As mentioned earlier, the USBR reported a projected change of 3°F in mean annual air temperature from the 1990s to 2050 at Sacramento River at Bend Bridge and Sacramento River at Freeport, and a change of 4.2°F from the 1990s to 2070 at the same locations. Notably, there may be a 23 percent decrease in April through July runoff and a 13.6 percent increase in December through March runoff by 2050 for both locations.

The USEPA CREAT mapping tool also provided information on changes in air temperature and precipitation. For the entire Sacramento River region, the change in annual temperature is projected to range from 1.71 to 2.07°F by 2035, and from 3.33 to 4.05°F by 2060. For the American River region only, the change in annual temperature is projected to range from 1.8 to 2.8°F by 2035, and from 3.51 to 4.27°F by 2060. The percent change in annual precipitation is projected to range from -3.1 to 9.58 percent by 2035, and from -6.06 to 18.7 percent by 2060 for the entire Sacramento River region. The percent change in annual precipitation is projected to range from -3.55 to 9.14 percent by 2035, and from -6.94 to 17.83 percent by 2060 for the American River region only.

The Sacramento River Basin was also studied by the USEPA in 2013 to determine impacts on streamflow, nutrient, and sediment loading due to climate change. The report determined that at the outlet of the Sacramento River, total suspended solids load could increase by 113 percent by mid-21st century (2041 to 2070) relative to current conditions, total phosphorus load could increase by 102 percent, and total nitrogen load could increase by 100 percent. The streamflow volume at the outlet of the Sacramento River could also increase by 99 percent relative to current conditions. Lastly, average annual air temperature could increase by 4°F by 2041 through 2070, similar to the USBR report and the CREAT mapping tool.

SECTION 5 – INDIVIDUAL INTAKE LOCATION COMPLIANCE EVALUATIONS

The purpose of this section is to (1) evaluate the existing and planned water treatment plants using Sacramento River water for their compliance with existing drinking water regulations, and (2) identify potential treatment concerns related to future drinking water regulations. For assistance with abbreviations and acronyms, the reader is referred to the List of Abbreviations at the front of the Report.

There are three existing intakes and associated water treatment plants within the study area: the City of West Sacramento's George Kristoff Water Treatment Plant (GKWTP), the City of Sacramento's Sacramento River Water Treatment Plant (SRWTP), and the Freeport Regional Water Authority (FRWA) intake which serves the Sacramento County Water Agency's (SCWA) Vineyard Surface WTP (VSWTP) and provides additional source water to East Bay Municipal Utility District (EBMUD). The Woodland-Davis Clean Water Agency (WDCWA) is currently constructing a new intake structure on the Sacramento River, just upstream of Veterans Bridge as well as a Regional Water Treatment Facility (RWTF). There is a potential future intake and associated water treatment plant being planned within the study area, called the Sacramento River Regional Water Reliability Project (SRRWRP). Out of the participating agencies for this report, the participating agencies for the SRRWRP are the Placer County Water Authority (PCWA), City of Roseville, and the City of Sacramento.

Each of these is discussed herein within the context of current and future regulatory compliance and potential treatment issues beginning with the most-upstream diversion point and then moving downstream. Provided below is a short summary of the key drinking water regulations that are used in this evaluation. **Appendix B** provides the Regulatory Framework for the analysis and the text box on the following page provides some key highlights.

SACRAMENTO RIVER REGIONAL WATER RELIABILITY PROJECT

The SRRWRP plans to divert water through existing Natomas Mutual Water Company (NMWC) intakes on the Sacramento River, deliver that water via raw water pipelines to a new regional water treatment plant, and distribute the treated surface water through new and existing pipelines to local water agencies. The project will allow for recharge of depleted groundwater storage in wet years for recovery in years when surface water supplies are insufficient to meet the needs of the region.

As the SRRWRP is a potential future diversion and treatment facility, there is no description of changes since the 2010 Update. In addition, there is no water quality information at the proposed diversion sites to report for the 2010 through 2014 study period. The closest participating water agency monitoring site is at WDCWA's intake, and the closest ambient monitoring sites are Veterans Bridge and Verona. The Veterans Bridge site has been monitored through the Sacramento Coordinated Monitoring Program (CMP), and is located downstream of both of the potential NMWC diversions at Pritchard Lake and Sankey Road. As discussed in **Chapter 3**, this location is no longer being monitored starting in 2015. The Sacramento River at Verona site is monitored by Department of Water Resources Sacramento Watershed

Coordinated Monitoring Program (DWR CMP), but is located upstream of both Pritchard Lake and Sankey Road.

Highlights of Selected Existing Drinking Water Regulations

NIPDWR and Phase I, II, and V Regulations. Set MCLs for many inorganic chemicals, SOCs, and VOCs.

SWTR. Set minimum 3 and 4- log reduction requirements for *Giardia* and viruses, respectively. Set turbidity requirements, which have since been tightened.

Interim Enhanced SWTR and Filter Backwash Rule. Set minimum 2-log reduction requirement for *Cryptosporidium*. Requires monthly source water monitoring for coliforms. Requires continuous monitoring of individual filter effluents (IFE) and combined filter effluent (CFE). Tightened treated water turbidity requirements: CFE < 0.3 NTU in 95 percent of samples, and not to exceed 1 NTU longer than 1 hour. Set IFE reporting and evaluation requirements. Requires recycling of all return flows to the headworks.

Stage 1 D/DBP Rule. Set a treatment technology for DBP precursor removal (enhanced coagulation) based on source water total organic carbon (TOC) levels. Varying levels of removal are required if the source water concentrations are > 2 mg/L. Sets MCLs for TTHMs and HAA5 at 80/60 mg/L, respectively in distribution system as system-wide running annual average (RAA).

Long Term 2 Enhanced SWTR. Requires *Cryptosporidium*, or *E. coli* source water monitoring depending on system size. Source water bin classification dependent on monitoring results. If average *Cryptosporidium* value is > 0.075 oocysts/L, bin classification will require additional action (which could be additional log reductions or other actions, including source water protection). Also requires disinfection profiling and benchmarking if monitoring for *Cryptosporidium*. Second round of source water monitoring to be conducted again, six years after initial bin classification.

Stage 2 D/DBP Rule. Requires compliance with distribution system MCLs for TTHM and HAA5 to be based on locational running annual average (LRAA). In Stage 2, compliance is based on LRAA of 80/60 µg/L. Initial Distribution System Evaluations were completed to identify long term monitoring locations.

Potential Future System Description

A planning study for Phase I of the SRRWRP was completed in August 2015. There are currently three project alternatives being considered. The project will be developed in three phases: Phase 1 is planned to be implemented in 8 to 10 years, Phase 2 in about 15 years, and Phase 3 in about 25 years. Each alternative currently includes use of an existing NMWC intake facility on the Sacramento River, phased installation of raw water pipelines, an approximate location for the new water treatment plant, and phased construction of finished water pipelines. All three alternatives use NMWC's Pritchard Lake intake facility (near River Mile 75) for water diversion in Phases 1 and 2, and use NMWC's Sankey Intake facility (near River Mile 79) in Phase 3. The location of the potential future centralized Water Treatment Plant (WTP) in all alternatives is east of the Sacramento International Airport. No details have been developed on the water treatment plant process or design. **Table 5-1** is a summary of the major differences between the three project alternatives. The proposed capacity of the water treatment plant is 30 million gallons per day (mgd) for Phase 1, 85 mgd for Phase 2, and 200 mgd for Phase 3.

Table 5-1
Summary of Project Alternatives for SRRWRP

Alternative	WTP Location	Raw Water Pipeline	Finished Water Pipeline	Total Pipeline	Major Advantage	Major Disadvantage
A	Sutter County	86,000 ft.	125,000 ft.	211,000 ft.	Direct finished water pipeline route to Western Placer County	WTP located outside agencies' service areas
B	RLECWD	86,000 ft.	133,000 ft.	219,000 ft.	Centralized WTP	Longest total pipeline length
C	RLECWD	80,000 ft.	133,000 ft.	213,000 ft.	Centralized WTP and shortest length of raw water pipeline	Finished water pipeline alignment could be more expensive

RLECWD = Rio Linda / Elverta Community Water District

Significant Potential Contaminating Activities in Protection Zone

The protection zone for this diversion location has been identified as the Sacramento River from River Mile 75 to 85, as well as the Feather River from the confluence with the Sacramento River up to River Mile 5. The Sacramento River has levees on both sides, including the Fremont Weir (which leads to the Yolo Bypass) on the right bank of the river between River Miles 81.5 and 84. Sacramento Slough enters from the left bank at River Mile 80.5, and during flood periods the Sutter Bypass can drain into the Sacramento River, and then on to the Yolo Bypass, between River Miles 80 and 84. The Feather River has a levee on the left bank, but is not leveed along its right bank. There is a levee on the west side of the Sutter Bypass, which is adjacent to the Feather River, so it allows only the lands located in the bypass to drain into the Feather River under normal flow conditions. During flood periods, the Feather River and the Sutter Bypass can be contiguous. This is shown on the inset map of the Watershed Map, see **Figure 2-1**.

This area is largely agricultural and rural, with limited urban or industrial development yet. There are limited recreational uses of the river, primarily power boating and on-shore and boat fishing. There are two marinas: one near River Mile 76 (Rio Ramaza) and one near River Mile 80 (Verona Village). Neither facility offers a fueling station or sewage pumpout. There are several major agricultural drains discharging to the river in this reach, including: the Sacramento Slough (River Mile 80.5), the Natomas Cross Canal (River Mile 79 – which includes discharges from Reclamation District (RD) 1001 in Sutter County and RD1000 in Natomas Basin [Pumping Plants 4 and 6]), and RD1000 direct discharge (Pumping Plant 2 at River Mile 75). The Sutter and Yolo Bypasses cross the Sacramento River between River Miles 80 and 84.

WOODLAND-DAVIS CLEAN WATER AGENCY DIVERSION

This section evaluates the new WDCWA Diversion and its associated regional water treatment facility, which is currently under construction. Since this is a new facility

under construction, there is no discussion of changes since the 2010 Update or regulatory compliance evaluation. This diversion facility and RWTF will serve customers in the cities of Davis and Woodland, as well as the University of California at Davis (UC Davis).

System Description

The WDCWA has developed a new surface water supply project that will divert up to approximately 46,100 acre-feet per year from the Sacramento River. The water will be treated at the RWTF that is currently under construction, expected to be operational in June 2016.

The new intake location is at River Mile 70.5, which is just upstream of the Interstate 5 bridge crossing, Veterans Bridge. The new 400 cubic feet per second (cfs) intake is a joint project between WDCWA and RD 2035. Out of the 400 cfs, 320 cfs will be allocated to RD 2035, and 80 cfs to WDCWA. The intake facility will include a sediment control system to prevent the long-term accumulation of fine silts and sands on the floor of the wet-well and a steel log boom to protect the structure from floating debris. Fish screens will be horizontally oriented with 1.75 millimeter (mm) slot size.

The initial capacity of the RWTF will be 30 mgd, with 18 mgd for the City of Woodland, and 12 mgd for the City of Davis, with 1.2 mgd of the 12 mgd allocated to UC Davis. It is expected that this capacity will be sufficient through 2035 for all agencies.

The RWTF will be a conventional water treatment plant employing Actiflo® ballasted flocculation. Ferric chloride and anionic polymer will be added as coagulants to the influent water. The coagulants will be mixed using a hydraulic jet mixer. The coagulated water will then enter one of three Actiflo® clarification basins. The water will then be routed to an ozone chamber, and then to the five dual media filters that have 12 inches of sand and 42 inches of granular activated carbon (GAC). Chlorine will only be used at the clearwell. The finished water pump station will have different pH, orthophosphate concentration (if added), and chlorine residual for each agency's distribution system.

Significant Potential Contaminating Activities in Protection Zone

The protection zone for this diversion location has been identified as the Sacramento River from River Mile 70.5 to 82, as well as the Feather River from the confluence with the Sacramento River up to River Mile 2. The Sacramento River has levees on both sides, including the Fremont Weir (which leads to the Yolo Bypass) on the right bank of the river upstream of River Mile 81.5. Sacramento Slough enters from the left bank at River Mile 80.5, and during flood periods the Sutter Bypass can drain into the Sacramento River, and then on to the Yolo Bypass, upstream of River Mile 80. The Feather River has a levee on the left bank, but is not leveed along its right bank. There is a levee on the west side of the Sutter Bypass, which is adjacent to the Feather River, so it allows only the lands located in the bypass to drain into the Feather River under

normal flow conditions. During flood periods, the Feather River and the Sutter Bypass can be contiguous. This is shown on the inset map of the Watershed Map, see **Figure 2-1**.

This area is largely agricultural and rural, with limited urban or industrial development yet. There are limited recreational uses of the river, primarily power boating and on-shore and boat fishing. There are four marinas: one near River Mile 76 (Rio Ramaza), one near River Mile 80 (Verona Village), and two near River Mile 70.5 (Alamar and Metro). Fuel is available at the Metro Marina and a sewage pumpout is available at the Alamar Marina. There are several major agricultural drains discharging to the river in this reach, including: the Sacramento Slough (River Mile 80.5), the Natomas Cross Canal (River Mile 79 – which includes discharges from RD1001 in Sutter County and RD1000 in Natomas Basin [Pumping Plants 4 and 6]), and RD1000 direct discharge (Pumping Plant 2 at River Mile 75). The Sutter and Yolo Bypasses cross the Sacramento River between River Miles 80 and 84.

Water Quality Summary

The WDCWA began water quality monitoring at their planned diversion in August 2009. Data collected during the 2010 to 2014 reporting period was discussed in **Section 3.** The 2010 Update included five months of data from August to December 2009. Since the water treatment plant is not yet operational, there is no treated water quality data to evaluate. Water quality at the WDCWA diversion is of good quality and suitable for conventional filtration. Below is a discussion of each of the constituents of interest.

Disinfection By-Product Precursors

Peak total organic carbon (TOC) levels at WDCWA's planned diversion are expected to occur during wet events. TOC ranged from 1.1 to 7.8 milligrams per liter (mg/L), with an average of 2.46 mg/L and a median of 2.1 mg/L. The maximum TOC level of 7.8 mg/L occurred in December 2012. The water treatment plant will need to achieve TOC removal through enhanced coagulation, or achieve treated water TOC less than 2 mg/L, as source water levels from 2010 to 2014 are less than 2 mg/L only 39 percent of the time. According to WDCWA, the enhanced coagulation compliance method will be determined on a monthly basis when samples are collected.

Unregulated Contaminant Monitoring Rule (UCMR) 3

UCMR3 was monitored four times at the WDCWA diversion. The only constituents detected were chromium, hexavalent chromium, strontium, and vanadium, all of which were only detected at very low levels as shown in **Table 5-2**.

Table 5-2
UCMR3 Monitoring at WDCWA Diversion

Constituent	Range, µg/L
Total Chromium	ND – 2.8
Hexavalent Chromium	0.19 – 0.25
Vanadium	2.7 – 5.6
Strontium	95 - 112

Endocrine Disruptors

Source water was sampled for 95 various endocrine disruptors from July 2010 to October 2014, on eight separate sampling dates. **Table 5-3** shows a compilation of detectable endocrine disruptors, which were all detected at low levels.

Giardia/Virus/*Cryptosporidium* Reduction Requirements

WDCWA conducted *Cryptosporidium* and *Giardia* monitoring for the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESTWR) from August 2009 through August 2011. Additional samples were collected through February 2012. Out of 26 samples collected between 2010 and 2012, *Cryptosporidium* was presumably detected twice, and *Giardia* was presumably detected 13 times. The overall average *Cryptosporidium* concentration was 0.014 oocysts per liter (oocysts/L), with a maximum running annual average of 0.022 oocysts/L. As the maximum running annual average was less than 0.075 oocysts/L, the source is classified as Bin 1, with no additional treatment required. WDCWA received a letter from DDW in May 2012, indicating a Bin 1 classification. The overall average *Giardia* concentration was 0.076 cysts per liter (cysts/L).

In addition, the raw water sampling conducted at the new intake included *Escherichia coli* (*E. coli*) monitoring. *E. coli* levels ranged from 2 to 1,700 most probable number per 100 milliliters (MPN/100 mL), with an average of 117 MPN/100 mL and a median of 17 MPN/100 mL. Only 14 percent of individual samples exceeded 200 MPN/100 mL. This data continues to support the appropriateness of 3/4-log reduction for *Giardia* and viruses.

The RWTF has been designed to achieve the 3/4/2-log reduction requirement for *Giardia*/viruses/*Cryptosporidium*. The plant will be operated to meet turbidity standards to receive credit for 2.5-log reduction of *Giardia*, 2.0-log reduction of viruses, and 2.0-log reduction for *Cryptosporidium* for physical removal and to achieve at least 0.5-log credit for *Giardia* and 2.0-log credit for viruses through disinfection.

As stated earlier, WDCWA has a Bin 1 classification based on *Cryptosporidium* monitoring data for the LT2ESTWR. WDCWA will begin the second round of LT2ESWTR monitoring in December 2017. Therefore, no additional RWTF improvements are anticipated at this time to meet future regulations.

Table 5-3
WDCWA Endocrine Disruptor Monitoring, 2010-2014

Constituent	Sample Date	ng/L
Acetaminophen	1/25/2011	27
	10/29/2013	640
Caffeine	7/26/2011	9.7
	10/31/2012	8.6
	10/29/2013	10
DACT	1/25/2011	8.4
DEET N-N-dietheyltoluamide	10/26/2010	2.5
	7/26/2011	3.1
	10/29/2013	86
Dehydronifedipine	7/13/2010	22
Diuron	7/26/2011	6.8
Fluoxetine	10/31/2012	16
Meclofenamic Acid	7/13/2010	7.9
Quinoline	10/31/2012	7.3
	10/29/2013	8.2
TCEP (Tri (2-chloroethyl) phosphate)	10/29/2013	54
TCPP	10/29/2013	810
TDCPP	1/25/2011	7.5
Theobromine	10/26/2010	38
	1/25/2011	19
	7/26/2011	6.6
	10/31/2012	30
	10/29/2013	19
2,4-D (2,4-Dichlorophenoxyacetic acid)	10/26/2010	17
	7/26/2011	43
Acesulfame-K	10/26/2010	200
	4/26/2011	55
	7/26/2011	240
	10/31/2012	57
	10/29/2013	21
Butalbital	1/25/2011	6.5
	7/26/2011	5.5
Estradiol (17 beta)	7/13/2010	5.1
Furosimide	7/13/2010	36
Iohexal	7/13/2010	12
	10/26/2010	110
	7/26/2011	18
	10/31/2012	28
Sucralose	10/26/2010	110
	7/26/2011	120
Triclosan	7/13/2010	14

CITY OF WEST SACRAMENTO GEORGE KRISTOFF WATER TREATMENT PLANT

System Description

The City of West Sacramento owns and operates the GKWTP, which treats Sacramento River water diverted at River Mile 62.5 near the Interstate 80 bridge crossing. The GKWTP and intake have a capacity of 58 mgd and are expandable to 72 mgd. The GKWTP has recently been operated between 5 and 27 mgd. The current average monthly winter flow is 7 mgd, and the average monthly summer flow is 13 mgd.

GKWTP is a conventional water treatment plant employing Actiflo® ballasted flocculation. Polyaluminum chloride (PAC) and cationic polymer are added as coagulants to the influent water. The coagulants are mixed using flash mixing in a small basin. The coagulated water then enters one of two Actiflo® clarification basins. During the summer, the water is pre-chlorinated prior to the Actiflo® process, but during winter the water is pre-chlorinated prior to filtration. The Actiflo® process uses ballasted flocculation via the addition of microsand to enhance the flocculation and settling of floc. The Actiflo® basins operate at surface loading rates up to 30 gallons per minute per square foot (gpm/sf) and therefore occupy much less space than a conventional flocculation/sedimentation basin. The space savings offered by Actiflo® was a primary reason for its selection at the GKWTP site due to limited available space. The basins are equipped with mixers, sand feeders, tube settlers, sand/sludge recirculation pumps and sand separators, and are considered more mechanically-intensive than conventional clarification processes.

The clarified water is then filtered through eight gravity-flow dual-media filters. These filters have a four-foot deep bed of GAC over 12-inches of sand using a gravel-less underdrain system. GAC was installed as the primary filter media instead of anthracite to protect against possible seasonal taste and odor events caused by thiobencarb, which can be present at the intake location due to rice farming practices in the watershed. The GAC filters also act as a barrier against emergency situations including accidental chemical spills in the river. The filters are backwashed with air and water. The filters have filter-to-waste capabilities. Dirty backwash water and sludge are handled in the plant's old flocculation/sedimentation basins, with recycle water returned ahead of the flash mix system.

The filtered water is post-chlorinated for disinfection credit, and corrosion control is implemented by the use of caustic soda to try and maintain pH at 8.5 in the distribution system. There are eight million gallons (mg) of storage on the plant site, including disinfection contact time, and an additional 10 mg in the distribution system.

Highlights of Changes Since 2010 Update

In April 2013 the City of West Sacramento constructed an additional 3.0 mg remote site storage tank and Bridge District pump station.

Significant Potential Contaminating Activities in Protection Zone

The protection zone for this diversion location has been identified as the Sacramento River from River Mile 62.5 to the confluence with the Feather River at River Mile 80. The Sacramento River has levees on both sides. This is shown on the inset map of the Watershed Map, see **Figure 2-1**.

The area nearest the intake is recently developing urban land use, while the area north of Sacramento International Airport is still largely agricultural and rural, with limited urban or industrial development. The bridge crossing for Interstate 80 is located just downstream of the intake. There are limited recreational uses of the river, primarily power boating and on-shore and boat fishing. Elkhorn Regional Park is located upstream and provides boat launch and permanent toilet facilities. There are four marinas: one near River Mile 76 (Rio Ramaza), one near River Mile 80 (Verona Village), and two near River Mile 70.5 (Alamar and Metro). Fuel is available at the Metro Marina and a sewage pumpout is available at the Alamar Marina. There are several major agricultural drains discharging to the river in this reach, including: the Sacramento Slough (River Mile 80.5), the Natomas Cross Canal (River Mile 79 – which includes discharges from RD1001 in Sutter County and RD1000 in Natomas Basin [Pumping Plants 4 and 6]), and RD1000 direct discharges (Pumping Plant 2 at River Mile 75, Pumping Plant 5 at River Mile 70, and Pumping Plant 3 at River Mile 66). It should be noted that RD1000 Pumping Plant 5 includes urban runoff from the Sacramento International Airport and Pumping Plant 3 includes urban runoff from the City and County of Sacramento.

Water Quality Summary

Below is a discussion of each of the constituents of interest and any notable compliance issues for each during the period of study.

Turbidity

The monthly turbidity reports submitted to the State Water Resources Control Board, Division of Drinking Water (DDW) were reviewed as part of this analysis. These report the four-hour turbidity measurements of the combined filter effluent (CFE), as well as peak daily influent, peak daily settled, and peak daily recycled water turbidities.

A statistical assessment of electronic data at the GKWTP from January 2010 through December 2014 shows that the average of the daily peak raw water turbidity was 19.4 nephelometric turbidity units (NTU), average of the daily peak settled water turbidity was 0.92 NTU, and the average of the daily average CFE turbidity was 0.03 NTU. The overall treatment process had an average solids removal of 99.8 percent, well above

the required 80 percent. **Figure 5-1** shows a time series plot of peak raw, settled and average treated daily water turbidities. The GKWTP easily met all current treated water turbidity standards.

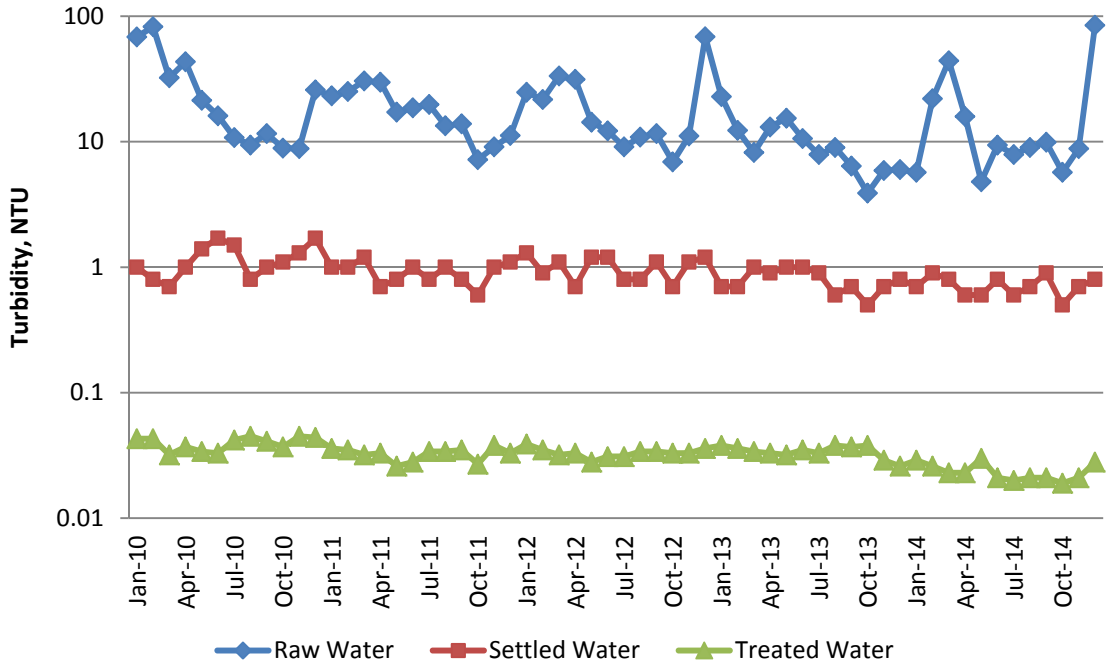


Figure 5-1. GKWTP, Raw, Settled, and Treated Water Turbidities, 2010 – 2014

Microbiological Constituent Review

The City of West Sacramento performed monthly distribution system coliform analysis from 2010 through 2014. A review of the City of West Sacramento's Consumer Confidence Reports (CCRs) shows that there were no coliform positive tests reported within the GKWTP distribution system from 2010 to 2014.

Disinfection By-Products

The City of West Sacramento monitors alkalinity and TOC levels in its raw water and TOC levels in its treated water monthly in order to determine TOC removal compliance. **Figure 5-2** shows a time series plot of raw and treated water TOC at GKWTP.

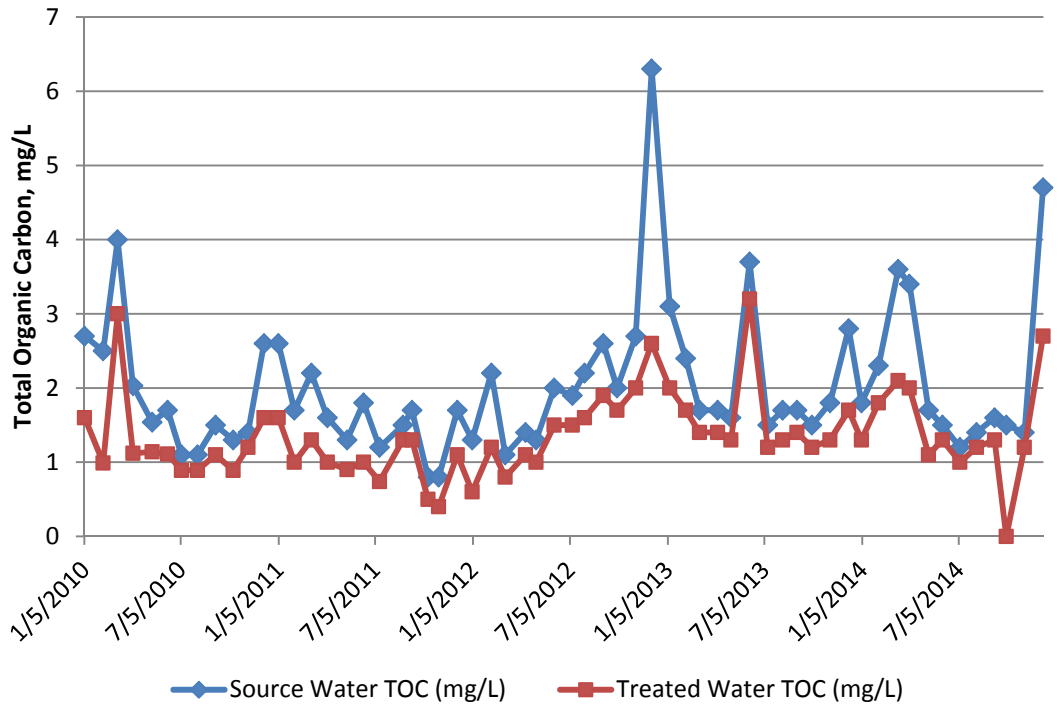


Figure 5-2. GKWTP, Raw and Treated Water TOC, 2010 – 2014

Source water TOC levels at GKWTP were less than 2.0 mg/L 65 percent of the time. Treated water TOC levels at GKWTP were less than 2.0 mg/L 88 percent of the time. The average raw and treated water TOC levels at GKWTP were 2.01 mg/L and 1.37 mg/L, respectively, equating to 31.5 percent average removal. For source water TOC levels between 2 and 4 mg/L, 35 percent TOC removal is required when the raw water alkalinity is less than 60 mg/L as calcium carbonate ($CaCO_3$). For source water TOC levels between 2 and 4 mg/L, 25 percent TOC removal is required when the raw water alkalinity is between 60 and 120 mg/L as $CaCO_3$. The average source water alkalinity over the reporting period was 65 mg/L as $CaCO_3$, so removal reduction requirements can vary between 25 and 35 percent.

From 2010 through 2014, the removal requirements were met on a monthly basis, except for November 2012 and June 2013. During these months, the percent TOC removal was not achieved. In November 2012, 35 percent TOC removal was required and 25.9 percent was achieved. In June 2013, 25 percent TOC removal was required, and 13.5 percent was achieved. However, compliance with the enhanced coagulation requirement is based on a running annual average, calculated quarterly, so the City of West Sacramento met the standard over the year.

The disinfection byproducts precursors compliance report for the first quarter of 2012 submitted to DDW indicated that the system was not in compliance that quarter as the TOC percent removal ratio RAA was less than or equal to 1.0. However, the City did not assign the correct TOC percent removal credit on the form for six months in 2012. Since the alternative compliance criterion for treated water TOC less than 2.0 mg/L was

met during the six months, the ratio should have been automatically assigned a value of 1.0. The same type of error occurred in March 2013, when both the source and treated water TOC was less than 2.0 mg/L and the ratio should have been automatically assigned a value of 1.0. Therefore, the system was in compliance.

Although the system was in compliance, **Figure 5-2** also shows that since May 2012, the treated water TOC has not been able to achieve a value below 1.0 mg/L, as was achievable in the past. Since the GKWTP has been achieving the same level of solids reduction, this indicates that the source water contribution of organic carbon may be changing to include more dissolved organic carbon (DOC) than in the past. Conventional filtration is effective at removing particulate organic carbon, but not DOC. There are numerous potential causes for an increase in DOC levels in the source water, including low river and reservoir levels due to the drought, instream generation (i.e., algae or decaying material), and agricultural drainage. Since DOC is not effectively removed through conventional treatment, increasing DOC levels in the raw water may result in higher TOC in the treated water.

Stage 1 D/DBP Rule Compliance Period

The City of West Sacramento sampled four sites in the distribution system for total trihalomethanes (TTHM) and haloacetic acids (HAA5) on a quarterly basis for Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule monitoring, from January 2010 to August 2013. The TTHM running annual average (RAA) ranged from 35.5 to 54.9 micrograms per liter (µg/L), with an average of 43.2 µg/L. All results were well below the primary Maximum Contaminant Level (MCL) of 80 µg/L. The HAA5 RAA ranged from 22.4 to 34.4 µg/L, with an average of 28.1 µg/L. All results were well below the primary MCL of 60 µg/L. Over the reporting period, the TTHM and HAA5 RAAs were well below the MCLs per the Stage 1 D/DBP Rule.

Stage 2 D/DBP Rule Compliance Period

The City of West Sacramento converted to eight Stage 2 D/DBP Rule monitoring sites in October 2013. Out of the eight sites, three sites are existing Stage 1 sites (PSIP Water Storage Reservoir, Central Water Storage Reservoir, Northeast Water Storage Reservoir), and five sites are new. TTHM locational running annual averages (LRAA) from October 2013 to December 2014 ranged from 28 to 44 µg/L, with site 4 (Bridgeway Lakes Storage Reservoir) having the highest LRAA of 44 µg/L. All LRAAs were well below the primary MCL of 80 µg/L.

HAA5 LRAAs ranged from 20.3 to 33.8 µg/L, with site 4 (Bridgeway Lakes Storage Reservoir) having the highest LRAA of 33.8 µg/L. All LRAAs were well below the primary MCL of 60 µg/L.

According to City of West Sacramento staff, the Bridgeway Lakes Storage Reservoir is the site furthest from the GKWTP. Additionally, it is located in an area with newer housing developments; the City of West Sacramento has determined that the water

demand from the Bridgeway Lakes Storage Reservoir was not as high as expected, and therefore the water can be prone to long detention times.

As sites PSIP Water Storage Reservoir, Central Water Storage Reservoir, and Northeast Water Storage Reservoir are both Stage 1 and Stage 2 D/DBP Rule monitoring sites, they are the only sites with continuous data over the reporting period. Individual TTHM and HAA5 data for these sites is shown in **Figures 5-3** and **5-4**. Generally, the data show that since the chlorination point was moved in 2010, from before the Actiflo® process to after the Actiflo® process, the TTHM and HAA5 are lower.

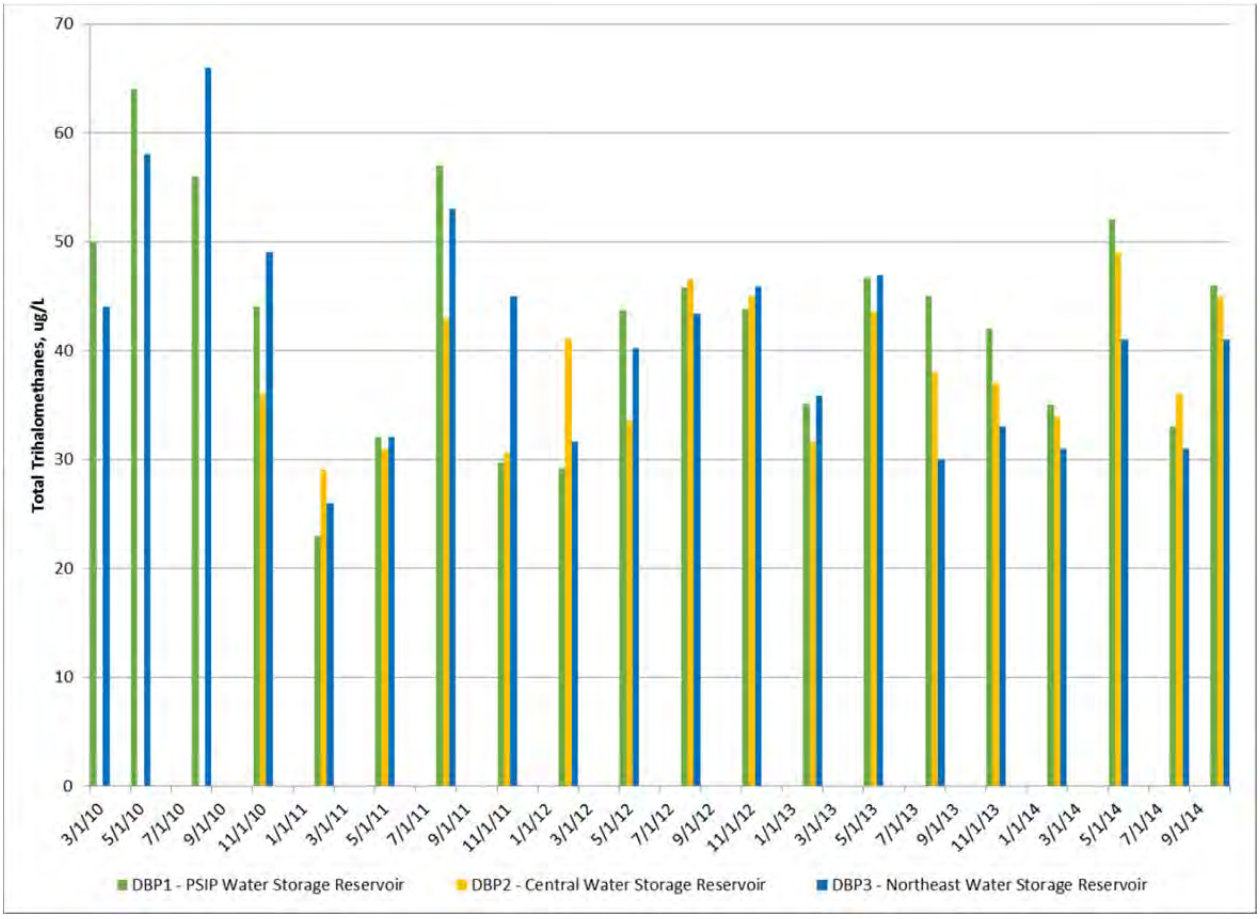


Figure 5-3. City of West Sacramento, Distribution System TTHM for Sites PSIP Water Storage Reservoir, Central Water Storage Reservoir, and Northeast Water Storage Reservoir, January 2010 – December 2014

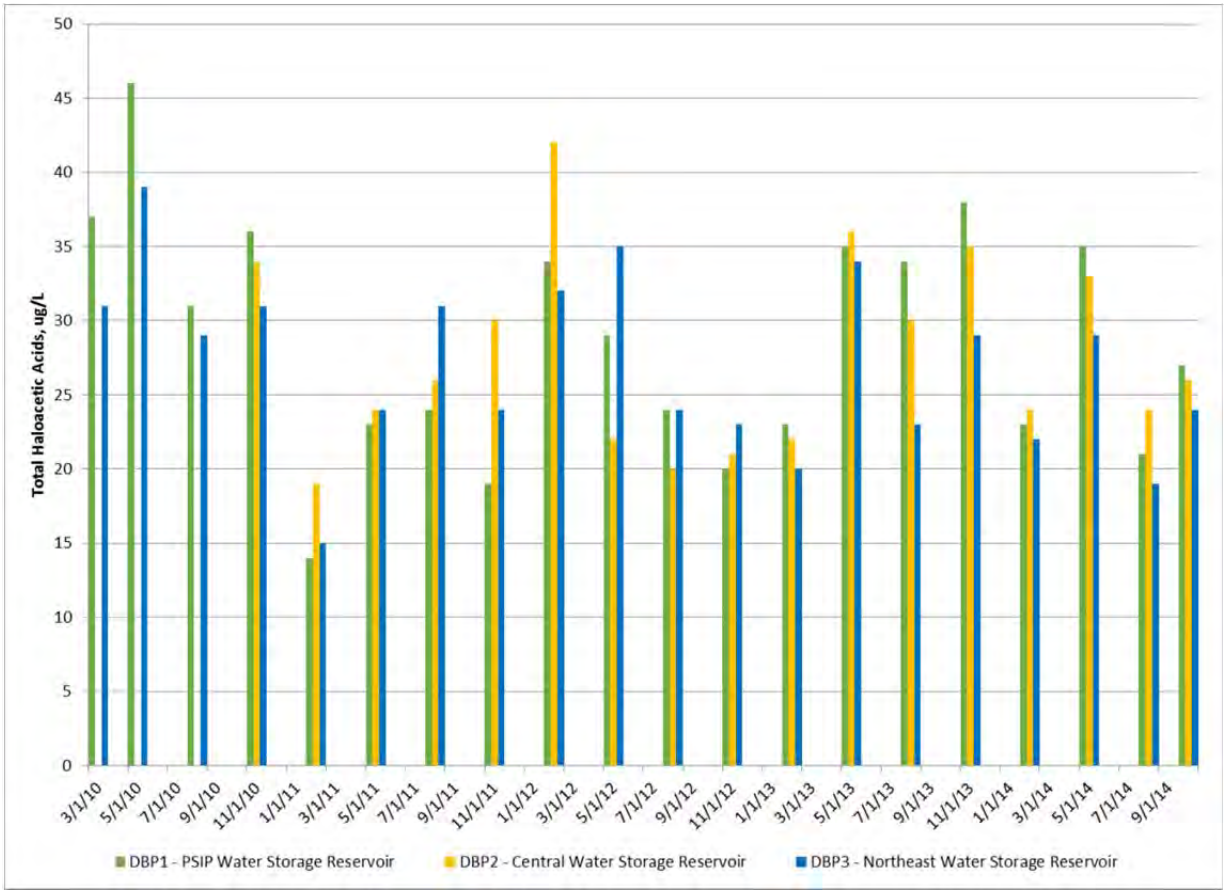


Figure 5-4. City of West Sacramento, Distribution System HAA5 for Sites PSIP Water Storage Reservoir, Central Water Storage Reservoir, and Northeast Water Storage Reservoir, January 2010 – December 2014

UCMR 3

The first quarter of UCMR 3 sampling was conducted in March 2015, and all perfluorinated compounds and organics at the entry point to the distribution system were non-detectable. Additionally, only chromium, hexavalent chromium, strontium, and vanadium at the entry point to the distribution system were found to be detectable, at very low levels as shown in **Table 5-4**.

Table 5-4
Results from First Quarter of UCMR3 Monitoring for City of West Sacramento, Entry Point to Distribution System

Constituent	Result, µg/L
Total Chromium	0.3
Hexavalent Chromium	0.18 – 0.19
Vanadium	3.2
Strontium	130

Giardia/Virus/*Cryptosporidium* Reduction Requirements

Based on the *E. coli*, *Giardia*, and *Cryptosporidium* data presented in **Section 3** as well as above and the LT2ESWTR data presented in the 2010 Update, 3/4/2-log reduction of *Giardia*/virus/*Cryptosporidium* continue to be appropriate reduction requirements for GKWTP. Out of 60 months from 2010 to 2014, there were only two monthly median source water *E. coli* values at or higher than 200 MPN/100mL at the GKWTP. Additionally, only five percent of all individual *E. coli* samples exceeded 200 MPN/100mL.

GKWTP currently receives reduction credit for 2.5-log *Giardia,* 2.0-log viruses, and 2-log *Cryptosporidium* for physical removal. Disinfection with free chlorine provides 0.5-log credit for *Giardia* and 2.0-log credit for viruses. This meets all of the current microbial removal/inactivation requirements of the Surface Water Treatment Rule (SWTR) and Interim Enhanced SWTR (IESWTR).

The City of West Sacramento has a Bin 1 classification based on *Cryptosporidium* monitoring data for the LT2ESTWR. The City of West Sacramento will begin the second round of LT2ESWTR monitoring in October 2015. Therefore, no additional plant improvements are anticipated at this time to meet future regulations.

Regulatory Compliance Evaluation

The City of West Sacramento has been monitoring the raw and treated water for GKWTP for Title 22 compliance constituents. **Table 5-5** lists the existing drinking water regulations and a compliance evaluation for these standards at GKWTP. West Sacramento is currently in compliance with current requirements and is expected to be in compliance with near-term requirements.

Table 5-5
Regulatory Compliance Evaluation
City of West Sacramento – George Kristoff WTP

	Targeted Compounds	Key Issues Compliance Status
Existing Regulations		
Phase I, II, and V	VOCs, SOCs	No MCLs exceeded based on review of the CCRs.
SWTR	Microbial and Turbidity	Data continue to support 3/4—log reduction requirement for *Giardia*/viruses. All operations, monitoring and reporting requirements are met, and all treated water turbidity standards are met.
Interim/Long Term 1 ESWTR and Filter Backwash Rule	Microbial and Turbidity	All turbidity standards met. 2-log reduction credit for *Cryptosporidium* applicable.
Long Term 2 ESWTR	Microbial	Completed source water monitoring and received Bin 1 classification from DDW. Will conduct second round of monitoring starting October 2015.
Stage 1 D/DBP Rule	Disinfectants and Disinfection By-Products	TOC RAA percent removal ratio >1.0, except for Nov. 2012 and June 2013, and compliance was met throughout the study period. The system was incorrectly found to be out of compliance with TOC removal requirement in first quarter 2013 report. TTHM/HAA5 RAAs at Stage 1 D/DBP Rule sites comply with drinking water standards (< 80/60 µg/L, respectively).
Stage 2 D/DBP Rule	Disinfectants and Disinfection By-Products	Current TTHM/HAA5 LRAAs for Stage 2 are below drinking water standards (< 80/60 µg/L, respectively).

CITY OF SACRAMENTO SACRAMENTO RIVER WATER TREATMENT PLANT

System Description

The City of Sacramento owns and operates the SRWTP, which treats Sacramento River water diverted at River Mile 60 immediately downstream of the confluence with the American River. The SRWTP has a permitted capacity of 160 mgd, but currently has a sustainable capacity of 135 mgd due to hydraulics limitations. A rehabilitation construction project is in progress to make improvements to bring the plant capacity to the permitted capacity of 160 mgd. The projected date of completion for the improvements is 2016. The current average winter flow is approximately 35 mgd, and the current average summer flow is approximately 60 mgd. The SRWTP is a conventional water treatment plant. The influent water is pre-chlorinated for disinfection and pre-treatment. Alum is added as a coagulant.

The SRWTP has three separate process trains: one (1), two (2) and three (3). Train 2, built in the 1930's, was taken out of service in November 2013 as part of the rehabilitation project. Train 2 will be replaced with a newly constructed train similar to Train 3, built in 2004. The water is flocculated in four-stages on Train 1, in two-stages

on Train 2, and four-stages on Train 3; all three trains use vertical-shaft flocculators. Train 1 has four circular flocculators operated in series, and there is a rectangular serpentine sedimentation basin buried underground with a surface loading rate of 1.8 gpm/sf. Train 2 had a two-step sedimentation process consisting of two parallel clarifiers and four parallel rectangular horizontal flow basins, with a surface-loading rate on the basins of 1.4 gpm/sf. Train 3 uses two parallel horizontal-flow clarifiers with a surface-loading rate of 1.0 gpm/sf. A polymer can be added to the settled water as a filter aid.

Clarified water from Trains 1 and 2 is applied to 16 gravity-flow, shallow, dual-media filters. The shallow filters consist of 12 inches of anthracite and 12 inches of sand, with a gravel base and a perforated pipe underdrain system. The older filters are operated at a maximum rate of 3.5 gpm/sf. The settled water from the Train 3 is applied to eight separate gravity-flow, deep, dual-media filters. The deep filters consist of 30 inches of anthracite over 12 inches of sand. The filters use a "gravel-less" underdrain system with nozzles and a lower plenum, and are backwashed with air and water. The newer filters, though permitted to filter at up to 6.0 gpm/sf, are operated at a maximum rate of 4.5 gpm/sf.

All of the filters are typically backwashed approximately every 72 hours. Currently, there are no filter-to-waste facilities for the older filters, but there are filter-to-waste systems on the newer filters. For the older filters part of Trains 1 and 2, the procedure is to rinse to waste following filter backwash; the filter is then put on standby until needed. All filter backwash water is sent to the filter washwater lagoons for settling and then returned to the raw water channel downstream of the grit basins and upstream of the flash mix system. The maximum return recycle flow rate is typically limited to no more than 10 percent of plant flow.

After filtration, the water is chlorinated for disinfection, and the pH is adjusted with lime. Contact time for disinfection (CT) is also calculated throughout the plant. The three clearwells at the water treatment plant provide 17.3 mg of storage, including disinfection contact time. The distribution system has an additional 45 mg of storage.

Highlight of Changes Since 2010 Update

A major rehabilitation project is currently in progress. Train 2 has been demolished and will be replaced with a replicate of the current Train 3. Train 1 will be decommissioned along with the 16 old filters, following completion of the newest treatment train going into service. Train 3 will become known as Trains 1 and 2, and the new treatment train will be known as Trains 3 and 4. Train 3 is being renamed as two processes (future Trains 1 and 2) to reflect that there are two subtrains that can be run independently. Eight new filters will be installed as part of the rehabilitation project, with the new filters part of the future Trains 3 and 4. Filters 1 through 8 will be shared by future Trains 1 and 2, and Filters 9 through 16 will be shared by future Trains 3 and 4. The upgraded plant includes the ability to apply chlorine pre- and post-filtration for all of the treatment trains. The rehabilitation project also includes mechanical dewatering with the decant from the residual solids dewatering process being discharged to the sewer. The filter washwater

lagoons will no longer be used to dry and store solids from the filter backwash process, due to the new residual solids collection system. The filter washwater will continue to be recycled to the headworks of the plant.

Significant Potential Contaminating Activities in Protection Zone

The protection zone for this diversion location has been identified as the Sacramento River from River Mile 60 to the confluence with the Feather River at River Mile 80 and the Lower American River to Nimbus Dam. Both rivers have levees on both sides. This is shown on the inset map of the Watershed Map, see **Figure 2-1**. Since this study focuses on the Sacramento River, and the American River has a separate Watershed Sanitary Survey, this study only evaluates the part of the Lower American River near the confluence with the Sacramento River.

The area nearest the intake on the Sacramento and American Rivers is urban, while the area north of Sacramento International Airport remains largely agricultural and rural, with limited urban or industrial development. There are several bridge crossings in the protection zone (Interstate 5, Interstate 80, and several along the Lower American River). Recreational uses on the Sacramento River are mostly limited to power boating and on-shore and boat fishing. There is swimming at Sand Cove Park, just downstream of GKWTP. Elkhorn Regional Park is located upstream and provides boat launch and permanent toilet facilities. There are seven marinas: one near River Mile 76 (Rio Ramaza), one near River Mile 80 (Verona Village), two near River Mile 70.5 (Alamar and Metro), and three between River Miles 61 and 62 (Riverview, Dwyer's Happy Landing, and Riverbank). Fuel is available at the Metro Marina and sewage pumpouts are available at the Alamar, Riverview, and Riverbank marinas. Recreational use on the American River is centered on the American River Parkway, and includes boating, fishing, and body contact recreation. Discovery Park is a popular beach area along with other stretches of the river, while rafting occurs along the length of the American River. There are several major agricultural drains discharging to the river in this reach including: the Sacramento Slough (River Mile 80.5), the Natomas Cross Canal (River Mile 79 – which includes discharges from Reclamation District (RD) 1001 in Sutter County and RD1000 in Natomas Basin [Pumping Plants 4 and 6]), and RD1000 direct discharges (Pumping Plant 2 at River Mile 75, Pumping Plant 5 at River Mile 70, Pumping Plant 3 at River Mile 66, and Pumping Plant 1 at River Mile 61). It should be noted that RD1000 Pumping Plant 5 includes urban runoff from the Sacramento International Airport and Pumping Plants 1 and 3 include urban runoff from the City and County of Sacramento. There are significant amounts of urban runoff from the Sacramento urban area, as well as some permitted industrial waste discharge, entering the river directly via sumps and indirectly via the Natomas East Main Drainage Canal at River Mile 60.5 and the Lower American River. Also, in the area along the Sacramento River between GKWTP and SRWTP and along the Lower American River there are known areas of illegal camping in the river corridor.

Water Quality Summary

Below is a discussion of each of the constituents of interest and any notable compliance issues for each during the period of study.

Turbidity

The monthly turbidity reports submitted to the DDW were reviewed as part of this analysis. These report the four-hour turbidity measurements of the CFE, as well as peak daily influent, peak daily settled, and peak daily recycled water turbidities.

A statistical assessment of electronic data at the SRWTP from January 2010 through December 2014 shows that the average of the daily peak raw water turbidity was 16.8 NTU, average of the daily peak settled water turbidity was 0.89 NTU, and the average of the daily average CFE turbidity was 0.04 NTU. The overall treatment process had an average solids removal of 99.7 percent, well above the required 80 percent. **Figure 5-5** shows a time series plot of peak raw, settled, and average treated daily water turbidities. The SRWTP easily met all current treated water turbidity standards.

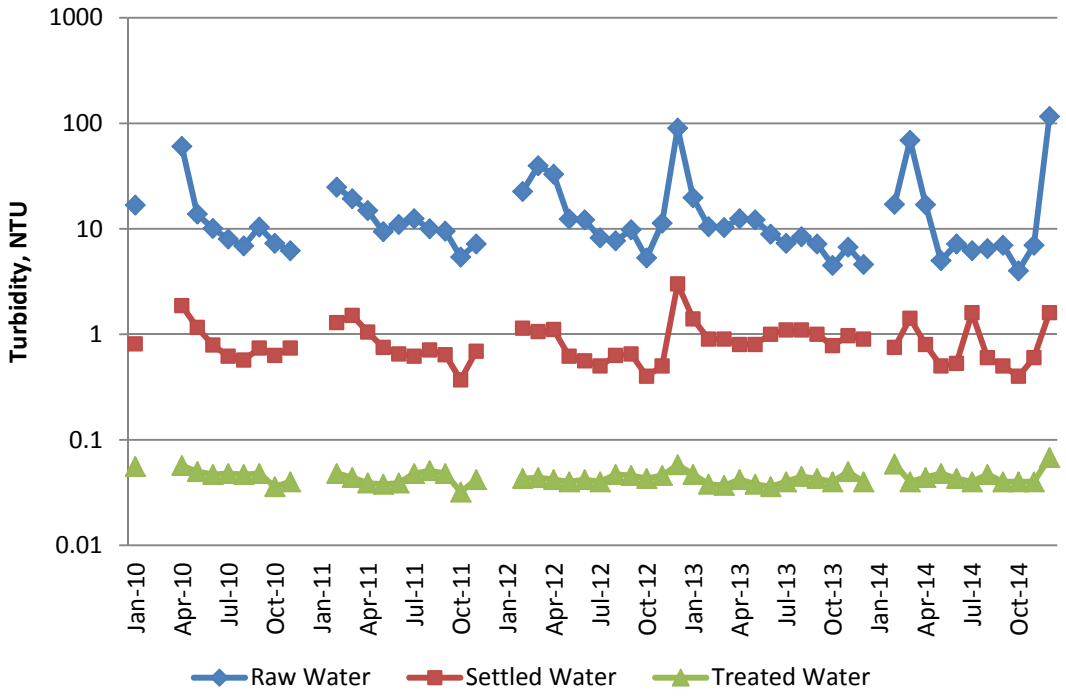


Figure 5-5. SRWTP, Raw, Settled, and Treated Water Turbidities, 2010 - 2014

In reviewing the monthly turbidity reports submitted to DDW, there were seven trigger exceedances for individual filter effluent reporting. The exceedances were all incidents where individual filter turbidities were greater than 0.3 NTU in two consecutive measurements after 60 minutes of continuous filter operation after backwash. There was no particular problematic filter, and the explanations for exceedences varied.

Some of the explanations for exceedences were: temporary malfunction of coagulant feed pump, backwash valve malfunction, extremely high turbidity in source water that resulted in plant shutdown, old filter accidentally set to record when the filter was not in service, and spike caused by calibration of turbidimeter.

Microbiological Constituent Review

The City of Sacramento performed monthly distribution system coliform analysis from 2010 through 2014. A review of the 2010 to 2014 City of Sacramento's CCRs shows that the monthly percent positive for total coliform was always less than five percent. Therefore, during the period of study, the City of Sacramento was always in compliance with the Total Coliform Rule. Additionally, there were no follow-up tests that were positive for *E. coli.*

Disinfection By-Products

The City of Sacramento monitors alkalinity and TOC levels in its raw water and TOC levels in its treated water monthly in order to determine TOC removal compliance. The average raw and treated water TOC levels at SRWTP were 1.9 mg/L and 1.3 mg/L, respectively, equating to 33.2 percent average reduction. **Figure 5-6** shows a time series plot of raw and treated water TOC at SRWTP.

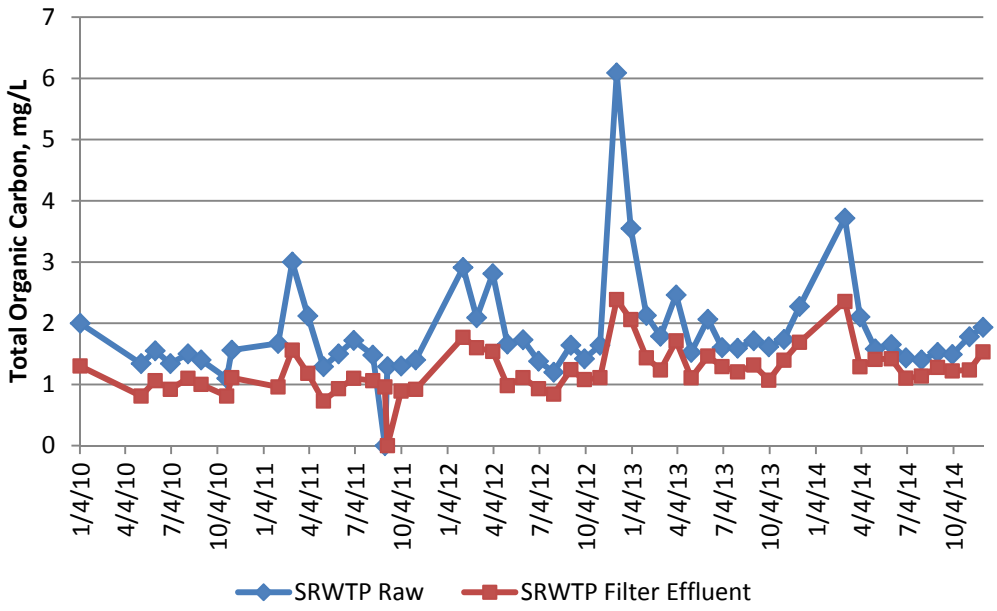


Figure 5-6. SRWTP, Raw and Treated Water TOC, 2010 - 2014

Seventy-five percent of the time, TOC levels in the raw water were below 2.0 mg/L, and the highest recorded level was 6.1 mg/L in December 2012. Due to the 6.1 mg/L reading in December 2012, and a 3.7 mg/L reading in March 2014, the source water RAA was greater than or equal to 2.0 mg/L for sixteen months. However, no TOC removal was required since treated water TOC was less than 2.0 mg/L at all times,

except for December 2012, January 2013, and March 2014. During these months, the SRWTP was required to achieve specific TOC removal requirements based on source water TOC and alkalinity. The SRWTP was able to achieve the 45 percent, 35 percent, and 25 percent removal requirements, respectively, for December 2012, January 2013 and March 2014.

It should be noted that the process to demonstrate compliance is no longer as straightforward as in previous reporting periods, as the source water RAA was previously always less than 2.0 mg/L and no TOC reduction calculation was required.

Figure 5-6 also shows that since May 2012, the treated water TOC has not been able to achieve below 1.0 mg/L, similar to the GKWTP. Since the SRWTP has been achieving the same level of solids reduction, this indicates that the source water contribution of organic carbon may be changing to include more DOC than in the past. Conventional filtration is effective at removing particulate organic carbon, but not DOC. There are numerous potential causes for an increase in DOC levels in the source water, including low river and reservoir levels due to the drought, instream generation (i.e., algae or decaying material), and agricultural drainage. Since DOC is not effectively removed through conventional treatment, increasing DOC levels in the raw water may result in higher TOC in the treated water.

Stage 1 D/DBP Rule Compliance Period

The City of Sacramento has collected both TTHM and HAA5 data for its distribution system. As part of the Stage 1 D/DBP Rule, the City sampled quarterly for TTHM and HAA5 at twelve sites selected to represent average and maximum residence times in the distribution system. Five sites were selected for this study to represent treated water from the SRWTP (sites 1SA, site 1SF, site 2S 14, site 5SE, and site 5SJ). The following statistics are based on these five sites only. The TTHM RAA ranged from 30.0 to 32.1 µg/L, with an average of 30.8 µg/L. The HAA5 RAA ranged from 18.5 to 21.5 µg/L, with an average of 19.5 µg/L. Over the reporting period, all RAAs are well below the respective MCLs per the Stage 1 D/DBP Rule.

Stage 2 D/DBP Rule Compliance Period

The City of Sacramento converted to twelve Stage 2 D/DBP monitoring sites in January 2011. Ten out of the twelve sites are applicable to the SRWTP. Out of the twelve sites, three sites are existing Stage 1 sites applicable for SRWTP (1SA, 5SE, and 5SJ). TTHM LRAAs ranged from 28 to 73 µg/L, with site 5SJ having the highest LRAA of 73 µg/L. HAA5 LRAAs ranged from 18 to 38 µg/L, with site 404 Blue Dolphin having the highest LRAA of 38 µg/L.

Over the reporting period, all LRAAs are below the respective MCLs per the Stage 2 D/DBP Rule. However, there were two Operational Evaluation triggers in 2014 at site 5SJ due to a single higher than normal TTHM sample result that resulted in the City conducting Operational Evaluations under the Stage 2 D/DBP Rule. The reason for the

higher than normal individual TTHM sample at site 5SJ in April 2014, at 123 µg/L, was attributed to the use of aluminum chlorohydrate (ACH) as an alternative coagulant, which was changed in May 2013. ACH was not as effective in reducing organic carbon and the SRWTP switched back to alum in 2014.

The City of Sacramento is currently conducting a chlorine optimization study to help lower disinfection byproducts. At the conclusion of the study, it may be determined that reducing or eliminating pre-chlorination is needed. The City of Sacramento is also in the process of completing a well in the Shasta Park area that will also feed the distribution system near site 5SJ and will assist with avoiding formation of high disinfection byproducts at this site.

As sites 1SA, 5SE, and 5SJ are both Stage 1 and Stage 2 D/DBP Rule monitoring sites, they are the only sites with continuous data over the reporting period. Individual TTHM and HAA5 data for these sites is shown in **Figures 5-7** and **5-8**.

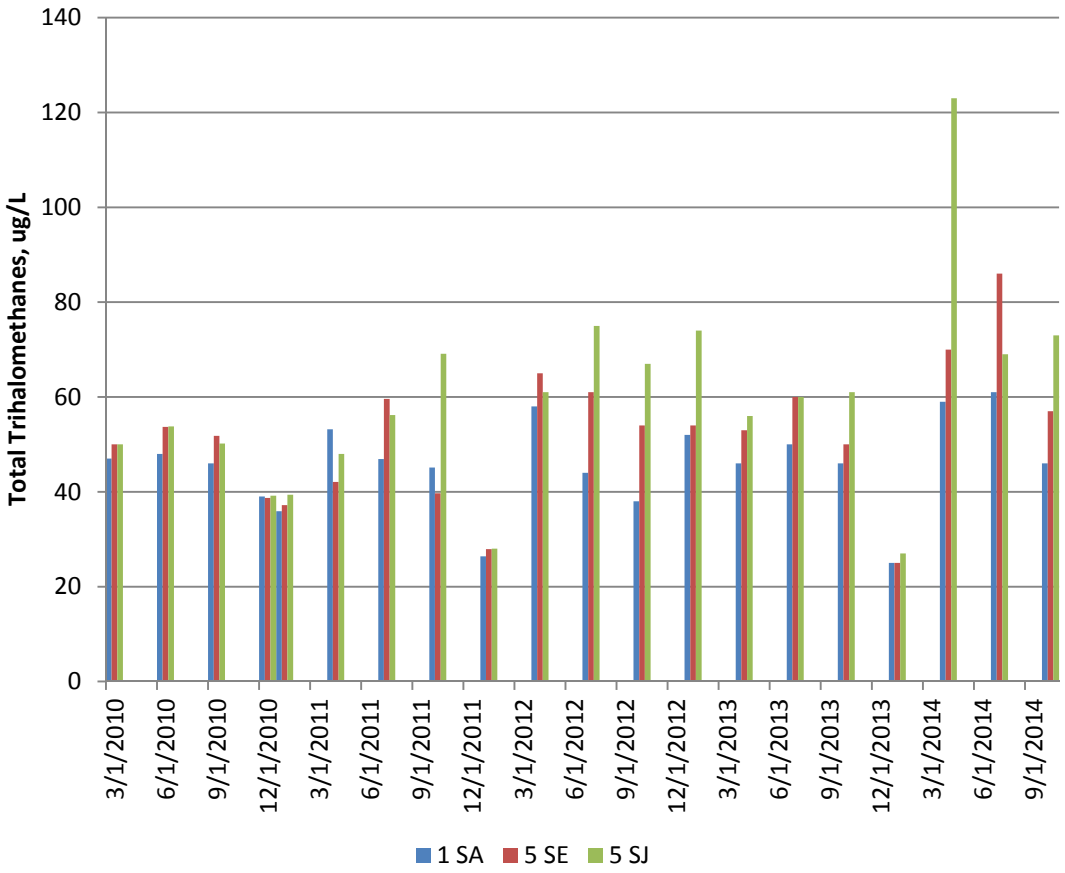


Figure 5-7. City of Sacramento, Distribution System TTHM for Sites 1SA, 5SE, 5SJ January 2010 – December 2014

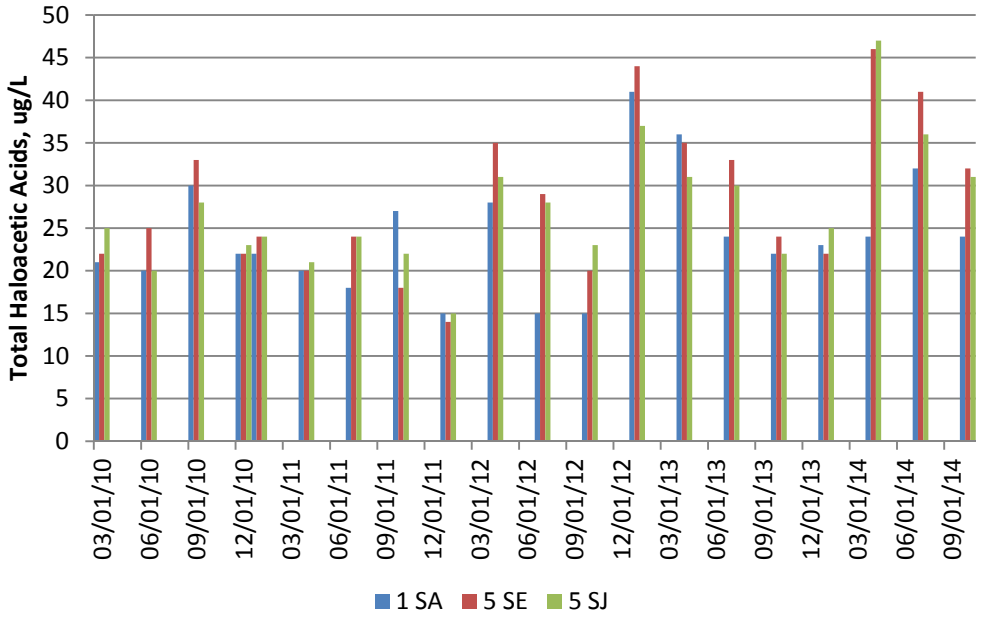


Figure 5-8. City of Sacramento, Distribution System HAA5 for Sites 1SA, 5SE, 5SJ January 2010 – December 2014

UCMR 3

The City of Sacramento also completed the UCMR 3, and only metals (total chromium, hexavalent chromium, vanadium, and strontium) were detected at very low levels, as shown in **Table 5-6.**

Table 5-6
UCMR3 Monitoring Results for City of Sacramento

Constituent	Result, µg/L
Total Chromium	ND - 0.2
Hexavalent Chromium	0.13 – 0.17
Vanadium	1.5 - 3.0
Strontium	72 -130

***Giardia*/Virus/*Cryptosporidium* Reduction Requirements**

Based on the *E. coli*, *Giardia*, and *Cryptosporidium* data presented in **Section 3** as well as above and the LT2ESWTR data presented in the Second Update and 2010 Update, 3/4/2-log reduction of *Giardia*/virus/*Cryptosporidium* continue to be appropriate reduction requirements for SRWTP. Out of 52 months from 2010 to 2014, there were three monthly median source water *E. coli* values at or higher than 200 MPN/100mL at the SRWTP. Additionally, nine percent of all individual *E. coli* samples exceeded 200 MPN/100mL.

SRWTP currently receives reduction credit for 2.5-log *Giardia,* 2.0-log viruses, and 2-log *Cryptosporidium* for physical removal. Disinfection with free chlorine provides 0.5-log credit for *Giardia* and 2.0-log credit for viruses. This meets all of the current microbial removal/inactivation requirements of the SWTR and IESWTR.

The City of Sacramento has a Bin 1 classification based on *Cryptosporidium* monitoring data for the LT2ESTWR. The City of Sacramento began the second round of LT2ESWTR monitoring in April 2015. Therefore, no additional plant improvements are anticipated at this time to meet future regulations.

Regulatory Compliance Evaluation

The City of Sacramento has been monitoring the raw and treated water for the SRWTP for Title 22 compliance constituents. **Table 5-7** lists the existing drinking water regulations and a compliance evaluation for these standards at SRWTP. SRWTP is currently in compliance with current requirements and is expected to be in compliance with near-term requirements.

Table 5-7
Regulatory Compliance Evaluation
City of Sacramento – Sacramento River WTP

	Targeted Compounds	Key Issues Compliance Status
Existing Regulations		
Phase I, II, and V	VOCs, SOCs	No MCLs exceeded based on review of the CCRs.
SWTR	Microbial and Turbidity	Data continue to support 3/4—log reduction requirement for *Giardia*/viruses. All operations, monitoring and reporting requirements are met, and all treated water turbidity standards are met.
Interim/Long Term 1 ESWTR and Filter Backwash Rule	Microbial and Turbidity	All turbidity standards are met. 2-log reduction credit for *Cryptosporidium* is applicable.
Long Term 2 ESWTR	Microbial	Completed source water monitoring and received Bin 1 classification from DDW. Started second round of monitoring in April 2015.
Stage 1 D/DP Rule	Disinfectants and Disinfection By-Products	TOC RAA <2.0 mg/L in treated water. There were a few individual months where enhanced coagulation for TOC removal was required, and compliance was met in all cases. TTHM/HAA5 RAAs at Stage 1 sites comply with drinking water standards (< 80/60 µg/L, respectively).
Stage 2 D/DBP Rule	Disinfectants and Disinfection By-Products	Current TTHM/HAA5 LRAA's for Stage 2 data are below drinking water standards(<80/60 µg/L, respectively).

FRWA DIVERSION

This section evaluates the FRWA Diversion and its associated facilities. This diversion delivers water directly to SCWA's VSWTP as well as to EBMUD for mixing with other source waters in their terminal reservoirs in the Bay Area prior to treatment.

System Description

FRWA is a joint-powers authority formed by SCWA and EBMUD to operate an untreated water delivery system from the Sacramento River. FRWA constructed a 185 mgd intake at River Mile 47, along with over 17 miles of 84-inch, 72-inch and 66-inch raw water pipeline, as part of the municipal water supply project. SCWA is able to receive up to 100 mgd at the VSWTP located at the intersection of Florin Road and Knox Road, approximately 13.5 miles from the intake. The VSWTP has an initial capacity of 50 mgd, with provisions for expansion to 100 mgd. The average daily flow in the winter is 9.5 mgd and 12.5 mgd in the summer. The VSWTP became operational in September 2011, and SCWA distributes its treated surface water from the VSWTP within its North and Central Services Areas. Both of these areas also use groundwater, and groundwater will continue to be used as a peaking and supplemental supply according to SCWA's conjunctive use program.

EBMUD

EBMUD can receive up to 100 mgd of untreated water at the Folsom South Canal (FSC), approximately 16.3 miles from the intake. EBMUD requested water four times in 2014 as shown in **Table 5-8**. EBMUD blends this water from the FSC into its raw water supply system (the Mokelumne Aqueducts) for treatment at its Sobrante and Upper San Leandro surface water treatment plants. Both of these water treatment plants have conventional filtration, and permitted design capacities of 60 mgd. The withdrawal of water by EBMUD from the Sacramento River is determined by EBMUD in accordance with its entitlement to Project Water Service of the Central Valley Project under its Long Term Renewal Contract with the US Bureau of Reclamation (USBR). There may be some years when EBMUD does not divert Sacramento River, and SCWA will be the only user of water during these periods.

Table 5-8
Water Volumes Diverted from FRWA Intake to Folsom South Canal

Month	FSC Quantity (mg)
April 2014	2,134.7
May 2014	2,211.1
June 2014	2,114.8
July 2014	1,683.9

SCWA

SCWA's VSWTP is a conventional surface water treatment plant with dual media filters. The water is pre-oxidized with potassium permanganate. ACH is used as the primary coagulant. Chemicals are mixed via pumped diffusion injection in the flash mix system. Water flows to three parallel flocculation/sedimentation basins. The flocculators have variable speed vertical shaft drives. Water is filtered by eight dual media filters which have 12 inches of sand and 48 inches of anthracite. Filters are backwashed based on turbidity or head loss, and backwash water is sent to two washwater basins. After returning to service, the water is filtered to waste until turbidity levels are acceptable. Settled backwash water is treated in a clarifier basin, and the decant is returned upstream of chemical flash mix. After filtration, the water is chlorinated for disinfection and the pH adjusted with caustic soda.

Significant Potential Contaminating Activities in Protection Zone

The protection zone for this diversion location has been identified as the Sacramento River from River Mile 47 to the confluence with the Feather River at River Mile 80 and the Lower American River to Nimbus Dam. Both rivers have levees on both sides. This is shown on the inset map of the Watershed Map, see **Figure 2-1**. Since this study focuses on the Sacramento River, and the American River has a separate Watershed Sanitary Survey, this study only evaluates the part of the Lower American River near the confluence with the Sacramento River.

The area nearest the intake on the Sacramento and American Rivers is urban, while the area north of Sacramento International Airport remains largely agricultural and rural, with limited urban or industrial development. There are several bridge crossings in the protection zone (Interstate 5, Interstate 80, I Street, and Tower). Recreational uses on the Sacramento River are mostly limited to power boating and on-shore and boat fishing. There is swimming at Sand Cove Park, just downstream of GKWTP. Elkhorn Regional Park is located upstream and provides boat launch and permanent toilet facilities. There are 11 marinas; one near River Mile 76 (Rio Ramaza), one near River Mile 80 (Verona Village), two near River Mile 70.5 (Alamar and Metro), three between River Miles 61 and 62 (Riverview, Dwyer's Happy Landing, and Riverbank), one at River Mile 58 (Sacramento), two near River Mile 55 (Sacramento Yacht Club and Sherwood Harbor), and one at River Mile 50 (Stan's Yolo). Fuel is available at Metro, Sacramento, Sherwood Harbor, and Stan's Yolo marinas, and sewage pumpouts are available at the Alamar, Riverview, Riverbank, Sacramento, Sacramento Yacht Club, and Sherwood Harbor marinas. Recreational use on the American River is centered on the American River Parkway, and includes boating, fishing, and body contact recreation. Discovery Park is a popular beach area along with other stretches of the river, while rafting occurs along the length of the American River. There are several major agricultural drains discharging to the river in this reach, including: the Sacramento Slough (River Mile 80.5), the Natomas Cross Canal (River Mile 79 – which includes discharges from RD1001 in Sutter County and RD1000 in Natomas Basin [Pumping Plants 4 and 6]), and RD1000 direct discharges (Pumping Plant 2 at River Mile 75,

Pumping Plant 5 at River Mile 70, Pumping Plant 3 at River Mile 66, and Pumping Plant 1 at River Mile 61). It should be noted that RD1000 Pumping Plant 5 includes urban runoff from the Sacramento International Airport and Pumping Plants 1 and 3 include urban runoff from the City and County of Sacramento. There are significant amounts of urban runoff from the Sacramento urban area, as well as some permitted industrial waste discharge, entering the river directly via sumps and indirectly via the Natomas East Main Drainage Canal at River Mile 60.5 and the Lower American River. There are potential discharges from the City of Sacramento Combined Sewer System. Also, in the area between GKWTP and SRWTP and along the Lower American River there are known areas of illegal camping in the river corridor.

Low river flows, exaggerated by the recent drought, can lead to Sacramento River reverse flow conditions. If reverse flow conditions are severe enough, the FRWA Intake has to be shut down in order to avoid treated wastewater flows from the downstream Sacramento Regional Wastewater Treatment Plant entering the FRWA Intake.

Water Quality Summary

Below is a discussion of each of the constituents of interest and any notable compliance issues for each during the period of study.

Turbidity

The monthly turbidity reports submitted to the DDW were reviewed as part of this analysis. These report the four-hour turbidity measurements of the CFE, as well as peak daily influent, peak daily settled, and peak daily recycled water turbidities.

A statistical assessment of electronic data at the VSWTP from September 2011 through December 2014 shows that the average of the daily peak raw water turbidity was 10.0 NTU, average of the daily peak settled water turbidity was 0.43 NTU, and the average of the daily average CFE turbidity was 0.032 NTU. The overall treatment process had an average solids removal of 99.6 percent, well above the required 80 percent. **Figure 5-9** shows a time series plot of peak raw, settled and average treated daily water turbidities. The VSWTP easily met all current treated water turbidity standards.

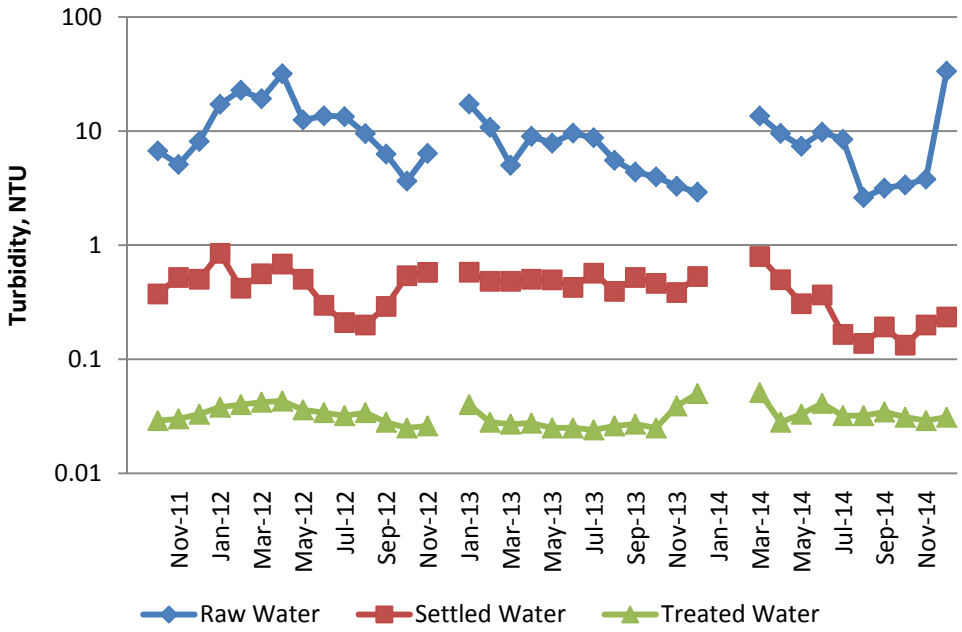


Figure 5-9. VSWTP, Raw, Settled, and Treated Water Turbidities, 2011 - 2014

Microbiological Constituent Review

SCWA performed monthly distribution system coliform analysis from 2011 through 2014. A review of the 2011 to 2014 SCWA CCRs shows that the monthly percent positive for total coliform was always less than five percent. Therefore, during the period of study, SCWA was always in compliance with the Total Coliform Rule. Additionally, there were no follow-up tests that were positive for *E. coli.*

Disinfection By-Products

SCWA monitors alkalinity and TOC levels in its raw water and TOC levels in its treated water monthly in order to determine TOC removal compliance. The average raw and treated water TOC levels at VSWTP were 1.8 mg/L and 1.2 mg/L, respectively, equating to 36 percent average removal. **Figure 5-10** shows a time series plot of raw and treated water TOC at VSWTP.

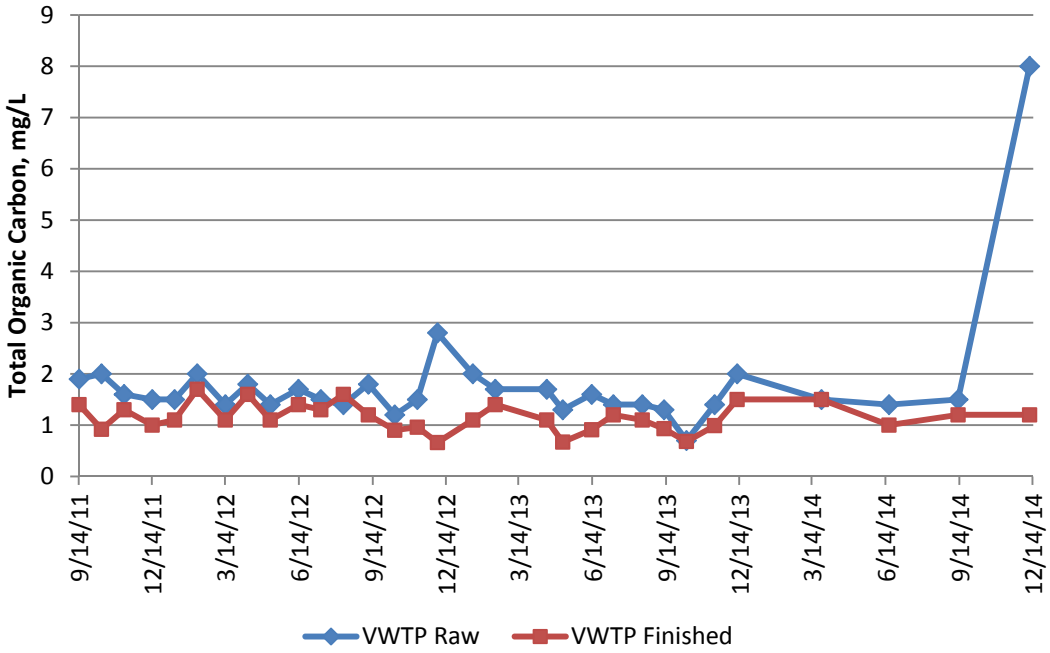


Figure 5-10. VSWTP, Raw and Treated Water TOC, 2010 - 2014

Eighty-four percent of the time, TOC levels in the raw water were below 2.0 mg/L, and the highest recorded level was 8.0 mg/L in December 2014. Peak TOC levels at the FRWA intake are expected to occur during wet events. The TOC source water RAA was always less than 2.0 mg/L, except for the last calculated RAA which included the 8.0 mg/L spike in December 2014. Therefore, during the reporting period, no TOC reduction calculation was required.

Stage 2 D/DBP Rule Compliance Period

SCWA has collected both TTHM and HAA5 data for its distribution system. Water from the VSWTP began entering the Laguna/Vineyard distribution system on September 8, 2011. As part of the Stage 2 D/DBP Rule, the SCWA samples quarterly for TTHM and HAA5 at eight sites. The original eight Stage 2 D/DBP Rule monitoring sites were revised in late 2012, to incorporate the new VSWTP source water. The following statistics are based on the eight revised Stage 2 D/DBP Rule monitoring sites. It was not possible to distinguish sites that are primarily surface water only, as the mixture of treated surface water and groundwater in the distribution system varies by seasonal demand. For example, during periods of increased demand (late April through October) surface water from VSWTP was expected to stay closest to the VSWTP. Conversely, during periods of low demand (November through mid-April), surface water would move further through the system.

TTHM LRAAs ranged from 6.1 to 31.3 µg/L, with site 4 (Clay Glen Way) having the highest LRAA of 31.3 µg/L. HAA5 LRAAs ranged from 3.7 to 22.5 µg/L with site 5 (Jones Family) having the highest LRAA of 22.5 µg/L. All LRAAs are well below the respective MCLs per the Stage 2 D/DBP Rule.

UCMR 3

SCWA also completed the UCMR3, and only metals (total chromium, hexavalent chromium, vanadium, and strontium) and chlorate were detected at very low levels as shown in **Table 5-9.**

Table 5-9
UCMR3 Monitoring Results for VSWTP

Constituent	Result, µg/L
Total Chromium	0.27 – 0.29
Hexavalent Chromium	0.16 – 0.25
Vanadium	1.5 – 2.3
Strontium	68 -140
Chlorate	100-300

Giardia/Virus/*Cryptosporidium* Reduction Requirements

Based on the *E. coli*, *Giardia*, and *Cryptosporidium* data presented in **Section 3** as well as above and the LT2ESTWR data presented in the 2010 Update, 3/4/2-log reduction of *Giardia*/virus/*Cryptosporidium* continue to be appropriate reduction requirements for VSWTP. Out of 40 months from September 2011 to December 2014, the FRWA Intake had two *E. coli* medians at or greater than 200 MPN/100mL in December 2012 and December 2014. Additionally, eight percent of all individual *E. coli* samples exceeded 200 MPN/100mL.

The VSWTP currently receives reduction credit for 2.5-log *Giardia,* 2.0-log viruses, and 2-log *Cryptosporidium* for physical removal. Disinfection with free chlorine provides 0.5-log credit for *Giardia* and 2.0-log credit for viruses. This meets all of the current microbial removal/inactivation requirements of the SWTR and IESWTR.

The VSWTP has a Bin 1 classification based on *Cryptosporidium* monitoring data for the LT2ESTWR. SCWA will begin the second round of LT2ESWTR monitoring in May 2015. Therefore, no additional plant improvements are anticipated at this time to meet future regulations.

Regulatory Compliance Evaluation

SCWA has been monitoring the raw and treated water for the VSWTP for Title 22 compliance constituents. **Table 5-10** lists the existing drinking water regulations and a compliance evaluation for these standards at VSWTP. VSWTP is currently in compliance with current requirements and is expected to be in compliance with near-term requirements.

Table 5-10
Regulatory Compliance Evaluation
SCWA – VSWTP

	Targeted Compounds	Key Issues Compliance Status
Existing Regulations		
Phase I, II, and V	VOCs, SOCs	No MCLs exceeded based on review of the CCRs.
SWTR	Microbial and Turbidity	Data continue to support 3/4—log reduction requirement for *Giardia*/viruses. All operations, monitoring and reporting requirements are met, and all treated water turbidity standards are met.
Interim/Long Term 1 ESWTR and Filter Backwash Rule	Microbial and Turbidity	All turbidity standards are met. 2-log reduction credit for *Cryptosporidium* is applicable.
Long Term 2 ESWTR	Microbial	Completed source water monitoring and received Bin 1 classification from DDW. Will conduct second round of monitoring starting May 2015.
Stage 1 D/DP Rule	Disinfectants and Disinfection By-Products	TOC RAA <2.0 mg/L in raw and treated water. Therefore, no TOC reduction calculation required. Since the VSWTP became operational in 2011, disinfection byproducts monitoring was conducted in accordance with Stage 2 D/DBP Rule.
Stage 2 D/DBP Rule	Disinfectants and Disinfection By-Products	Current TTHM/HAA5 LRAA's for Stage 2 data are below drinking water standards(<80/60 µg/L, respectively).

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This section consists of a discussion of the key findings for this 2015 Update and a list of recommendations. Significant changes over the past five years are summarized at the beginning of this section.

SIGNIFICANT CHANGES SINCE 2010 UPDATE

During the past five years, new information has been generated that was used to evaluate source water quality, treatment capabilities, and potential contaminating activities. There have also been new or improved watershed management programs and activities that have been implemented which may be expected to protect and possibly improve source water quality. This new information, which is summarized below, was obtained and evaluated for this 2015 Update.

- The scope of interest for this 2015 Update includes the potential future Sacramento River Regional Water Reliability Project (SRRWRP) diversion. This project is in the early stages of planning, but expects to utilize two existing Natomas Mutual Water Company (NMWC) intake structures on the Sacramento River near Pritchard Lake and Sankey Road and treat water at a central Regional Water Treatment Plant east of Sacramento International Airport.
- The new Woodland-Davis Clean Water Agency (WDCWA) diversion and Regional Water Treatment facility (RWTF) is under construction with operations expected to begin in June 2016.
- The City of West Sacramento's George Kristoff Water Treatment Plant (GKWTP), formerly known as the Bryte Bend Water Treatment Plant, did not undergo any changes but a new 3 million gallon (mg) storage tank and associated pump station were constructed in the distribution system.
- The City of Sacramento's Sacramento River Water Treatment Plant (SRWTP) is currently undergoing a plant remodeling project to replace one of the flocculation/sedimentation basins as well as eight old filters. In addition, sludge dewatering was added to help with solids handling, the high service pump station was replaced, and vortex breakers were added to the intake structure to assist with pump cavitation under low flow scenarios.
- The Freeport Regional Water Authority (FRWA) intake became operational in September 2011 to supply Sacramento County Water Agency's (SCWA) Vineyard Surface Water Treatment Plant (VSWTP) and the East Bay Municipal Utility District (EBMUD) raw water supply system.
- There has been a significant quantity of water quality data collected by the participating water agencies and by other ambient monitoring programs. There was limited pathogen data (*Giardia* and *Cryptosporidium*), but substantial organics, total organic carbon (TOC), and metals data to evaluate. These data allow for a more comprehensive assessment of source and treated water quality.
- The Sacramento Coordinated Monitoring Program (Sacramento CMP), implemented locally by permitted discharge agencies, ceased ambient monitoring on the

Sacramento River in 2015. Future sampling is uncertain at this time. Future data of interest may be available through the Delta Regional Monitoring Program (RMP) program.

- Data indicate that there is a significant increase in TOC levels in the Sacramento River between Colusa and Verona. Agricultural drains entering in this reach of the river have higher levels of TOC than the mainstem. TOC levels in the source water appear to be increasing over time. Treated water TOC levels at the water treatment plants has increased since 2012.
- The City of Sacramento had a higher than normal TTHM level at one location associated with the SRWTP that triggered Operational Evaluations for two quarters under the Stage 2 Disinfectants/Disinfection By-Products (D/DBP) Rule.
- Data indicate that iron, aluminum, and manganese levels in the Sacramento River can exceed the secondary MCLs. Similar to TOC, the levels increase between Colusa and Verona and agricultural drains have higher levels than the mainstem.
- The Central Valley Regional Water Quality Control Board (Regional Board) has adopted a new, long-term management program for agricultural drainage; the Irrigated Lands Regulatory Program (ILRP). This includes issuance of two coalition group orders in the Sacramento Valley; one for rice crops and one for all other irrigated crops.
- There was an increase in the acreage of rice grown in the Sacramento Valley during the study period, and an increase in the amount of pesticides applied. During the 2013 and 2014 rice growing seasons there were more frequent detections of thiobencarb in agricultural drains and at higher concentrations than the previous study period. There were also low detections at the GKWTP intake in 2011 and 2013; all were below levels of human health concern and below the secondary drinking water standard.
- There was also an increase in the acreage of orchards planted in the Sacramento Valley during the study period. There is a broader spectrum of pesticides used on a wide variety of crops. Few pesticides were detected in the Sacramento River watershed upstream of Freeport, and those detects were generally very low and sporadic.
- The livestock population in the Sacramento River watershed continued to decrease during the study period. In addition, regulation and management efforts increased for both rangeland and dairy livestock.
- Public education related to recreation has continued through “Keep Our Waters Clean” and the “Pups in the Park” campaigns.
- The homeless population has stabilized in the near intake protection zone and strong management programs in both Sacramento and Yolo counties continue efforts to assist unsheltered homeless.
- Urban runoff management expanded under the Phase 2 National Pollutant Discharge Elimination System (NPDES) permit program, as well as updates to the Phase 1 NPDES permits, and a new Industrial Stormwater NPDES permit.

- Two industrial NPDES dischargers located in the near intake protection zone, both under the California Department of General Services, ceased discharging and their permits were rescinded.
- Two municipal wastewater treatment plants (WWTP) ceased discharging during the study period, five were upgraded or replaced, another ceased discharging in July 2015, and two plan to convert to land disposal by 2018.
- There was a reduction in the volume of untreated wastewater discharged into the river system from sanitary sewer overflows (SSOs) during the study period.
- The new California Office of Emergency Services (Cal OES) Oil by Rail program provides information on and management of Bakken Crude oil shipments into California via railroad.
- Population growth in the watershed has slowed again. Over the past five years most growth occurred in or near the Sacramento metropolitan area. Increases in population may lead to an increasing urbanization of the watershed as well as land use changes.
- Regional Board programs and policies are increasingly addressing the Municipal (MUN) beneficial use, but may not be sufficiently addressing long-term, downstream protections.
- There are several key activities underway that may have the potential to impact how the Central Valley water supply system is operated. Any operational modifications to reservoir storage and river flows have a high likelihood of impacting the source water quality of the Sacramento River.

KEY FINDINGS AND CONCLUSIONS

The key findings and conclusions for this report are organized as they pertain to river water quality, treatment and water quality regulatory compliance, and source water/watershed contaminant sources.

River Water Quality

Overall, the Sacramento River continued to provide good quality raw water. The raw water can currently be treated to meet all drinking water standards using conventional water treatment processes. There are no long-term constituent trends prevalent in the raw water that necessitate special treatment processes at this time. Key findings for each of the constituents of interest are presented below.

Turbidity

The turbidity levels are seasonally variable, with the highest levels occurring during the wet season, typically in January and February. Turbidity appears to be related to high river flow, caused by upstream sources as well as local precipitation, for the existing water treatment plants as well as at the ambient monitoring sites. The turbidity levels at SRWTP are generally lower than GKWTP, likely due to the influence of the Lower American River. Turbidity data at the Veteran's Bridge monitoring site are comparable to the data provided for WDCWA and GKWTP, therefore the potential future SRRWRP diversion is likely to have similar turbidity levels. Turbidity data at VSWTP is lower than the other water treatment plants, likely due to sedimentation occurring at the FRWA intake and in the 13 mile transmission pipeline to the water treatment plant site.

Coliform

Average and median *Escherichia coli* (*E. coli)* levels increase with travel downstream. The large difference between the median and average values at each site indicates that there are high outlying values, or peak events. Higher coliform peak concentrations are seen downstream (more peaking effect). Elevated levels of coliform occur during the winter months at all monitoring sites. The highest levels occur during high precipitation events, which are the periods of high flow from the main stem river and tributaries as well as local discharges from precipitation events. Overall, the *E. coli* levels have remained on the same order of magnitude over the past ten years, with median values at all existing water treatment plants less than 15 most probable number per 100 milliliters (MPN/100 mL). The WDCWA median was just slightly higher at 17 MPN/100 mL. In almost all cases, the monthly medians at GKWTP, SRWTP, and VSWTP are less than 200 MPN/100 mL.

Giardia/Cryptosporidium

There were significantly fewer protozoa samples collected during this study period, only 26 samples for each at the WDCWA diversion. Less than eight percent of samples were presumptively positive for *Cryptosporidium*, with an average concentration of 0.014 oocysts per liter (oocysts/L). Fifty percent of *Giardia* samples were presumptively positive, with an average concentration of 0.076 cysts per liter (cysts/L). The data reports did not allow for assessment of confirmed protozoa species. The relatively low frequency of confirmed detections is consistent with historical data and indicates that the presence of these protozoa is most likely low. When detected, concentrations are near detection limits. There do not appear to be consistently detectable concentrations of *Giardia* or *Cryptosporidium* in the Sacramento River during any particular season. There is no clear correlation between river flow, coliform levels, or turbidity and either protozoan.

Total Organic Carbon

Only the new WDCWA diversion had a median raw water TOC value greater than 2 milligrams per liter (mg/L) during the study period. The average values of TOC were higher than the median values at all sites. Raw water TOC levels at SRWTP and VSWTP have lower levels than the GKWTP, likely due to the influence of the Lower American River on the Sacramento River water downstream of the confluence of the rivers. TOC levels are seasonally variable, with the highest levels during the wet season (late fall to early spring). The Department of Water Resources Coordinated Monitoring Program (DWR CMP) data show that there are significant increases in TOC along the Sacramento River between Colusa and Verona, where three large agricultural drains enter the river (Butte Slough, Colusa Basin Drain, and Sacramento Slough). The highest levels were seen in the Colusa Basin Drain, with a median value of 7.2 mg/L. Raw water levels at GKWTP are lower during this study period than the 2010 Update, but raw water levels at SRWTP and ambient sampling through the Sacramento CMP at Veteran's Bridge, Discovery Park, and Freeport have seen significant increases since the 2010 Update.

Volatile and Synthetic Organic Compounds

Other than the low level detection of the rice herbicide thiobencarb at the GKWTP, there were no other reported detections of any volatile organic compounds (VOCs) or synthetic organic compounds (SOCs) in the raw water at the existing water treatment plants or in the monitoring conducted for the new WDCWA diversion. There were a few detects of other VOCs and SOCs in ambient samples from the Sacramento CMP and US Geological Survey (USGS) monitoring at Freeport, but all but one were below respective drinking water standards or Notification Levels.

Aluminum/Iron/Manganese

Raw water levels of iron and aluminum can be well above their respective primary and secondary MCLs in the Sacramento River. Average and median values are at, or greater than, the secondary MCL for aluminum and iron at all monitoring locations, except for Discovery Park on the Lower American River. The DWR CMP collected quarterly samples during the study period along the Sacramento River. A review of the data shows that aluminum and iron levels increase between Hamilton City and Colusa, and then again between Colusa and Verona. Stony Creek is a tributary entering downstream of Hamilton City that could be contributing metals to the Sacramento River. Butte Slough, Colusa Basin Drain, and Sutter Bypass all enter downstream of Colusa and have recorded very high levels of aluminum and iron. Another increase from Verona to WDCWA is not well understood, but could be related to the Natomas Cross Canal or Reclamation District (RD) 1000 discharges into the Sacramento River.

Total manganese levels in raw water can also be found above its secondary MCL. WDCWA has the most extensive data set of the participating water agencies, and the average and median were similar and just below the secondary MCL. Peaks were seen

as high as 200 micrograms per liter (µg/L). The DWR CMP also collected data for manganese and the same trend was seen for manganese as iron and aluminum, so the same sources are likely contributing manganese as well but at lower overall levels.

Treatment and Water Quality Regulatory Compliance

The GKWTP, SRWTP, and VSWTP are currently in compliance with all existing drinking water regulations. All participating water agencies implement conventional filtration processes and meet all current drinking water standards, including MCLs and treatment technology requirements. The water treatment plants at the potential future SRRWRP diversion will be, and new WDCWA diversion has been, designed to meet all drinking water standards. Below is a summary of the key treatment and regulatory compliance topics.

Giardia/Virus/Cryptosporidium Reduction Requirements

Monthly median *E. coli* values are less than 200 MPN/100 mL in almost all cases at all three existing water treatment plants, and presumed *Giardia* detects have concentrations near the detection limits; therefore, the source water microbial data support that 3/4-log reduction requirements for *Giardia* and viruses continue to be appropriate. The water treatment plants achieve excellent suspended solids removal with average combined filter effluent turbidities of less than 0.04 nephelometric turbidity units (NTU) and at least 99.6 percent solids removed. Treated water turbidity at GKWTP, SRWTP, and VSWTP meets the Interim Enhanced Surface Water Treatment Rule (IESWTR) standards, and all plants have a 2-log reduction credit for *Cryptosporidium*. Existing data for *Cryptosporidium* levels, collected as part of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), have put SRWTP, GKWTP, VSWTP, and the new WDCWA diversion in the Bin 1 classification. Therefore, all water treatment plants should continue to, or plan to, provide 3/4/2-log reduction for *Giardia*/virus/*Cryptosporidium*.

Total Organic Carbon

The treated water TOC levels at both GKWTP and SRWTP were increasing during the study period, especially after May 2012 when the treated water has not been able to be reduced to less than 1 mg/L as it historically was. The cause of this is unknown, but it likely indicates an increased presence of dissolved organic carbon (DOC) as it is not removed by conventional filtration and would pass through to the treated water. The City of West Sacramento did not meet enhanced coagulation requirements in two months during the study period, but the running annual average (RAA) was always in compliance with the regulations.

Disinfection By-Products

Distribution system levels for TTHM and haloacetic acids (HAA5) are less than 80 and 60 µg/L, respectively, for both RAA and LRAA, for GKWTP, SRWTP, and VSWTP. A

distribution system site associated with the SRWTP had a higher than normal TTHM result in one quarter that triggered an Operational Evaluation on two occasions in 2014; the City of Sacramento conducted the Operational Evaluations. The City of Sacramento saw its highest peaks of TTHM and HAA5 during the study period in 2014, coincident with the increasing treated water TOC levels.

Source Water/Watershed Contaminant Sources

There are numerous types of potential contaminating activities in the watershed. Eight activities were selected for evaluation in this report based on constituents of interest, proximity to protection zones, and/or predominance in the watershed. The key findings for each of these activities are provided below.

Agricultural Drainage

The acreage of irrigated agriculture in the Sacramento Valley decreased slightly, two percent, in the past five years to approximately 1.89 million acres. The acreage of rice production accounts for nearly 30 percent of that land, and it saw an increase of six percent between 2007 and 2012. Orchards account for a similar percentage, and have seen an 18 percent increase between 2007 and 2012. Pastureland accounts for less than 15 percent, and has seen a 12 percent decrease in acreage over the five year period. The remaining acreage is row crops and wetlands.

There were low level detections of the rice herbicide thiobencarb at the GKWTP intake in 2011 and 2013 as part of a special rice season monitoring program, but these did not exceed the secondary drinking water standard. There was an increasing number and level of thiobencarb detections in the agricultural drainages in 2013 and 2014, well above the Performance Goal of 1.5 µg/L. There is a trend of broader pesticide use due to the phase out of molinate and increased weed resistance. Pesticide use on rice increased slightly during this study period, as compared with the last five year period. The Rice Pesticide Program has continued with generally the same management measures, with efforts to address the increased levels in the agricultural drains.

The Regional Board adopted the long-term ILRP, issuing orders to two coalition groups formed in the Sacramento Valley – one for rice, the Sacramento Valley Rice Growers order (replacing the conditional Rice Waiver Program), and one for all other irrigated agriculture, the Growers within the Sacramento River Watershed that are Members of a Third-Party Group (replacing the conditional Sacramento Valley Water Quality Coalition [SVWQC]). The Rice Waiver Program investigated a broader suite of constituents than the Rice Pesticides Program (RPP). They found detectable levels of propanil, clomazone, and triclopyr, which have no drinking water standards, in agricultural drains. High turbidity and TOC levels were found in the rice drainage during the irrigation season. The SVWQC monitored for a wide suite of constituents in the Sacramento River watershed. There was only one pesticide detected in the watershed upstream of Freeport above the drinking water standards, simazine, and these were isolated events. Other pesticides were detected, but were generally well below any human health

thresholds. Data for TOC shows similar levels to rice drainage, which is comprised of mostly non-humic, dissolved carbon.

Livestock

The overall population of cattle decreased again in the watershed over the past five years, by 7 percent. The number of dairy cattle in the watershed account for only six percent of the total watershed cattle population, primarily in Glenn, Tehama, and Yuba counties. The State Water Resources Control Board (State Board) continues to work on a statewide approach for regulating forest activities on public lands, including grazing. This resulted in a new US Forest Service Water Quality Management Handbook being adopted in May 2011 to improve water quality protections.

The Regional Board issues individual NPDES and general order NPDES permits to dairies, depending on size. There are four individual NPDES permits and 58 general Order permits in the Sacramento River watershed. Both permits specifically prohibit discharges to surface waters and address manure handling, management, and application. The Dairy Quality Assurance Program (DQAP) has been incorporated into the Dairy Orders as an elective education program for dairies on protecting water quality.

River Corridor and River Recreation

Extensive recreation occurs in the river and within the river corridor along the Lower Sacramento and American Rivers. It is not possible to quantify the number of users, or the type of recreation that specifically occurs. There are still 12 marina facilities located in the protection zones. Various participating agencies have continued to sponsor the public education campaigns “Keep Our Waters Clean”, to encourage use of restrooms and sewage pumpouts, and “Pups in the Park”, to encourage use of pet waste pickup bags. The cities of Sacramento and West Sacramento and Sacramento County have continued enforcement of derelict boat removal. Sacramento County, the City of Sacramento, and the City of West Sacramento all require a permit and inspection for boats moored for extended periods of time. Water quality studies conducted by the Regional Board at Discovery Park on the Lower American River showed elevated levels of *E. coli* during recreational periods, but low or non-detectable levels of actual pathogens.

Homeless/Illegal Camping

Homeless populations in the Sacramento metropolitan area and the City of West Sacramento have remained relatively stable over the study period. Illegal camping still occurs in the river corridor along the Lower American River Parkway and in West Sacramento in the Lighthouse Marina area, but the numbers have remained lower due to enforcement of no-camping ordinances in Sacramento and West Sacramento. Sacramento City and County, as well as the City of West Sacramento and Yolo County,

have worked hard on creating housing for the homeless and have reduced the number of unsheltered homeless.

Urban Runoff

The urbanization of the watershed upstream of the Sacramento metropolitan area continued during this study period. Small cities and urban areas continue to be regulated under the Phase II Stormwater Program. Under the Phase II Stormwater Program, Stormwater Management Plans (SWMP) were implemented with specific best management practices (BMPs) to minimize pollution, including implementation of treatment BMPs in new development. Monitoring was not required for any Phase II permittees in the Sacramento River watershed.

In the Sacramento River watershed there are two NPDES Stormwater Phase I permits; the Sacramento Stormwater Quality Partnership (SSQP) and the Statewide California Department of Transportation (Caltrans). The SSQP continued its extensive monitoring program, and this data continues to show the potential water quality impact that urban runoff can have on ambient water quality. Levels of contaminants in urban tributaries and in the urban runoff discharges can be higher than some of the respective water quality objectives, including E. coli, organic carbon, and iron. Studies show that new development areas have discharges with significantly lower levels of pollutants than older development areas. The SSQP implements an extensive pollution reduction program that addresses constituents of interest for source water protection, including illegal discharges, fecal waste, sediment, TOC, and pesticides. New NPDES permits for the SSQP will revise how monitoring is conducted and may result in less available local ambient data. However, there may be data of interest available in the future from the Delta RMP.

Caltrans also implements a statewide SWMP to reduce the impacts of highway runoff on local receiving waters. An inventory of the Construction Stormwater Program resulted in identification of 484 sites, ranging from less than one to 3,320 acres. An inventory was conducted to identify the Industrial Stormwater Permittees in the watershed, resulting in 571 permits. There are only 41 industrial facilities in the reach of the near intake protection zones that are larger than 50 acres, and these facilities are generally in compliance with the permit requirements.

Industrial NPDES Dischargers

There were 40 Industrial NPDES permitted facilities identified and six of these were prioritized for discussion, including: Empire Mine, Original Sixteen to One Mine, Sterling Caviar, Former McClellan Air Force Base (AFB), Aerojet Rocketdyne (both treated groundwater and stormwater), and Sliger Mine.

Empire Mine installed a new treatment system in 2011 and the facility has shown a dramatic decrease in arsenic, iron, and manganese. The Original Sixteen to One Mine finally was issued a new NPDES permit in 2015, as well as interim limits to allow time

for implementation and compliance. Sterling Caviar has still not implemented any action to meet its interim effluent limits, which have now been extended until 2017. McClellan AFB and Aerojet Rocketdyne are under current NPDES permits and performing relatively well; both have ongoing issues with specialty constituents which warrant close tracking by the applicable participating water agencies. Sliger Mine is located in El Dorado County and owned by the US Bureau of Reclamation (USBR). This facility is in disrepair and not meeting effluent limits on its current permit. A Notice of Violation was issued to the USBR by the Regional Board, and a new NPDES permit is expected in 2015.

Wastewater Facilities

There are 33 NPDES permitted wastewater facilities in the watershed at or upstream of Freeport. There was only one expansion of 3 million gallons per day (mgd). Five facilities were replaced or upgraded, three facilities were closed, and two will soon be discharging to land. A review of enforcement orders shows generally good compliance, with most violations related to pH, coliform, chlorine residual, disinfection byproducts, and nitrate.

Collection system spills, known as SSOs, can occur in any collection system and contain raw sewage. The spills of greatest concern are those that reach the receiving water and have substantial volume. During the study period, there were 270 Category 1 SSOs in the watershed, for a total volume of 1.2 mg. This is less than the September 2007 through December 2009 period. The Sacramento Area Sewer District (SASD) had 53 SSOs greater than 1,000 gallons and 22 SSOs greater than 5,000 gallons that reached surface water.

The City of Sacramento's combined sewer system (CSS) has continued to have fewer incidences of combined sewer overflows (CSOs). There was only one untreated CSO discharge in December 2012 from the CSS, of 3.8 mg. The Sacramento Regional County Sanitation District (Regional San) operates the Regional Wastewater Treatment Plant (Regional Plant). Discharge is still prohibited during negative downstream flow times, in addition to discharge only when minimum dilution of 14:1 (or river flow of 1,300 cubic feet per second [cfs]) is met. Regional San discharge permit was renewed in 2010, and subsequently amended four times. The new permit will require the Regional Plant be modified to add tertiary treatment and implement seasonal disinfection requirements.

There were 10 *E. coli* monitoring results in the raw water at the SRWTP or VSWTP that potentially correlate to a wastewater discharge or spill event.

Watershed Spills

Cal OES continues operation of the Response Information Management System (RIMS) as part of the State's Standardized Emergency Management System (SEMS). The purpose of RIMS is to provide a single point for statewide tracking of the status and

progress of hazardous materials spills information. This can be accessed on-line to view information on current and archived hazardous materials spills.

Cal OES also created the Oil by Rail program to address the increasing amount of Bakken Crude oil entering California via railroad.

The Sacramento River Source Water Protection Program (SRSWPP) has continued to implement a voluntary spill notification and response program to help ensure timely direct notification of hazardous spills upstream of the water treatment plants.

RECOMMENDATIONS

A final objective of this report is to identify appropriate watershed management actions that may assist in protecting and possibly improving source water quality. **Table 6-1** presents the recommendations developed for this 2015 Update, listed by subject area and not by priority. Development of recommendations for watershed management actions that are economically feasible and within the authority of the participating water agencies to implement is critical. Of importance is to target potential contaminating activities that may be most likely to affect source water quality, such as activities located in the protection zones or activities that are predominant in the watershed. Some recommendations provide for information tracking, which will facilitate updating management actions as needed. Recommendations apply to all participating water agencies, unless noted, and may be implemented by them as they have resources available. These recommendations could be implemented by individual agencies, or as part of the SRSWPP.

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Table 6-1
2015 Update Recommendations

Recommendation	Basis for Recommendation	Notes
Water Quality and Treatment		
Continue to optimize treatment and distribution, especially during times of reduced source water quality (i.e. storms, high river flows, and unusual reservoir release patterns).	Based on source water quality, optimization is especially important during wet weather. It may also be useful during other seasonal periods of potentially reduced water quality, such as first flush storm events and peak recreational periods.	Only applicable to WDCWA (once RWTF is operational), West Sacramento, Sacramento, SCWA, and EBMUD.
Ensure that *Giardia* and *Cryptosporidium* are analyzed as part of the second round of LT2ESWTR monitoring.	*Cryptosporidium* is required under the LT2ESWTR to determine Bin classification, but it is important to have *Giardia* to determine overall level of treatment.	Only applicable to WDCWA, West Sacramento, Sacramento, SCWA, and EBMUD.
If water quality issues arise, consider: 1. Monitoring for DOC. 2. Source water monitoring of *E. coli* more frequently than monthly. 3. Source water monitoring for aluminum, iron, manganese, and TOC during same quarters (or approximate timing) as the DWR CMP monitoring (February, May, August, November).	The data presented in this 2015 Update indicates that there are potential sources of all these constituents that may be increasing over time and that these could become treatability issues in the future at the water treatment plants. If these trends continue, this monitoring could assist with confirmation of causes and identification of sources that may need additional management.	Only applicable to: 1. WDCWA (once RWTF is operational), West Sacramento, and Sacramento. 2. WDCWA (once RWTF is operational) and SCWA. 3. WDCWA (once RWTF operational), West Sacramento, Sacramento, and SCWA.
Consider verification/further evaluation of other sources of organic carbon and metals between Verona and WDCWA intake (i.e., the Natomas Cross Canal and RD1000 discharges), such as through the SRWPP.	This 2015 Update was not able to identify and evaluate sufficient data to be certain of the changes in water quality between Verona and the WDCWA on the Sacramento River and suggests further investigation to find potential sources.	
Consider requesting DWR add Natomas Cross Canal to the DWR CMP, such as through the SRSWPP.	This drain into the Sacramento River carries a large amount of water that may carry contaminants.	
If the Sacramento CMP or Delta RMP do not conduct Sacramento River monitoring between Verona and Freeport in the future, consider WTP-coordinated special study during selected events for TOC/DOC, selected metals (total and dissolved), and phosphorus.	These ambient programs have provided a large amount of supporting information to better understand where changes in water quality occur along the Sacramento River and how those trends may be changing over time.	

Table 6-1 Cont'd
2015 Update Recommendations

Recommendation	Basis for Recommendation	Notes
Source Water/Watershed Contaminant Sources		
Move Livestock and Homeless evaluations to 10 year frequency in watershed sanitary survey.	Both of these activities have remained very stable in the watershed over the past decade. There is increased management for both as well.	
If source water *Cryptosporidium* monitoring results in Bin 2 classification under the LT2ESWTR, consider use of Implementation Plan from the Regional Board's Drinking Water Policy for Surface Waters of the Delta and Its Upstream Tributaries.	The Regional Board Drinking Water Policy provides a mechanism for drinking water utilities in the Delta or its upstream tributaries (downstream of major reservoirs) to request that an evaluation be conducted if there is a change in source water quality at an intake. It is uncertain if this will result in any improvement of water quality, but it will ensure that the Regional Board is aware of the degradation.	
Continue to, or consider, supporting the Keep Our Waters Clean.	This local public education program related to recreation provides tremendous benefit and covers several watershed contaminant sources.	Continue to be applicable to: Roseville, West Sacramento, Sacramento, and SCWA. Consider applicability to: WDCWA and EBMUD
Continue to, or consider, supporting the Pups in the Park campaign.	This local public education program related to pet waste reduces fecal waste in the watershed.	Continue to be applicable to: Sacramento and SCWA. Consider applicability to: EBMUD
Continue participation in the Sacramento River Voluntary Spill Notification Program.	This program provides annual updates, communication charts, an annual program review, and operator training to ensure that the water treatment plants receive early notification to allow for spill response planning.	Only applicable to WDCWA, West Sacramento, Sacramento, SCWA, and EBMUD.

Table 6-1 Cont'd
2015 Update Recommendations

Recommendation	Basis for Recommendation	Notes
Watershed Contaminant Sources		
Through the Sacramento River Source Water Protection Program, or individual agency activities, continue to, or consider: 1. Participate as a stakeholder in the Regional Board management programs (i.e. MUN Designation programs, CV-SALTS, ILRP, RPP, etc.) 2. Track water system operational programs to identify potential drinking water quality impacts (i.e., CA WaterFix, DWR Reoperation Study, Folsom Joint Federal Project, US Bureau of Reclamation Basin Study). 3. Track selected NPDES dischargers (i.e., McClellan AFB) and act as an active stakeholder for permitting.	The development of this voluntary program by the water agencies has proven to be a highly effective tool for prioritizing on-going source water protection activities, as well as achieving the most benefits with the limited resources available.	Continue to be applicable to: West Sacramento, Sacramento, and SCWA. Consider applicability to: WDCWA and EBMUD 1. All agencies listed above. 2. All agencies listed above. 3. Only applicable to Sacramento, SCWA, and EBMUD
Continue to track Aerojet and act as an active stakeholder for permitting.	The Aerojet Groundwater Extraction and Treatment Systems NPDES continues to be expanded with up to 48 mgd discharging to the Lower American River. There are a broad suite of contaminants and there have been exceedences of effluent limits.	Only applicable to Sacramento, SCWA, and EBMUD.
Continue to coordinate with SRCSD and City of Sacramento on operations agreements and notifications.		Only applicable to SCWA and EBMUD.

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APPENDIX B – REGULATORY FRAMEWORK

REGULATORY FRAMEWORK

This Framework provides a review of current and anticipated drinking water regulations related to large surface water systems as promulgated by the United States Environmental Protection Agency (USEPA) and the California State Water Resources Control Board's Division of Drinking Water (DDW). Anticipated regulations were limited to those projected to be implemented within five years. Under the provisions of the Safe Drinking Water Act (SDWA), the DDW has the primary enforcement responsibility (referred to as "primacy"). The Health and Safety Code of the California Administrative Code establishes DDW's authority and stipulates drinking water quality and monitoring standards. To maintain primacy, a state's drinking water regulations can be no less stringent than the federal standards (a state's regulations can be more stringent).

The USEPA and DDW establish primary regulations for the control of contaminants that affect public health and secondary regulations for compounds that affect the taste or aesthetics of drinking water. For each contaminant that is regulated, the USEPA is required to establish a maximum contaminant level (MCL) or a treatment technique (TT) to limit the level of these compounds in drinking waters. USEPA is also required to recommend a Best Available Technology (BAT) for removal of each contaminant during treatment.

In March 2010 the USEPA announced that they would be implementing a new regulatory strategy for drinking water. There are four major components to the strategy:

- Regulate contaminants as groups,
- Foster development of new drinking water treatment technologies,
- Use authority of multiple statutes to protect drinking water, and
- Partner with states to share data.

CURRENT REGULATIONS

The most significant drinking water quality regulations applied to surface water supplies are shown in **Table 1**. **Attachment 1** contains a summary of each of the contaminants currently regulated in drinking water by either the USEPA or the DDW. The attachment identifies the regulation and the MCL or the TT associated with each of the contaminants listed. There are numerous constituents which only have a California drinking water standard or a more stringent California drinking water standard, so DDW is indicated as the regulation. The following is a general discussion of the requirements of the regulations listed in **Table 1**.

NIPDWR

Prior to the establishment of the USEPA, the US Public Health Service had established 22 drinking water standards. These standards were adopted by the USEPA as National Interim Primary Drinking Water Regulations (NIPDWR) by the SDWA. These contaminants have been updated or replaced by subsequent regulations.

REGULATORY FRAMEWORK

Table 1
Summary of Current Major Federal and State Drinking Water Quality Regulations

Regulation	Year of Promulgation	Number of Contaminants	Targeted Contaminants
National Interim Primary Drinking Water Regulations (NIPDWR)	1975-1981	7	Trihalomethanes, Arsenic, Radiologicals
Phase I Standards	1987	8	VOCs
Phase II Standards	1991	36	VOCs, SOCs, and IOCs
Phase V Standards	1992	23	VOCs, SOCs, and IOCs
Surface Water Treatment Rule (SWTR)	1989	5	Microbiological and Turbidity
Total Coliform Rule (TCR)	1989	2	Microbiological
Lead and Copper Rule (LCR)	1991/2003 [1]	2	Lead and Copper
Drinking Water Source Assessment and Protection Program	1996	-	Source Water Protection
Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule	1998/2006 [1]	14	D/DBPs and Precursors
Interim Enhanced Surface Water Treatment Rule (IESWTR)	1998/2007 [1]	2	Microbiological and Turbidity, Systems >10,000
Radionuclides Rule	2000	4	Radionuclides
Arsenic Rule	2001/2008 [1]	1	Arsenic
Filter Backwash Recycling Rule	2001/2007 [1]	-	Microbiological and Turbidity
Stage 2 D/DBP Rule	2006	9	DBPs
Long Term 2 ESWTR	2006	1	*Cryptosporidium*
Unregulated Contaminant Monitoring Rule 2	2006	25	Chemical and Microbiological
CA Public Notification Requirements	2006	None	None
CA Secondary Drinking Water Standards	2006	25	Aesthetics
CA Perchlorate Regulation	2007	1	Perchlorate
Contaminant Candidate List 2	2008	11	Chemical
CA Waterworks Standard	2008	None	None
Endocrine Disrupters Screening Program	2009/2010	134	Endocrine Disrupters
Contaminant Candidate List 3	2009	116	Chemical and Microbiological
Six-Year Review	2010	-	-
Unregulated Contaminant Monitoring Rule 3	2012	30	Chemical and Biological
Revised Total Coliform Rule	2012	3	Microbiological
CA Hexavalent Chromium Reg	2014	1	Hexavalent Chromium

[1] California Adoption of Federal Rule

Phase I Regulations

The Phase I Regulations were finalized in July 1987 and compliance for large utilities was required by January 1989. The Phase I Regulations included MCLs for eight volatile organic compounds (VOCs) and required utilities to collect quarterly samples from each source water supply for one year. After one year, utilities could qualify for reduced monitoring based on the first year monitoring results (one sample every three years). The Phase I Regulations also included monitoring requirements for unregulated contaminants. All systems were required to monitor for a minimum of 34 unregulated volatile organic contaminants; two additional contaminants if the system is determined vulnerable; and 15 additional contaminants at the State's discretion.

Phase II Regulations

The Phase II Regulations were proposed in May 1989 and finalized in July 1991. Monitoring under the Phase II Regulations was required to begin in January 1993. The Phase II Regulations established MCLs for 36 contaminants (7 inorganic constituents (IOCs), 10 VOCs, and 19 synthetic organic compounds (SOCs), plus nitrate, nitrite, and total nitrate and nitrite) and TT requirements for two additional treatment additives (polymers). In order to simplify the increasing number of monitoring requirements, the Standardized Monitoring Framework (SMF) was developed. The SMF is based on a nine-year cycle divided into three, three-year monitoring periods. Under the new monitoring schedule, initial monitoring, baseline monitoring, reduced monitoring, and increased monitoring requirements were established.

Phase V Regulations

The Phase V Regulations were proposed in July 1990 and finalized in July 1992. The SMF was incorporated into the Phase V Regulations with the first compliance period for large utilities beginning January 1994. Phase V established regulations for 23 contaminants including 22 from the original list of 83 included in the 1986 SDWA Amendments (originally included a proposal for sulfate that was not included in the final Phase V regulations). The 23 Phase V contaminants include five IOCs, three VOCs, and 15 SOCs. The MCL for nickel, 0.1 mg/L, was remanded in February 1995 by the US Court of Appeals for the District of Columbia Circuit. The USEPA is required to reconsider the nickel MCLG and the MCL, but no action has been taken yet.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) was promulgated to control the levels of turbidity, *Giardia lamblia*, viruses, *Legionella*, and heterotrophic plate count bacteria in U.S. drinking waters. Many of the detailed requirements of this regulation were enhanced or superseded by the Interim and Long Term 2 Enhanced Surface Water Treatment Rules described later.

The California SWTR requires all utilities utilizing a surface water supply or a groundwater supply under the influence of a surface water supply, to provide adequate disinfection and, under most conditions, to provide filtration. Exemptions from filtration of surface water supplies are provided in rare occasions where the source water supply meets extremely rigid requirements for water quality and the utility possesses control of the watershed.

General Requirements

The SWTR includes the following general requirements to minimize human exposure to microbial contaminants in drinking water.

- Utilities are required to achieve at least 99.9 percent removal and/or inactivation of *Giardia lamblia* cysts (3-log removal) and a minimum 99.99 percent removal and/or inactivation of viruses (4-log removal). The required level of removal/inactivation must occur between the point where the raw water ceases to be influenced by surface water runoff to the point at which the first customer is served.
- The disinfectant residual entering the distribution system must not fall below 0.2 mg/L for more than 4 hours during any 24-hour period.
- A disinfectant residual must be detectable in 95 percent of distribution system samples. A heterotrophic plate count (HPC) concentration of less than 500 colonies/mL can serve as a detectable residual if no residual is measured.
- Each utility must perform a watershed sanitary survey at least every five years.

Removal Credit

The level of physical removal credit given a utility for both *Giardia lamblia* and viruses is determined by the type of treatment process used. For a conventional water treatment plant, the SWTR provides a 2.5-log removal credit for *Giardia lamblia* and a 2.0-log removal credit for viruses. Alternative treatment technologies are awarded removal credit from DDW based on performance tests.

Disinfection Credit

Disinfection during conventional treatment (assuming all operational criteria and performance standards are met and the plant receives 2.5-log credit for physical removal of *Giardia* and 2.0-log credit for physical removal of viruses), must achieve 0.5-log inactivation of *Giardia lamblia* and 2.0-log inactivation of viruses. To determine the inactivation of *Giardia lamblia* and viruses achieved at a treatment plant, the SWTR established the concept of disinfection contact time (CT). CT is the product of the concentration of disinfectant remaining at the end of a treatment process ("C" in mg/L) and the contact time in which 10 percent of the water passes through the treatment process ("T" or "T_{10}" in minutes). The contact time in which 10 percent of the water

travels through a unit process can be conservatively estimated from DDW guidelines or more accurately determined by conducting a tracer study. The USEPA Guidance Manual to the SWTR includes tables that identify the log removal of both *Giardia lamblia* and viruses achieved for a calculated CT value based on the type of disinfectant, the water temperature, and pH.

Total Coliform Rule

The Total Coliform Rule (TCR) was promulgated by the USEPA in June 1989 with compliance required eighteen months after promulgation (January 1991). DDW promulgated the Total Coliform Rule in January 1992 and the Rule went into effect on May 1, 1992. The Revised Total Coliform Rule is discussed later and supersedes some parts of this rule. Under the TCR, utilities must submit a monitoring plan to the DDW for approval. The plan must provide for representative sampling of the distribution system (including all pressure zones and reservoir areas), describe any sample rotations proposed and include a statement that the sample collector has been trained. The total number of samples and frequency of sampling required is dependent on the population served by the utility. For all but the smallest utilities, weekly sampling is required. If any sample is coliform-positive, two actions must be taken within 24 hours of notification to DDW of the positive result:

- A set of repeat samples must be collected. The location of the repeat samples must include the tap that tested positive, and one upstream and downstream location, both of which must be within five service connections of the positive sample location. If one or more of the repeat samples tests positive for the presence of coliforms, an additional set of repeat samples must be taken. This process continues until all of the samples are total coliform-negative or an MCL has been violated.
- The sample must be analyzed for the presence of fecal coliform or *E. coli*.

The previous coliform standard was a density based standard. This was replaced by a presence/absence regulation. There are three potential scenarios in which an MCL is violated. These scenarios consist of the following:

- For utilities that analyze less than 40 samples per month, no more than 1 monthly sample may be coliform-positive (this includes repeat samples). If more than 1 monthly sample is coliform-positive then an MCL has been violated. For >40 samples per month collected, an MCL has been violated if more than 5.0% are positive.
- Utilities are in violation of an MCL if an original sample is fecal coliform/*E. coli*-positive and any repeat sample is total, fecal, or *E. coli*-positive.
- Utilities are in violation of an MCL if an original sample is total coliform-positive and any repeat sample is fecal coliform/*E. coli*-positive.

Furthermore, there are two conditions that result in a "Significant Rise in Bacterial Count" classification. This condition is not considered a violation of an MCL; however, it does require notification to DDW. The two conditions that result in this classification are listed below:

- An initial sample that is total coliform-positive is determined to be either fecal coliform or *E. coli*.-positive, as well.
- At least two repeat samples are total coliform-positive but neither sample is fecal coliform or *E. coli*-positive.

Best Available Technology

The TCR includes a list of four preventative measures a utility can institute to minimize the presence of coliforms in the distribution system. These four items include the following:

- Ensure proper well protection.
- Maintain of a minimum 0.2 mg/L disinfectant residual through the entire distribution system.
- Institute a distribution system maintenance program including:
  - appropriate pipe replacement and repair procedures,
  - flushing program,
  - proper operation and maintenance of distribution system reservoirs, and
  - maintenance of a positive water pressure throughout system.
- Provide adequate filtration and disinfection treatment processes.

Lead and Copper Rule

The Lead and Copper Rule (LCR) was promulgated by the USEPA on June 7, 1991. The objective of the LCR is to minimize the corrosion of lead and copper-containing plumbing materials in public water systems (PWS) by requiring utilities to optimize treatment for corrosion control. The LCR establishes "action levels" in lieu of MCLs for regulating the levels of both lead and copper in drinking water. The action level for lead was established at 0.015 mg/L while the action level for copper was set at 1.3 mg/L. The compliance for these action levels is based on results from first-flush distribution system samples at sites selected to meet the LCR requirements. An action level is exceeded when greater than 10 percent of samples collected from the sampling pool contain lead levels above 0.015 mg/L or copper levels above 1.3 mg/L. Unlike an MCL, a utility is not out of compliance with the LCR when an action level is exceeded. Exceedance of an action level requires a utility to take additional steps to reduce lead and copper corrosion in the distribution system. In addition, there is a California state secondary standard, of 1.0 mg/L, for copper that requires monitoring in the source and treated water separately.

In October 1999, USEPA made minor revisions to the LCR to clarify the original rule, streamline implementation, promote consistent national implementation, and reduce the reporting requirements. The revisions do not include any changes to the action levels for lead and copper. The revisions include requiring monitoring for public water systems with optimized corrosion control, which was inadvertently left out of the original LCR. The revisions also include changing the definition of the word "control" in the LCR to only require public water systems to replace lines that it owns or has authority to replace to protect the water quality. The revisions allow systems with low lead and copper tap levels to reduce the number and frequency of sample collection sooner. Finally, there are numerous modifications to the system reporting requirements to minimize the reporting burden.

In 2004 and 2007 the USEPA made several more minor revisions to the LCR, including a requirement to include lead health effects language in the annual Consumer Confidence Report.

Drinking Water Source Assessment and Protection Program

The 1996 SDWA Amendments included a requirement for States to develop a program to assess sources of drinking water and encourage States to establish protection programs. California has developed the Drinking Water Source Assessment and Protection (DWSAP) Program in response to this requirement. When bringing a new source into service, a source assessment must be conducted as part of the permitting process.

Once an original assessment is performed for a source water, DDW recommends that the assessment be reviewed every five years. If conditions have changed that might impact the overall ranking of potential contaminating activities (presence in watershed/source water or change to treatment), then a water utility could consider updating the assessment. A completed assessment is required to obtain and continue to obtain chemical monitoring waivers for source waters.

There are eight components identified by California which are required as part of its DWSAP Program.

- Source Identification: Systems must locate the source using Global Positioning System.
- Delineation of the Watershed and the Near Intake Zones: Surface water systems must delineate the watershed contributing to the source and may, optionally, identify the near intake zones which are close to the point of diversion where contaminant activities may have a greater influence.
- Evaluation of the Physical Barrier Effectiveness: Surface water systems must complete the forms developed by the State to determine the effectiveness of the natural physical barriers for preventing contaminants from entering the source.

- Identification of Potential Contaminating Activities (PCAs): Surface water systems must develop an inventory of PCAs within the near intake zone or the entire watershed. The PCAs on the inventory must then be ranked for risk using the table from the DWSAP guidance.
- Perform a Vulnerability Assessment: Systems must perform a vulnerability assessment for each PCA identified. This assessment is based on the risk ranking, location, and the physical barrier effectiveness. After assessment, the PCAs are prioritized.
- Develop an Assessment Map: Systems must develop an assessment map, at a minimum using USGS quad maps 7.5 minute series. The map must show the location of the source, the watershed or recharge area, the near intake zones, and the location of the PCAs.
- Prepare a Drinking Water Source Assessment Report: Systems must prepare a report on the assessment to submit to the State for review. The report must include the assessment map, the methods used to locate the source, the recharge area delineation calculations, the physical barrier effectiveness forms, the potential contaminating activity forms, and the vulnerability assessment forms.
- Include a Summary of the Report in the Annual Consumer Confidence Report: Systems must prepare a summary of the assessment to include in the annual Consumer Confidence Report. The report must also be available to the public for review.

After the final report has been reviewed and accepted by DDW, systems can begin the voluntary Source Water Protection Program if desired. There are some loan and grant funds available to assist with these programs. The Source Water Protection Program components have been highlighted by the State and will include: public involvement, report review, initiation of protection measures, and information transfer to the public.

Stage 1 Disinfectants and Disinfection By-Products Rule

The purpose of the Stage 1 Disinfectants/Disinfection By-Product (D/DBP) Rule is "… to minimize risks from disinfection by-products and still maintain adequate control over microbial contamination." DDW adopted this regulation in 2012 without any significant variation from the Federal rule. The Stage 2 D/DBP Rule is discussed later and supersedes some parts of this rule.

Maximum Residual Disinfectant Level Goals

The USEPA has set maximum residual disinfectant level goals (MRDLGs) for chlorine, chloramines, and chlorine dioxide. These are shown in **Table 2**.

Table 2
Maximum Residual Disinfectant Level Goals

Disinfectant	Goal
Chlorine	4 mg/L as Cl_2
Chloramines	4 mg/L as Cl_2
Chlorine Dioxide	0.8 mg/L as ClO_2

The MRDLGs are set at levels for which no known or anticipated adverse health effects occur. These goals are non-enforceable health goals based only on health effects and exposure information.

Maximum Residual Disinfectant Levels

The Stage 1 D/DBP Rule established maximum residual disinfectant levels (MRDLs) for chlorine, chloramines, and chlorine dioxide. These are shown in **Table 3**.

Table 3
Maximum Residual Disinfectant Levels

Disinfectant	Level
Chlorine	4.0 mg/L as Cl_2
Chloramines	4.0 mg/L as Cl_2
Chlorine Dioxide	0.8 mg/L as ClO_2

Chlorine

The residual disinfectant level must be monitored at the same points in the distribution system and at the same time as when sampling for total coliforms. Compliance with the MRDL will be based on the running annual average of the monthly average of all samples, computed quarterly. Operators may increase the residual chlorine level in the distribution system above the MRDL if necessary to protect public health from acute microbiological contamination problems including: distribution line breaks, storm runoff events, source water contamination, or cross-connections.

Chloramines

The residual disinfectant level must be monitored at the same points in the distribution system and at the same time as when sampling for total coliforms. Compliance with the MRDL will be based on the running annual average of the monthly average of all samples, computed quarterly. Operators may increase the residual chloramine level in the distribution system above the MRDL if necessary to protect public health from acute microbiological contamination problems including: distribution line breaks, storm runoff events, source water contamination, or cross-connections.

Chlorine Dioxide

Systems that use chlorine dioxide must measure the residual disinfectant level at the entrance to the distribution system on a daily basis. Non-compliance with the MRDL can result in acute or non-acute violations. If the daily sample at the entrance exceeds the MRDL, then the system is required to take three additional samples in the distribution system on the next day as described below. If any samples collected the second day in the distribution system exceed the MRDL, or if the distribution system samples were not collected, the system will be in acute violation of the MRDL. If only the sample collected at the entrance to the distribution system exceeds the MRDL on the second day, or if the entrance sample was not collected, the system will be in a non-acute violation of the MRDL.

Follow up monitoring in the distribution system will be governed by the type of residual disinfectant used. Systems using chlorine as a residual disinfectant and operating booster stations after the entrance to the distribution system must take three samples in the distribution system; one close to the first customer, one at an average residence time, and one at the maximum residence time. Systems using chlorine dioxide or chloramines as a residual disinfectant or chlorine without operating booster stations after the entrance to the distribution system must take three samples in the distribution system as close as possible to the first customer at intervals of not less than six hours.

Operators may not increase the residual chlorine dioxide level in the distribution system above the MRDL under any circumstances.

Maximum Contaminant Level Goals (MCLGs) for Trihalomethanes, Haloacetic Acids, Chlorite, and Bromate

The USEPA has set MCLGs for four trihalomethanes, three haloacetic acids, chlorite, and bromate. These are shown in **Table 4**.

Table 4
Maximum Contaminant Level Goals

Disinfection By-Product	MCLG
Bromodichloromethane	0 mg/L
Dibromochloromethane	0.06 mg/L
Bromoform	0 mg/L
Chloroform	0.07 mg/L
Monochloroacetic Acid	0.07 mg/L
Dichloroacetic Acid	0 mg/L
Trichloroacetic Acid	0.02 mg/L
Chlorite	0.8 mg/L
Bromate	0 mg/L

The MCLGs are set at levels for which no known or anticipated adverse health effects occur. These goals are non-enforceable health goals based only on health effects and exposure information.

Maximum Contaminant Levels for TTHM, HAA5, Chlorite, and Bromate

The Stage 1 D/DBP Rule set MCLs for Total Trihalomethanes (TTHM), five haloacetic acids (HAA5), chlorite, and bromate. These are shown in **Table 5**.

Table 5
Maximum Contaminant Levels

Contaminant	Level
TTHM[1]	0.080 mg/L
HAA5[2]	0.060 mg/L
Chlorite	1.0 mg/L
Bromate	0.010 mg/L

[1]TTHM includes chloroform, bromodichloromethane, dibromochloromethane, bromoform.
[2] HAA5 includes mono, di and tri-chloroacetic acids and mono and di-bromoacetic acids.

Total Trihalomethanes and Haloacetic Acids

TTHMs and HAA5 are formed when disinfectants react with naturally occurring organic matter in water. All systems must monitor the distribution system for TTHMs and HAA5. Compliance for surface water, GWUDIS and groundwater systems with population greater than 10,000 is based on the running annual average of quarterly averages of all samples taken in the distribution system, computed quarterly.

Chlorite

Chlorite is produced when chlorine dioxide reacts with naturally-occurring organic material. Systems using chlorine dioxide for disinfection are required to conduct sampling for chlorite. Systems are required to monitor chlorite on a daily basis at the point of entry to the distribution system. If chlorite is detected at levels greater than 1.0 mg/L at the entrance to the distribution system, then additional distribution system monitoring is required the following day. Systems must monitor three locations in the distribution system (at the same time): close to the first customer, representative of average residence time, and representative of maximum residence time, on a monthly basis.

Bromate

Bromate is produced when ozone reacts with naturally occurring bromide. Systems using ozone for disinfection are required to conduct sampling for bromate. Systems

must collect one sample per month at the entrance to the distribution system while the ozonation system is operating under normal conditions. Compliance with the MCL is based on a running annual average, computed quarterly, of monthly samples.

Treatment Technique for Disinfection By-Product Precursors

The USEPA requires systems that have surface water or groundwater under the direct influence of surface water (GWUDIS) as a supply to use conventional filtration treatment to remove specific amounts of organic material by implementing a treatment technique, either by enhanced coagulation or enhanced softening. The percent of removal required depends on source water total organic carbon (TOC) and alkalinity. **Table 6** provides a summary of the removal requirements.

Compliance with this treatment technique must be calculated on a quarterly basis, once 12 months of data are available. Each month the system must calculate percent actual TOC removal, determine the percent required TOC removal (from above), and calculate the removal ratio (must be greater than 1.0).

Table 6
TOC Removal Requirements (Percent)

	Alkalinity, mg/L as $CaCO_3$		
TOC, mg/L	0 – 60	> 60 – 120	> 120
> 2.0 - 4.0	35	25	15
> 4.0 - 8.0	45	35	25
> 8.0	50	40	30

In lieu of calculating the removal ratio, systems have the opportunity to be granted a 1.0 for the monthly removal ratio if they meet one of the four following conditions, regardless of the calculated removal ratio:

- Remove greater than or equal to 10 mg/L of magnesium hardness (as $CaCO_3$),
- Raw water TOC is less than 2.0 mg/L,
- Raw water or treated water specific UV absorbance (SUVA) is less than or equal to 2.0 L/mg-m, or
- Treated water alkalinity is less than 60 mg/L (only for systems practicing enhanced softening).

The USEPA has also provided alternative compliance criteria from the treatment technique requirements. Utilities will not be required to achieve the specified TOC removals provided one of the following conditions is met:

- Source water TOC is less than 2.0 mg/L,
- Treated water TOC is less than 2.0 mg/L,

- Source water TOC is less than 4.0 mg/L, source water alkalinity is greater than 60 mg/L, and distribution system TTHM is less than 0.04 mg/L and HAA5 is less than 0.03 mg/L,
- Distribution system TTHM is less than 0.04 mg/L and HAA5 is less than 0.03 mg/L and only chlorine is used for primary disinfection and distribution system residual,
- Source water SUVA, prior to any treatment, is less than or equal to 2.0 L/mg-m, or
- Treated water SUVA is less than or equal to 2.0 L/mg-m.

Interim Enhanced Surface Water Treatment Rule

The Interim ESWTR applies to public water systems (PWSs) that use surface water or GWUDIS and serve > 10,000 population. The purpose of this regulation is "… to improve control of microbial pathogens, including specifically *Cryptosporidium*, in drinking water; and address risk trade-offs with disinfection by-products." When the DDW adopted this regulation in 2007, it included several more detailed regulatory requirements than the Federal version.

Cryptosporidium

The rule set an MCLG for the protozoan genus *Cryptosporidium* of zero (0). Since there was not a reliable means for monitoring this constituent in the drinking water at the time of promulgation, a treatment technique requirement was established in lieu of setting an MCL. The treatment technique requires a 2.0-log (99 percent) *Cryptosporidium* removal or control for PWSs that are currently required to filter under the existing SWTR. This removal must be achieved between the raw water intake and the first customer.

The rule provides that systems with conventional or direct filtration water treatment plants will be granted the 2.0-log removal credit, provided turbidity requirements are met for the existing SWTR (1.0/5.0 NTU) and the combined filter effluent requirements for this rule (0.3/1.0 NTU).

The rule also provides that systems with slow sand or diatomaceous earth filtration water treatment plants will be granted the 2.0-log removal credit, provided turbidity requirements are met for the existing SWTR (1.0/5.0 NTU). For systems applying to use an "alternative filtration technology", the system must show that the treatment, in combination with disinfection, consistently achieves 99.9 percent removal/inactivation of *Giardia*, 99.99 percent removal/inactivation of viruses, and 99 percent removal of *Cryptosporidium*.

Turbidity

For surface water and GWUDIS systems that are required to filter their source water under the existing SWTR, that employ conventional or direct filtration for treatment, the combined filter effluent turbidity requirements have been tightened. For alternative

filtration technologies, the State set turbidity performance requirements at a level that, in combination with disinfection, will consistently achieve 99.9 percent removal/inactivation of *Giardia*, 99.99 percent removal/inactivation of viruses, and 99 percent removal of *Cryptosporidium*.

The combined filter effluent (CFE) turbidity must be less than 0.3 NTU in at least 95 percent of monthly measurements. The CFE may never exceed 1 NTU (based on four hour measurements) and may not exceed 1 NTU for more than 1 continuous hour based on more frequent measurements (at least recorded every 15 minutes for conventional and direct filtration plants). The CFE turbidity shall not exceed 1.0 NTU for more than eight hours (based on 15-minute measurements). Monthly reports must show total number of measurements taken and have two options for value reporting:

- Report the number of 15-minute measurements and show the 50^{th}, 90^{th}, 95^{th}, 98^{th}, and 99^{th} percentiles and report all measurements greater than 1.0 NTU.
- Report 4 hour measurements and also provide the number of 15-minute measurements that month, the number and percent of those 15-minute measurements less than or equal to 0.3 NTU, and show all 15-minute measurements greater than 0.3 NTU.

The rule requires continuous, on-line measurement of turbidity for each individual filter effluent (IFE) for conventional and direct filtration plants. These data must be recorded every 15 minutes also. Systems with two or fewer filters may conduct continuous monitoring of the CFE turbidity in lieu of individual monitoring. IFE turbidity levels shall be monitored and the following conditions will require DDW reporting and self-assessment activities:

- Report IFE turbidity if greater than 1.0 NTU in two consecutive measurements, 15 minutes apart anytime during filter run
- Report IFE turbidity if greater than 0.3 NTU in two consecutive measurements, 15 minutes apart during the first 60 minutes of filter operation
- Conduct Filter Self-Assessment if IFE turbidity greater than 1.0 NTU in two consecutive measurements, 15 minutes apart anytime during filter run, for three consecutive months
- Conduct Comprehensive Performance Evaluation if IFE turbidity greater than 2.0 NTU in two consecutive measurements, 15 minutes apart anytime during filter run, for two consecutive months

DDW has added several other requirements to the rule including:

- All filters shall be visually inspected once per year as part of the operations plan based on DDW guidance.
- On-line turbidimeters shall be manually verified once per month for combined filter effluent and once per month for individual filter effluent.

- Turbidity shall be recorded and reported for sedimentation effluent at least once per day.
- Flow rate and turbidity shall be recorded and reported for recycled backwash water at least once per day.
- System must report turbidity data to the State within 10 days after the end of each month.

Disinfection Profiling and Benchmarking

The purpose of the disinfection profiling and benchmarking is to develop a process to assure that there is no significant reduction in microbial protection as a result of significant disinfection process modifications to meet the new MCLs for TTHMs and HAA5 from the Stage 1 D/DBP Rule, or subsequent MCLs.

Initial profiling was required for surface water systems if their annual average TTHM levels were greater than or equal to 80 percent of the new MCL (0.064 mg/L) or annual average HAA5 levels were greater than or equal to 80 percent of the new MCL (0.048 mg/L).

The initial disinfection profile was developed using a minimum of one year of weekly *Giardia lamblia* log inactivation. The month with the lowest average log inactivation was identified as the critical period or benchmark. When only one year of data was used, the benchmark inactivation was the same as the critical period. When multiple years of data were used, the benchmark inactivation was the average of the critical period from each year.

After the initial profiling and benchmarking was complete, a utility submitted it to the State as part of the sanitary survey (see description below). If a utility decides to make changes to the disinfection practices, then the utility must consult with the State to ensure that microbial protection is not compromised. Changes that would require a benchmark analysis include; changes in the point of disinfection, the type of disinfectant, the disinfection process, or any other modification identified by the State.

Finished Water Reservoirs

Under this rule, surface water and GWUDIS systems must cover all new treated water reservoirs, holding tanks, and other storage facilities.

Sanitary Surveys

Primacy states, such as California, must now conduct sanitary surveys for all surface water and GWUDIS systems, regardless of size. This is not the same as the watershed sanitary survey requirements, which is a water system requirement. These surveys must be conducted every three years for community water systems (CWS) and every

five years for non-community water systems (NCWS). DDW may grant a waiver to water utilities to perform the sanitary survey every five years if the system has outstanding performance based on previous sanitary surveys. DDW must determine how outstanding performance will be evaluated to allow for the reduced frequency of the sanitary survey.

The sanitary surveys must meet the eight components of the 1995 USEPA/State Guidance. These components include: source assessment (DDW typically uses watershed sanitary surveys for compliance with this component), treatment, distribution system, finished water storage, pumps, pumping facilities and controls, monitoring and reporting, data verification, system management and operation, operator compliance with state requirements, and disinfection profiling (if required).

Radionuclides

The USEPA published the Final Radionuclides Rule on December 8, 2000. The Rule applies to all CWSs. It included several new standards including:

- Set the Gross Alpha, Gross Beta and Photon, Combined Radium (226/228), and Uranium MCLGs at zero.
- Set the Gross Alpha MCL at 15 pCi/L.
- Set the Gross Beta and Photon MCL at 4 mrem/yr.
- Set the Combined Radium MCL at 5 pCi/L.
- Set the Uranium MCL at 30 ug/L.

The Rule requires all initial monitoring to be collected at the entry point to the distribution system (EPDS). It also clarified that Gross Beta and Photon are only required to be monitored by vulnerable systems. The frequency of repeat monitoring is determined by the initial one year of quarterly monitoring results.

- Sample results less than the detection limit for reporting (DLR), then 1 sample every 9 years.
- Sample results less than half the MCL, then 1 sample every 6 years.
- Sample results less than the MCL, then 1 sample every 3 years.

Arsenic Rule

The Final Arsenic Rule was promulgated by the USEPA on January 22, 2001. The Rule sets an MCLG of 0 mg/L and an MCL of 0.010 mg/L (10 ug/L) for arsenic. DDW adopted a regulation with the same standard in 2008. The OEHHA has developed a PHG for arsenic of 4 nanograms per liter (ng/L), equal to 0.004 ug/L.

Surface water systems are required to collect an annual sample. If sample results are greater than the MCL, then quarterly sampling is triggered. Waivers are available with

three rounds of monitoring with results less than the MCL. With a waiver, sampling can be reduced to once every nine years.

Filter Backwash Recycling Rule

The Final Filter Backwash Recycling Rule applies to all PWSs that use surface water and employ conventional or direct filtration and recycle water within the treatment plant. The DDW incorporated this rule into its adoption of the IESWTR.

This requires all recycle streams to pass through all treatment processes; therefore all streams need to be returned prior to chemical addition and coagulation. Also, each system must notify DDW in writing that they practice recycling. This notification must include a plant schematic that shows the type and location of recycle streams, typical recycle flow data, highest plant flow in the previous year, design flow of the plant, and DDW approved operating capacity.

Each system must collect and maintain the following information: copy of recycle notice to DDW, list of all recycle flows and frequency, average and maximum backwash flow rate and duration, typical filter run length and how determined, type of recycle treatment, and data on recycle treatment facilities.

DDW has added several other requirements to the rule including:

- Raw water shall be sampled for total coliform and either fecal coliform or *E. Coli* at least once per month.
- Chlorine residual shall be confirmed in 95 percent of distribution samples every month.

Stage 2 Disinfectants and Disinfection By-Products Rule

The Stage 2 D/DBP Rule was published in January 2006 and adopted by DDW in 2012. It applies to public water systems (PWSs) that are community water systems (CWSs) or non-transient non-community water systems (NTNCWs) that add a primary or residual disinfectant other than ultraviolet light or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light.

The key provision in this rule is the change in calculating the maximum contaminant level (MCL). Under the State 1 D/DBP Rule compliance with the MCL was calculated using a running annual average (RAA) to average compliance samples from all distribution system sampling locations. Under Stage 2 D/DBPR, the MCL is calculated using locational running annual averages (LRAAs). PWSs must maintain the LRAA for each compliance sampling location at or below 0.080 mg/L total trihalomethanes (TTHM) and 0.060 mg/L haloacetic acids (HAA5). All systems, including consecutive systems, must comply with the MCLs for TTHM and HAA5 LRAA using compliance

sampling locations identified from their Initial Distribution System Evaluation (IDSE) Final Report.

In May 2012 DDW adopted the Stage 2 D/DBP Rule as a marked up version of the existing regulatory code to incorporate the federal requirements into State code.

Initial Distribution System Evaluation

An IDSE was to be performed to identify locations with representative high TTHM and HAA5 concentrations throughout a system's retail distribution system. The IDSE results were used in conjunction with the Stage 1 D/DBPR compliance monitoring to identify and select Stage 2 D/DBPR routine compliance monitoring locations. There are four IDSE options:

- Standard monitoring program
- System specific study [based on TTHM and HAA5 monitoring] and modeling requirements
- Obtaining a 40/30 waiver
- Obtaining a very small system waiver

For systems electing the Standard Monitoring Program both the timing and number of IDSE monitoring were based on the retail population served by the individual public water system(s) and the source water type (either surface water or groundwater).

The timing of when the IDSE must be completed is based on either an individual system's retail population or, in the case of a combined distribution system, the retail population served by the largest system in that combined system. Combined distribution systems include water systems that receive fully treated water from another water system. The system providing the water is the wholesaler and the system receiving the water is the consecutive system. Since this rule included specific monitoring requirements for both wholesale and consecutive systems, USEPA developed guidance materials to assist combined systems and encouraged coordinating the timing of sample collection for those consecutive systems to enable data assessment. Those systems determined to be large, >100,000 population, were required to submit their IDSE plans under Schedule 1, by October 1, 2006. Schedule 2 systems, those between 50,000 and 100,000 population, had plans due April 1, 2007. Schedule 3 systems, those between 10,000 and 50,000 population, had plans due October 1, 2007. Schedule 3 systems, those less than 10,000 population, had plans due April 1, 2008.

The numbers of IDSE samples in the standard monitoring option are based on each individual system's retail population and the source water type, with the number ranging from 2 to 40. The frequency of sample collection also depends on the retail population and source water type, either one annual, four quarterlies, or six every 60 days.

Compliance Monitoring

Compliance with the Stage 2 D/DBPR is based on calculating a LRAA, where compliance means maintaining the annual average at each routine sampling location in the distribution system at or below 0.080 mg/L and 0.060 mg/L for TTHM and HAA5, respectively. This is in lieu of the RAA MCL calculation under the Stage 1 D/DBPR that averaged observed values across distribution system compliance sampling locations. Monitoring for the LRAA will occur at routine sampling locations identified in the IDSE Final Report at specific frequencies based on system population. In addition, water systems must submit a new Monitoring Plan for routine sampling which identifies the location, timing, and frequency of sample collection as well as the methodology for determining compliance with the MCLs. The number of routine sites for compliance monitoring is based on retail population and source water type, ranging from 2 to 20. The frequency also depends on retail population and source water type, with small systems only required to monitor annually and large systems monitoring quarterly.

If a water system is required to conduct quarterly monitoring, it must make compliance calculations at the end of the fourth calendar quarter that follows the compliance date (based on system size and designation in their IDSE Report and updated Monitoring Plan) and at the end of each subsequent quarter (or earlier if the LRAA calculated based on fewer than four quarters of data would cause the MCL to be exceeded regardless of the monitoring results of subsequent quarters). If the system is required to conduct monitoring at a frequency that is less than quarterly, it must make compliance calculations beginning with the first compliance sample taken after the compliance date.

Operational Evaluation Levels

The Stage 2 D/DBPR includes the concept of "operational evaluation levels." Operational evaluation levels trigger a system to evaluate system operational practices and identify opportunities to reduce DBP concentrations in the distribution system in order to reduce the potential the system will exceed the MCL. The Stage 2 D/DBPR operational evaluation levels are identified using the system's Stage 2 D/DBPR compliance monitoring results.

The operational evaluation includes an examination of system treatment and distribution operational practices, including changes in sources or source water quality, storage tank operations, and excess storage capacity, which may contribute to high TTHM and HAA5 formation. Systems must also identify what steps could be considered to minimize future operational evaluation level exceedences.

Operational Evaluation Levels
(calculated at each monitoring location)

IF (Q1 + Q2 + 2Q3)/4 > MCL,
then the system must conduct an operational evaluation

where
Q3 = current quarter measurement
Q2 = previous quarter measurement
Q1 =quarter before previous quarter measurement
MCL=Stage 2 MCL for TTHM (0.080 mg/l) **or**
Stage 2 MCL for HAA5 (0.060 mg/L)

Minimum Reporting Levels for DBPs

The rule establishes regulatory minimum reporting limits (MRLs) for compliance reporting of DBPs by public water systems. These regulatory MRLs also define the minimum concentrations that must be reported as part of the Consumer Confidence Reports. Beginning April 1, 2007 water systems must report all quantitative data results that have concentrations above the MRL. This includes both compliance data, such as routine or increased DBP monitoring, as well as non-compliance data, such as IDSE monitoring, operational evaluation assessment data, and treatment technique compliance data.

Maintain TOC < 4 mg/L for Reduced TTHM and HAA5 Monitoring

In order to qualify for reduced routine compliance monitoring for TTHM and HAA5, subpart H systems (i.e., systems that use surface water supplies or ground water under direct influence of surface water) not monitoring to demonstrate compliance with TOC removal requirements of Stage 1 D/DBPR (i.e., plants that are not conventional filtration designs) must take monthly TOC samples every 30 days at a location prior to any treatment, beginning April 1, 2008 or earlier, if specified by the state. The source water TOC running annual average must be <4.0 mg/L (based on the most recent four quarters of monitoring) on a continuing basis at each treatment plant to reduce or remain on reduced monitoring for TTHM and HAA5. After demonstration of TOC level, the system may reduce monitoring to every 90 days.

Systems on a reduced monitoring schedule may remain on that reduced schedule as long as the average of all samples taken in the year (for systems which must monitor quarterly) or the result of the sample (for systems which must monitor no more than frequently than annually) is no more than 0.060 mg/L and 0.045 mg/L for TTHMs and HAA5, respectively.

Long Term 2 Enhanced Surface Water Treatment Rule

The Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) was published by the USEPA in early January 2006 in the Federal Register. This regulation applies to all public water systems that use surface water or ground water under the direct influence of surface water (GWUDI).

The LT2ESWTR includes variable deadlines that are dependent on population served. Some systems serving more than 100,000 people were required to submit detailed monitoring plan submissions under LT2ESWTR by July 1, 2006. The Major Milestone Schedule for Stage 2 D/DBPR and LT2ESWTR Implementation provides an overview of key monitoring, reporting, and compliance milestones under both rules.

The requirements for filtered and unfiltered systems are different. This section summarizes only the requirements for filtered systems.

Source Water Monitoring

Filtered systems are not required to conduct source water monitoring if the system will provide a total of at least 5.5-log of treatment for *Cryptosporidium.* Otherwise, PWSs using surface water or GWUDI are required to monitor their source water (i.e., the influent water entering the treatment plant) monthly for 24 months to determine a maximum running annual average *Cryptosporidium* level. As described in the next section, monitoring results determine the extent of *Cryptosporidium* action requirements under the LT2ESWTR. Large systems must also monitor for *E. coli* and turbidity at the same time in source water.

Systems must adhere to their sampling plan and must report results no later than 10 days after the end of the first month following the month when the sample is collected. All systems serving at least 10,000 people must report the results from the initial source water monitoring to USEPA electronically using the Central Data Exchange (CDX) website. Submission of historical (grandfathered) data was allowed if it met the quality assurance and quality control requirements specified in the rule.

Systems serving less than 10,000 persons may use *E. coli* as a surrogate indicator for *Cryptosporidium.* However, if the *E. coli* levels are sufficiently high, these systems must then undertake *Cryptosporidium* monitoring. The trigger level for *Cryptosporidium* monitoring was originally set at *E. coli* levels above 10 MPN/100 mL for a lake or reservoir source and 50 MPN/100 mL for a flowing stream. In 2010, based on data submitted by large systems the USEPA revised the trigger threshold to 100 MPN/100 mL for all surface water supplies.

The rule also includes a provision for all systems to conduct a second round of source water monitoring (either *Cryptosporidium* or *E. coli)* for all systems. This second round of sampling will take place six years following bin classification for the source water.

Analytical Method

Systems must analyze for *Cryptosporidium* using either USEPA Method 1623 or Method 1622. Systems must analyze at least a 10 L sample, a packed pellet volume of at least 2 mL, or enough volume to clog two filters. The rule contains specific quality assurance and quality control requirements. Only USEPA approved laboratories can perform the *Cryptosporidium* sample analysis. Analytical methods are also specified for turbidity and *E. coli* measurements required by the rule.

Sampling

Filtered systems serving at least 10,000 people must sample their source water for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 24 months. Filtered systems serving fewer than 10,000 people must sample their source water for *E. coli* at least once every two weeks for 12 months. Filtered systems serving fewer than 10,000 people with the initial *E. coli* annual mean *E. coli* concentration greater than 100 *E. coli MPN*/100 mL must then sample their source water for *Cryptosporidium* at least twice per month for 12 months. These small systems could also elect to skip the *E. coli* monitoring and instead conduct *Cryptosporidium* monitoring at least monthly for 24 months.

Systems must collect samples within a five-day period around the scheduled date. If an extreme condition or situation exists that may pose danger to the sample collector, or that cannot be avoided and causes the system to be unable to sample, the system must sample as close to the scheduled date as is feasible unless the state approves an alternative sampling date. The system must submit an explanation for the delayed sampling date to the state concurrent with the shipment of the sample to the laboratory. If a system is unable to report a valid analytical result for a scheduled sampling date due to equipment failure, loss of or damage to the sample, failure to comply with the analytical method requirements, including the quality control requirements, or the failure of an approved laboratory to analyze the sample, then the system must collect a replacement sample.

Replacement samples should be collected not later than 21 days after receiving information that an analytical result cannot be reported for the scheduled date unless the system demonstrates that collecting a replacement sample within this time frame is not feasible or the state approves an alternative re-sampling date. The system must submit an explanation for the delayed sampling date to the state concurrent with the shipment of the sample to the laboratory. Systems that fail to meet these criteria for any source water sample must revise their sampling schedules to add dates for collecting all

missed samples. Systems must submit the revised schedule to the state for approval prior to when the system begins collecting the missed samples.

Monitoring Location

Systems must collect samples for each plant that treats a surface water or GWUDI source. Where multiple plants draw water from the same influent, such as the same pipe or intake, the state may approve one set of monitoring results to be used for all plants. Systems must collect source water samples prior to chemical treatment, such as coagulants, oxidants and disinfectants. The state may approve a system to collect a source water sample after chemical treatment. To grant this approval, the state must determine that collecting a sample prior to chemical treatment is not feasible for the system and that the chemical treatment is unlikely to have a significant adverse effect on the analysis of the sample. Systems that recycle filter backwash water must collect source water samples prior to the point of filter backwash water addition. Specific requirements are included for bank filtration and other special cases.

A system that begins using a new source of surface water or GWUDI after the system is required to begin monitoring under paragraph (c) of this section must monitor the new source on a schedule the state approves.

Monitoring and Treatment Compliance Dates

Starting dates for monitoring are staggered by system size, with smaller systems beginning monitoring after larger systems. Milestones for monitoring, reporting, and compliance occur first for very large systems ($\geq$100,000 persons), then systems serving 50,000 - 99,999 persons, followed by systems serving 10,000 - 49,999 persons, and finally systems serving fewer than 10,000. Populations are based on retail population served.

Bin Classification Table for Filtered Systems

Filtered water systems will be classified in one of four categories or bins based on their monitoring results. The rule specifies several calculation procedures depending on how many samples were collected or if the sample frequency was not consistent.

Additional action for *Cryptosporidium* (beyond 3.0-log reduction awarded for conventional filtration or 2.5-log reduction for direct filtration) will be based on source water concentrations of the protozoa and the type of treatment implemented at the plant. If the maximum running annual average (MRAA) is less than 0.075 oocysts/L, the source is assigned Bin 1 classification and no additional action is required. If the MRAA is greater than or equal to 0.075 oocysts/L, then various levels of action are required based on the Bin classification and the treatment type. **Table 7** provides a summary of those action requirements.

Calculating Bin Placement

- Total of at least 48 samples. The bin concentration is equal to the arithmetic mean of all sample concentrations.
- Total of at least 24 samples, but not more than 47 samples. The bin concentration is equal to the highest arithmetic mean of all sample concentrations in any 12 consecutive months during which *Cryptosporidium* samples were collected (maximum running annual average).
- For systems that serve fewer than 10,000 people and monitor for *Cryptosporidium* for only one year (i.e., collect 24 samples in 12 months), the bin concentration is equal to the arithmetic mean of all sample concentrations.
- For systems with plants operating only part of the year that monitor fewer than 12 months per year under § 141.701(e), the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

Table 7
Treatment Requirements by Bin Classification

Bin Classification	Filtration Treatment			
	Conventional filtration (including softening)	Direct Filtration	Slow Sand or Diatomaceous Earth Filtration	Alternative Filtration Technology
Bin 1	No additional treatment	No additional treatment	No additional treatment	No additional treatment
Bin 2	1-log	1.5-log	1-log	As determined by State
Bin 3	2-log[1]	2.5-log[1]	2-log[1]	As determined by State[1]
Bin 4	2.5-log[1]	3-log[1]	2.5-log[1]	As determined by State[1]

[1]Systems must achieve at least 1-log through ozone, chlorine dioxide, UV, membranes, bag/cartridge filters, or bank filtration.

Conventional filtration systems classified in Bins 2, 3 and 4 must provide 1.0 to 2.5-log additional action for *Cryptosporidium*. Systems will select from a wide range of treatment and management strategies in the "microbial toolbox" to meet their additional action requirements. Systems classified in Bin 3 and Bin 4 must achieve at least 1 log of additional treatment using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or ultraviolet (UV) light.

Microbial Toolbox

PWSs can achieve additional *Cryptosporidium* treatment credit through implementing pretreatment processes, such as pre-sedimentation or bank filtration, by developing a watershed control program, and by applying additional treatment steps like ozone,

chlorine dioxide, UV, and membranes. In addition, PWSs can receive a higher level of credit for existing treatment processes through achieving superior filter effluent turbidity or through a demonstration of performance. Taken as a whole, this list of control options is termed the "microbial toolbox." PWSs may use one or more tools to accumulate the needed treatment credits to meet the treatment requirement associated with their bin classification.

UV Dose Table

Systems receive *Cryptosporidium*, *Giardia lamblia*, and virus treatment credits for ultraviolet (UV) light reactors by achieving the UV dose values described in the rule. Systems must validate and monitor UV reactors to demonstrate that they are achieving a particular UV dose value for treatment credit. UV reactor validation must occur at full-scale using a test microbe with quantified dose-response characteristics using low-pressure mercury lamps. Validation must include operating conditions of flow rate, UV intensity as measured by a UV sensor, and UV lamp status, as well as other considerations including lamp fouling and inlet/outlet hydraulics. To receive treatment credit for UV light, systems must treat at least 95 percent of the water delivered to the public during each month by UV reactors operating within validated conditions for the required UV dose.

CT Tables

CT is the product of the disinfectant contact time (T, in minutes) and disinfectant concentration (C, in milligrams per liter). Systems with treatment credit for chlorine dioxide or ozone must calculate CT at least once each day, with both C and T measured during peak hourly flow. Systems with several disinfection segments in sequence may calculate and sum the CT for each segment, where a disinfection segment is defined as a treatment unit process with a measurable disinfectant residual level and a liquid volume. Systems receive the *Cryptosporidium* treatment credit by meeting the corresponding CT value for the applicable water temperature specified in CT tables specified in the rule.

Open Finished Water Reservoirs

Up to now, regulations required PWSs to cover all new storage facilities for finished water but did not address existing uncovered finished water storage facilities. Under the LT2ESWTR, PWSs using uncovered finished water storage facilities must either cover the storage facility, treat the storage facility discharge to achieve inactivation and/or removal of 4-log virus, or develop and implement a risk mitigation plan.

Microbial Profiling and Benchmarking

After the first round of source water monitoring if a water system plans to make a significant change to its disinfection practice, they must develop a disinfection profile and calculate disinfection benchmarks for *Giardia lamblia* and viruses. The same process should be used as outlined in Guidance under the IESWTR. Significant changes to disinfection practice are defined as follows:

- Changes to the point of disinfection;
- Changes to the disinfectant(s) used in the treatment plant;
- Changes to the disinfection process; or
- Any other modification identified by the state as a significant change to disinfection practice.

Unregulated Contaminant Monitoring Rule 2

The Unregulated Contaminant Monitoring Rule 2 (UCMR2) required "treated" water monitoring of specified unregulated constituents. The Rule was promulgated on January 4, 2007. The purpose was to assist the USEPA to collect information about contaminants present in drinking water supplies that were unregulated. The UCMR2 was comprised of three lists, or groups, of monitoring. List 1 required CWSs and NTNCWs serving greater than 10,000 to conduct "treated" water monitoring of specified unregulated constituents. A select group of 800 systems serving less than 10,000 were also required to conduct the monitoring. List 2 required only large systems, serving greater than 100,000, to conduct "treated" water monitoring of specified unregulated constituents.

- List 1 - 10 constituents, two methods, sampling was conducted between January 2008 and December 2010, surface water quarterly for one year, groundwater semi-annual for one year, sampled at entry point to distribution system only.
  - 2,2',4,4'- tetrabromodiphenyl ether (BDE-47), 2,2',4,4',5-pentabromodiphenyl ether (BDE-99), 2,2',4,4',5,5'-hexabromobiphenyl (HBB), 2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153), 2,2',4,4',6-pentabromodiphenyl ether (BDE-100), Dimethoate, Terbufos sulfone, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene (TNT), Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX).
- List 2 - 15 constituents, three methods, sampling was conducted between January 2008 and December 2010, surface water quarterly for one year, groundwater semi-annual for one year, sampled at entry point to distribution system for all constituents and also at distribution system maximum residence time for the six nitrosamines (all under one method).
  - N-nitrosodiethylamine (NDEA), N-nitrosodimethylamine (NDMA), N-nitroso-di-n-butylamine (NDBA), N-nitroso-di-n-propylamine (NDPA), N-nitrosomethylethylamine (NMEA), N-nitrosopyrrolidine (NPYR), Acetochlor

ethane sulfonic acid (ESA), Acetochlor oxanilic acid (OA), Alachlor ESA, Alachlor OA, Metolachlor ESA, Metolachlor OA, Acetochlor, Alachlor, Metolachlor.

Analytical work was to be completed using a USEPA approved UCMR2 laboratory and data was to be submitted to the USEPA via the on-line CDX system. The USEPA assigned specific dates for sampling conducted by each water agency. The List 1 and List 2 constituents were monitored concurrently. Systems finalized their sampling inventory with the USEPA and had the opportunity to revise the sampling schedule through CDX. Some large systems that have multiple ground water entry points to the distribution system (EPTDSs) were allowed to monitor at representative entry point(s) rather than at each EPTDS.

California Public Notification Requirements

These requirements were finalized and effective in September 2006. They apply to all PWSs. DDW revised the existing requirements by modifying the format substantially, and not necessarily the content. DDW revised public notification into three Tiers.

1. Tier 1 violations are the most serious (fecal/*E.coli* positive distribution system samples, nitrate/nitrite MCL exceedances without resampling, turbidity violations without DDW notification, or other emergency short-term exposure health advisories). These violations will require mass public notification within 24 hours.
2. Tier 2 violations are the less serious (other MCL violations, bacterial monitoring/testing errors). These violations require mass public notification within 30 days and must run for at least seven days. If the violation continues, the notification shall be repeated every 3 months.
3. Tier 3 violations are the least serious (other monitoring violations, testing procedure violations). These violations require mass public notification within one year and must run for at least seven days. If the violation continues, the notification shall be repeated annually. A detailed list of items to be included in public notifications is provided in the final rule.

There are new requirements, similar to the Consumer Confidence Report, such as foreign language translations, revised health effects text, submittal of certification to DDW within 10 days of public notification, and notification retention for up to three years.

California Secondary Drinking Water Standards

These Standards were finalized and effective in September 2006. They apply to all PWSs. DDW revised several secondary drinking water standards and clarified monitoring and compliance requirements. Corrosivity was removed from the list of secondary MCLs and pH was added.

Systems may obtain a waiver for treatment (up to nine years) to meet the secondary MCLs, and the process to obtain that waiver was clarified and detailed. Only sources with levels less than three times the MCLs may apply and must include:

- System complaint log
- Engineering report on treatment feasibility
- Results of customer survey
- Report of public meeting

The rule also clarifies that a source exceeding a secondary MCL may be used for standby or to meet peak demands if the use of the source is metered, it is only used less than five consecutive days or maximum 15 days per year, a PWS provides public notice prior to use if feasible, the use of the source is disclosed in the CCR, and the system is flushed to minimize the impact of the source.

California Perchlorate Regulation

DDW developed a primary MCL for perchlorate in drinking water in July 2007. DDW set the MCL for perchlorate at 6 ug/L, based on the public health goal (PHG) for perchlorate at that time of 6 ug/L, set by the Office of Environmental Health Hazard Assessment (OEHHA) in March 2004. The regulation requires all sources to be monitored for perchlorate two times in one year, once during the vulnerable period (May through September) and once five to seven months earlier or later. Historic data collected after January 1, 2001 was allowed to be grandfathered if it met all the sampling and quality assurance and quality control requirements of the regulation.

OEHHA revised the PHG down to 1 µg/L in February 2015 (discussed further below in the Other Drinking Water Thresholds section). The revision to the PHG will require DDW to consider revision of the current MCL, likely in 2016.

Contaminant Candidate List 2 (CCL2)

The 1996 Safe Drinking Water Act Amendments provided a list of chemical and microbial contaminants for possible future regulation. Every five years the USEPA is required to update the list, select at least five constituents for evaluation, and determine whether to regulate. The regulations will be determined based on risk assessment and cost-benefit considerations and on minimizing overall risk.

The USEPA selected constituents to evaluate as part of the first listing in 1998 and determined in 2003 not to regulate any of those selected. The USEPA opted to use the remaining constituents from the first listing as the second list for evaluation. Beginning in 2006, from this list of 51 constituents, 42 chemical and 9 microbial, the USEPA was to select at least five to determine whether to regulate. Eleven constituents were

selected for determination, several of which were already regulated in California. USEPA published a Final Regulatory Determination in July 2008 and determined not to regulate any of the eleven constituents due to their lack of presence at levels of public health concern in public water systems. USEPA did determine that updated Health Advisories were warranted for seven of the constituents; including both dacthal acid degradates, as shown on **Table 8**.

If a contaminant is determined to need regulation, the standard shall be promulgated within 18 months of the determination. The regulations are determined based on risk assessment and cost-benefit considerations and on minimizing overall risk. Regulations must be based on best available, peer-reviewed science and data from best available methods. If regulated, the standard will take effect three years later. For each new regulation, the USEPA is required to identify affordable technologies that will achieve compliance for small systems.

As part of the Regulatory Determination, USEPA also requested more information on perchlorate and MTBE in order to make those regulatory determinations. In February 2011 the USEPA determined that perchlorate does warrant regulation in drinking water and this is discussed further in the Anticipated Future Regulations section below. A revised risk assessment for MTBE was expected in 2011 however it has not yet been completed. A regulatory determination will be made after that is complete.

Table 8
Contaminant Candidate List 2

Constituent	USEPA Regulate?	DDW Regulate?	Updated Health Advisory?
Boron	No	NL	Yes
Dacthal mono and di-acid degradates	No	No	Yes
1,1-dichloro-2,2-bis(p-chlorophenyl) ethylene (DDE)	No	No	No
1,3-dichloropropene	No	MCL	Yes
2,4-dinitrotoluene	No	No	Yes
2,6-dinitrotoluene	No	No	Yes
s-ethyl propylthiocarbamate (EPTC)	No	No	No
Fonofos	No	No	No
Terbacil	No	No	No
1,1,2,2-tetrachloroethane	No	MCL	Yes

California Waterworks Standard

This was finalized by DDW in February 2008 and effective on March 9, 2008. It applies to all PWSs. The previous requirements were modified substantially in format, and somewhat in content. The definitions were expanded and detailed. Permit requirements for new sources and systems, as well as amendments, were organized and detailed. This also included a list of actions that require a permit amendment. There is now a requirement for a source capacity planning study for any anticipated water system expansion. The study shall present information on expected growth, water demands, and water supplies for a ten-year projection in a report to DDW. An Urban Water Management Plan can also meet these requirements.

Significant detail has been added for new well siting, construction and permit application. All technical sections of the Standards, related to design, installation, and operation, were updated, and many were expanded or had detail added.

The additives section was expanded to include indirect additives. Indirect additives, including chemical, material, lubricant, or product in the production, treatment or distribution of drinking water that will result in its contact with the drinking water including process media (carbon, sand), protective materials (coatings, linings, liners), joining and sealing materials (solvent cements, welding materials, gaskets, lubricating oils), pipes and related products (pipes, tanks, fittings), and mechanical devices used in treatment/transmission/distribution systems (valves, chlorinators, separation membranes), must be tested and certified as meeting the specifications of American National Standard Institute/NSF International (ANSI/NSF) 61.

If a water system is determined by DDW to have a deficiency in operations, the water system may be required to develop and submit a Water System Operations and Maintenance Plan. Detailed requirements for the plan are provided.

Endocrine Disrupters Screening Program

This is a monitoring program through the USEPA Office of Science that was finalized in April 2009. This program only applies to pesticide manufacturers, importers, and potentially users. The USEPA developed criteria for screening endocrine disrupters to identify priority chemicals. USEPA will implement the workplan by using assays in a two-tiered screening and testing process (Endocrine Disrupters Screening Program):

- Through Tier 1 screening, USEPA hopes to identify chemicals that have the potential to interact with the endocrine system. (see June 2015 modification below)
- Through Tier 2 testing, USEPA will determine the endocrine-related effects caused by each chemical and obtain information about effects at various doses.

USEPA will use this two-tiered approach to gather information needed to identify endocrine-active substances and take appropriate action. The initial list of 67 chemicals considered for Tier 1 screening is primarily pesticides – both active ingredients and inerts. In December 2007, USEPA issued draft procedures for the initial screening. For active ingredients, test orders will be sent to technical registrants and for inert ingredients, test orders will be sent to manufacturers, importers, and potentially users of chemicals on the list. Some of these constituents are already regulated in drinking water and some are on the CCL3/CCL4 (see below).

A second list of chemicals for Tier 1 screening was published in November 2010. The list of 134 chemicals includes pesticides, two perfluorocarbon compounds (PFCs), and three pharmaceuticals (erythromycin, nitroglycerin, and quinoline). This list also contains other chemicals, such as those used for industrial manufacturing processes, plasticizers, or in the production of pharmaceutical and personal care products (PPCPs).

The USEPA received information requests for Tier 1 between October 2011 and February 2012. In May 2014, the USEPA removed hydrazine and hydrochlorofluorocarbon from the list of chemicals for screening. They are currently reviewing this information to identify the Tier 2 testing requirements. Pesticides have been prioritized based on existing information and their review will be coordinated with the pesticide registration review program to reduce workload. A Comprehensive Management Plan was developed in 2012 and updated in February 2014. It is anticipated that the screening and testing will be completed by 2021.

In June 2015, USEPA proposed to modify the screening process to include the use of a high throughput assay (robot) and a computational model to identify a chemical's ability to interact with the endocrine system. This would replace three of the 11 current assays in the Tier 1 battery (related to estrogen receptors). The USEPA is hoping to replace the other eight assays in the future. This alternative method will accelerate the pace of screening, reduce costs, and reduce animal testing.

Contaminant Candidate List 3 (CCL3)

This is the third list developed by USEPA, as described previously under CCL2, to determine whether additional constituents need to be regulated in drinking water. The process used to draft this list was different than that implemented to develop the first and second CCLs. This process involved development of a "universe" of potential chemicals and then screening that list down based on health effects and occurrence in drinking water supplies.

The final list for the CCL3 was published in September 2009 and focuses on chemicals that are toxic and have potential to be present in drinking water supplies. This includes 116 constituents, 104 chemicals and 12 microbiological contaminants. USEPA is

required to select at least five constituents from the list to make regulatory determinations for. In June 2011, the USEPA identified a short list of 32 constituents for the CCL3 that were assessed for determinations and in October 2014 announced preliminary regulatory determination for five constituents. USEPA determined to regulate strontium and not to regulate; dimethoate, 1,3-dinitrobenzene, terbufos, and terbufos sulfone. This regulatory determination is not yet final, but is expected in 2016.

Six-Year Review

In March 2010, the USEPA published its Six-Year Review of the National Primary Drinking Water Regulations. This is an assessment of the existing 71 regulations to determine if any of the current standards are in need of a detailed analysis for possible regulatory revision. The USEPA determined that 67 of the 71 existing standards are acceptable as they stand. Four constituents; acrylamide, epichlorohydrin, trichloroethylene (TCE), and tetrachloroethylene (PCE), are all candidates for possible regulatory revision. This will initiate a process for detailed analyses in four categories to determine if the current standards should be revised. The analyses include:

- Health effects assessment
- Analytical and treatability feasibility assessment
- Occurrence assessment
- Cost and benefit assessment

In conjunction with the Six-Year Review, the USEPA worked with the drinking water community to solicit input on the key groups of water quality constituents that may be appropriate for regulation. Nine groups of constituents were identified:

- Ready for regulatory consideration – carcinogenic volatile organic compounds (VOCs), nitrosamines, and DBPs from chlorination
- Future consideration with data gaps - perfluoronated compounds, organophosphates, and carbamates
- Long-term consideration with significant gaps and other issues – triazines, chloroacetanilides, cyanotoxins

In February 2011, the USEPA announced that it will move forward with development of regulatory standards for a group of carcinogenic VOCs (discussed later in the Anticipated Future Regulations section). The USEPA also announced that the second group of contaminants to be addressed will be nitrosamine DBPs, although no schedule has been proposed yet.

There are health assessments in progress for acrylamide, TCE, and PCE. Once all these analyses are completed then a regulatory revision determination will be made for each constituent. TCE and PCE will be included in the carcinogenic VOC Regulation. This process will likely take quite a few years to complete. The next Six-Year Review

will be published as a draft by December 2016 and final by March 2017. It will include a review of the LT2ESWTR (potentially evaluating; binning, use of surrogates, and effectiveness of mitigation tools), Stage 2 D/DBP Rule (including chlorate and nitrosamines), chromium (including hexavalent), and other newer regulations.

Unregulated Contaminant Monitoring Rule 3

The goal of the Unregulated Contaminant Monitoring Program is to generate national occurrence data for CCL contaminants (and other selected contaminants) that can be used to make future regulatory determinations under the Safe Drinking Water Act. The third Unregulated Contaminant Monitoring Rule (UCMR3) was outlined in April 2010 and formally proposed in March 2011. The final rule was published in April 2012.

Sampling for the UCMR 3 occurs from 2013 through 2015. The monitoring includes 30 contaminants (28 chemicals and 2 viruses) under three lists. Nineteen of the target contaminants being considered are from the CCL3 that was finalized in September 2009. The eleven chemicals included in UCMR3 that are not part of CCL3 are chromium, chromium 6, testosterone, 4-androstene-3,17-dione, chlorodifluoromethane, bromodichloromethane, noroviruses, and four perfluorinated chemicals; perfluorobutane sulfonic acid (PFBS), perfluoroheptanoic acid (PFHpA), perfluorohexane sulfonic acid (PFHxS), and perfluorononanoic acid (PFNA).

- Assessment Monitoring (List 1 Contaminants) applies to all PWSs serving more than 10,000 people and 800 representative PWSs serving 10,000 or fewer people. These constituents will be monitored in the Entry Point to the Distribution System (EPDS), and the six metals and chlorate will also be monitored at the maximum detention time in the distribution system.

    - Method 522 (GC/MS) for 1,4-dioxane;
    - Method 524.3 (GC/MS) for seven VOCs: 1,1-dichloroethane, 1,2,3-trichloropropane, 1,3-butadiene, bromochloromethane, chlorodifluoromethane, chloromethane, and methyl bromide;
    - Method 200.8 (ICP/MS) for five metals: cobalt, molybdenum, strontium, chromium, and vanadium;
    - Method 218.7 (IC/UV) for chromium 6;
    - Method 300.1 (IC) for chlorate; and
    - Method 537 Rev1.1 for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), PFNA, PFHxS, PFHpA, and PFBS.

- Screening Survey (List 2 Contaminants) applies to all PWSs serving more than 100,000 people, 320 representative PWSs serving 10,001 to100,000 people, and 480 representative PWSs serving 10,000 or fewer people. These constituents will be monitored at the EPDS.

    - Method 539 (LC/MS/MS) for seven hormones: 17-alpha-ethynylestradiol, 17-beta-estradiol, equilin, estriol, estrone, testosterone, and 4-androstene-3,17-dione.

- Pre-Screen Testing (List 3 Contaminants) applies to USEPA-selected 800 representative PWSs serving 1,000 or fewer people that do not disinfect. These PWSs with wells that are located in areas of karst or fractured bedrock, will participate in monitoring for two List 3 viruses during a 12-month period from January 2013 through December 2015. These constituents will be monitored at the EPDS.

    - Method 1615 for viruses; enteroviruses and noroviruses; and
    - Bacterial Indicators; total coliforms, *E. coli*, bacteriophage, *Enterococci*, and aerobic spores.

Changes from the UCMR2 include adding PWSs that rely on 100 percent purchased water (consecutive systems), clarifying the terms of representative groundwater sampling, and updating reporting elements.

Revised Total Coliform Rule

The USEPA published revisions to the TCR (RTCR) in February 2013. There were also some minor revisions published in February 2014. These revisions apply to all PWSs. There were numerous changes to the original TCR, but the key topics included:

- Removal of MCLG and MCL of zero for total coliform,
- Establish MCLG and MCL of zero of *E. coli,*
- Total coliform will serve as an indicator or potential contamination into the distribution system, with detects requiring assessments to determine if any sanitary defects exist and correct them (find and fix strategy),
- *E. coli* MCL violation will result in a requirement to conduct an assessment and correct any sanitary defects found,
- Minor revisions of routine and repeat monitoring requirements to match newer Groundwater Rule requirements (related to water quality and system performance), and
- Opportunity for increased flexibility in repeat monitoring for total coliform positive to better increase options for verifying and identifying extent of fecal contamination.

Provided below are some additional details of the regulation related to the MCLs, monitoring, reporting, and public notification.

Coliform Treatment Technique

Under the RTCR there will no longer be a monthly MCL violation for multiple total coliform detections. This will become effective on April 1, 2016. Instead, EPA replaced the MCLG and MCL for total coliforms with a treatment technique for coliforms that requires assessment and corrective action. A PWS that exceeds a specified frequency of total coliform occurrence must conduct an assessment to determine if any sanitary defects exist (a sanitary defect is defined by the RTCR as a "defect that could provide a pathway of entry for microbial contamination into the distribution system or that is indicative of a failure or imminent failure of a barrier that is already in place"); if any are found, the system must correct them. In addition, under the treatment technique requirements, a PWS that incurs an *E. coli* MCL violation must conduct an assessment and correct any sanitary defects found.

A PWS that exceeds a specified frequency of coliform occurrence must conduct a Level 1 or Level 2 assessment to determine if any sanitary defect exists and, if found, to correct the sanitary defect. A Level 2 assessment requires a more in-depth and comprehensive review of the PWS compared to a Level 1. PWSs are required to correct all sanitary defects found through either a Level 1 or Level 2 assessment. Systems should ideally be able to correct any sanitary defects found in the assessment within 30 days and report that correction on the assessment form.

Level 1 treatment technique triggers:

- For systems taking 40 or more samples per month, the PWS exceeds 5.0 percent total coliform-positive samples for the month; or
- For systems taking fewer than 40 samples per month, the PWS has two or more total coliform-positive samples in the same month; or
- The PWS fails to take every required repeat sample after any single routine total coliform-positive sample.

Level 2 treatment technique triggers:

- The PWS has an *E. coli* MCL violation (see below for a description of what constitutes an *E. coli* MCL violation); or
- The PWS has a second Level 1 treatment technique trigger within a rolling 12-month period, unless the initial Level 1 treatment technique trigger was based on exceeding the allowable number of total coliform-positive samples, the State has determined a likely reason for the total coliform-positive samples that caused the initial Level 1 treatment technique trigger, and the State establishes that the system has fully corrected the problem; or
- For PWSs with approved reduced annual monitoring, the system has a Level 1 treatment technique trigger in two consecutive years.

At a minimum, both Level 1 and 2 assessments must include review and identification of the following elements:

- Atypical events that may affect distributed water quality or indicate that distributed water quality was impaired;
- Changes in distribution system maintenance and operation that may affect distributed water quality, including water storage;
- Source and treatment considerations that bear on distributed water quality, where appropriate;
- Existing water quality monitoring data; and
- Inadequacies in sample sites, sampling protocol, and sample processing.

Level 1 Assessment:
A Level 1 assessment must be conducted when a PWS exceeds one or more of the Level 1 treatment technique triggers specified previously. Under the rule, this self-assessment consists of a basic examination of the source water, treatment, distribution system and relevant operational practices. The PWS should look at conditions that could have occurred prior to and caused the total coliform-positive sample. Example conditions include treatment process interruptions, loss of pressure, maintenance and operation activities, recent operational changes, etc. In addition, the PWS should check the conditions of the following elements: sample sites, distribution system, storage tanks, source water, etc. These assessments can be completed by the water system.

Level 2 Assessment:
A Level 2 assessment must be conducted when a PWS exceeds one or more of the Level 2 treatment technique triggers specified previously. It is a more comprehensive examination of the system and its monitoring and operational practices than the Level 1 assessment. The level of effort and resources committed to undertaking a Level 2 assessment is commensurate with the more comprehensive investigation and review of available information, and engages additional parties and expertise relative to the Level 1 assessment**.** Level 2 assessments must be conducted by a party approved by the State: the State itself, a third party, or the PWS where the system has staff or management with the required certification or qualifications specified by the State. If the PWS or a third party conducts the Level 2 assessment, the PWS or third party must follow the State requirements for conducting the Level 2 assessment. The PWS must also comply with any expedited actions or additional actions required by the State in the case of an *E. coli* MCL violation.

USEPA has published a draft Guidance Manual for completion of the Level 1 and 2 Assessments. That document is available on the USEPA website, but it will be replaced with a final version of the Guidance Manual in 2013. The Assessments must include a list of sanitary defects/significant deficiencies or a statement of none found, a description of the corrective actions taken, and a list of additional corrective actions proposed.

Coliform Treatment Technique Violation

A system incurs a coliform treatment technique violation when any of the following occurs:

- A system fails to conduct a required assessment within 30 days of notification of the system exceeding the trigger.
- A system fails to correct any sanitary defect found through either a Level 1 or 2 assessment within 30 days or in accordance with State-derived schedule.
- A seasonal system fails to complete a State-approved start-up procedure prior to serving water to the public.

These violations would result in a Tier 2 Public Notification.

E. coli MCL

Systems are required to meet an MCL for *E. coli*, as demonstrated by required monitoring. EPA is also establishing an MCLG of zero. These are both effective on April 1, 2016. The MCL for *E. coli* is based on the monitoring results for total coliforms and *E. coli*.

E. coli MCL Violation

A system incurs an *E. coli* MCL violation if any of the following occurs:

- A routine sample is total coliform-positive and one of its associated repeat samples is *E. coli*-positive.
- A routine sample is *E. coli*-positive and one of its associated repeat samples is total coliform-positive.
- A system fails to take all required repeat samples following a routine sample that is positive for *E. coli*.
- A system fails to test for *E. coli* when any repeat sample tests positive for total coliforms.

These violations result in a Tier 1 Public Notification. Although not explicitly stated, as a logical consequence of the second condition, a system also violates the MCL when an *E. coli*-positive routine sample is followed by an *E. coli*-positive repeat sample because *E. coli* bacteria are a subset of total coliforms.

Monitoring and Reporting Requirements

The RTCR specifies the frequency and timing of the microbial testing by water systems based on population served, system type, and source water type. The RTCR links monitoring frequency to compliance monitoring results and system performance. It provides criteria that well-operated small systems must meet to qualify for and stay on reduced monitoring. It requires increased monitoring for high-risk small systems with

unacceptable compliance history. It also requires some new monitoring requirements for seasonal systems.

Monitoring Violation

A system incurs a monitoring violation when any of the following occurs:

- A system fails to take every required routine or additional routine sample in a compliance period.
- A system fails to test for *E. coli* following a routine sample that is total coliform-positive.

Reporting Violation

A system incurs a reporting violation when any of the following occurs:

- A system fails to timely submit a monitoring report or a correctly completed assessment form after it properly monitors or conducts an assessment by the required deadlines. The PWS is responsible for reporting this information to the State regardless of any arrangement with a laboratory.
- A system fails to timely notify the State following an *E. coli*-positive sample.
- A seasonal system fails to submit certification of completion of State-approved start-up procedure.

Public Notification Requirements

The rule continues to require public notification (PN) when there is a potential health threat as indicated by monitoring results, and when the system fails to identify and fix problems as required. The RTCR eliminates PN requirements based only on the presence of total coliforms. Instead, the RTCR requires PN when an *E. coli* MCL violation occurs, indicating a potential health threat, or when a PWS fails to conduct the required assessment and corrective action.

EPA is requiring a Tier 1 PN for an *E. coli* MCL violation, Tier 2 PN for a treatment technique violation for failure to conduct assessments or corrective actions, and a Tier 3 PN for a monitoring violation or a reporting violation.

DDW has two years to adopt a similar version of this regulation. Compliance with this regulation will begin on April 1, 2016.

The Consumer Confidence Reports will be modified to remove the reporting requirements for total coliform, modify reporting requirements for *E. coli*, and modify health effects language.

California Hexavalent Chromium Regulation

DDW published a Final Hexavalent Chromium Regulation in May 2014 with an MCL of 10 µg/L; effective July 1, 2014. This was based on the OEHHA PHG of 0.02 µg/L, which was finalized in July 2011. Initial and repeat monitoring requirements are the same as other inorganic contaminants. Chromium (VI), or hexavalent chromium, has primarily been found in groundwater supplies in California. Chromium (VI) causes acute gastritis when ingested in high doses and is an established human lung carcinogen when inhaled.

In a parallel effort, the USEPA recommends that water systems conduct enhanced monitoring for hexavalent chromium. For surface waters this includes quarterly sampling of the raw water, the entry point to the distribution system, and a maximum residence time location in the distribution system.

OTHER DRINKING WATER THRESHOLDS

In addition to regulatory standards, there are several other drinking water thresholds that should be discussed. This includes USEPA Health Advisories, USEPA Human Health Benchmarks for Pesticides, California Notification Levels and Archived Advisory Levels, and OEHHA Public Health Goals.

USEPA Health Advisories

The USEPA Office of Water Office of Science and Technology has developed Health Advisories for other constituents in drinking water that are not currently regulated. These are non-enforceable levels which can provide guidance to water systems on the potential risk to public health. USEPA has conveniently compiled Federal drinking water standards, including Health Advisories, into a reference handbook (USEPA 2012). The reference handbook includes acute and chronic risk for cancer and non-cancer health effects. (http://water.epa.gov/action/advisories/drinking/upload/dwstandards2012.pdf) In 2015 USEPA added Health Advisories for two cyanotoxins, as described below.

Cyanotoxins

USEPA published 10-day Health Advisories (HA) for microcystin and cylindrospermopsin in June 2015. The HAs for children less than six years old are microcystin at 0.3 ug/L and cylindrospermopsin at 0.7 ug/L. The HAs for older children and adults are microcystin at 1.6 ug/L and cylindrospermopsin at 3.0 ug/L.

USEPA also released “Health Effects Support Documents” for microcystin, cylindrospermopsin and a third cyanotoxin, anatoxin-a. At this time, USEPA has determined that there is not sufficient data to develop a Health Advisory for anatoxin-a. In addition, USEPA released a document “Recommendations for Public Water

Systems to Manage Cyanotoxins in Drinking Water." All three of these cyanotoxins are listed on the CCL3 and Draft CCL4, for consideration of potential future regulation.

USEPA Human Health Benchmarks for Pesticides

For those pesticides without drinking water standards or Health Advisories, USEPA Office of Pesticide Programs has developed Human Health Benchmarks for use by the states and water systems in water quality management. The USEPA developed human health benchmarks for 363 pesticides to enable others to better determine whether the detection of a pesticide in drinking water or source waters for drinking water may indicate a potential health risk and to help them prioritize monitoring efforts. These values, which are periodically updated, are available on the Internet (http://iaspub.epa.gov/apex/pesticides/f?p=HHBP:home:3921856313509). The benchmarks include acute and chronic non-cancer endpoints, and USEPA has also started development of cancer risk benchmarks.

California Notification Levels and Archived Advisory Levels

DDW has established health-based notification levels for contaminants that have no MCLs but, are thought to pose a risk to drinking water supplies. Notification Levels (NLs) and Archived Advisory Levels (AALs) have been established in response to detection in drinking water supplies or in anticipation of possible contamination. Chemicals for which NLs or AALs are established may eventually be regulated by MCLs. To date, 39 of the 93 chemicals for which NLs or AALs have been established, are now regulated by MCLs. Of the remaining 54 chemicals, 30 currently have NLs, as shown in **Table 9**, and 24 are chemicals with AALs, as shown in **Table 10**. NLs and AALs are calculated using standard risk assessment procedures. If a chemical is present in a water supply at a concentration that exceeds the NL or AAL, the water system must inform its customers. If a chemical is present at the response level concentration, DDW recommends taking the source out of service. If the drinking water system does not take the source out of service, more extensive public notification is required.

California Public Health Goals

The Office of Environmental Health Hazard Assessment (OEHHA) is responsible for development of risk assessments for drinking water contaminants and publication of Public Health Goals (PHGs). These values represent the level below which there is no expected or known risk to human health for non-carcinogens. For cancer-causing chemicals, the PHG is set at the one-in-a-million risk level. These are reviewed periodically and updated as appropriate. Currently, there are 91 PHGs as shown in **Attachment 2**. OEHHA must develop a PHG before DDW can set a California MCL for a contaminant for the first time, or in agreement with adoption of a federal standard.

The MCL must be as close as possible to the PHG, considering cost and feasibility of treatment.

Table 9
DDW Drinking Water Notification Levels

Chemical	Notification Level (milligrams per liter)	Response Level (milligrams per liter)
Boron	1	10
n-Butylbenzene	0.26	2.6
sec-Butylbenzene	0.26	2.6
tert-Butylbenzene	0.26	2.6
Carbon disulfide	0.16	1.6
Chlorate	0.8	8
2-Chlorotoluene	0.14	1.4
4-Chlorotoluene	0.14	1.4
Diazinon	0.0012	0.012
Dichlorodifluoromethane (Freon 12)	1	10
1,4-Dioxane	0.001	0.035
Ethylene glycol	14	140
Formaldehyde	0.1	1
HMX	0.35	3.5
Isopropylbenzene	0.77	7.7
Manganese	0.5	5
Methyl isobutyl ketone (MIBK)	0.12	1.2
Naphthalene	0.017	0.17
N-Nitrosodiethyamine (NDEA)	0.00001	0.0001
N-Nitrosodimethylamine (NDMA)	0.00001	0.0003
N-Nitrosodi-n-propylamine (NDPA)	0.00001	0.0005
Propachlor**	0.09	0.9
n-Propylbenzene	0.26	2.6
RDX	0.0003	0.03
Tertiary butyl alcohol (TBA)	0.012	1.2
1,2,3-Trichloropropane (1,2,3-TCP)	0.000005	0.0005
1,2,4-Trimethylbenzene	0.33	3.3
1,3,5-Trimethylbenzene	0.33	3.3
2,4,6-Trinitrotoluene (TNT)	0.001	0.1
Vanadium	0.05	0.5

Table 10
DDW Drinking Water Archived Advisory Levels

Chemical	Archived Advisory Level (milligrams per liter)	Response Level (milligrams per liter)
Aldicarb	0.007	0.07
Aldrin	0.000002	0.0002
Baygon	0.03	0.3
a-Benzene Hexachloride	0.000015	0.0015
b-Benzene Hexachloride	0.000025	0.0025
Captan	0.015	1.5
Carbaryl	0.7	7
Chloropicrin	0.05	0.5
Chlorpropham (CIPC)	1.2	12
1,3-Dichlorobenzene	0.6	6
Dieldrin	0.000002	0.0002
Dimethoate	0.001	0.01
2,4-Dimethylphenol	0.1	1
Diphenamide	0.2	2
Ethion	0.004	0.04
Malathion	0.16	1.6
N-Methyl dithiocarbamate (Metam sodium)	0.00019	0.019
Methylisothiocyanate	0.19	1.9
Methyl Parathion	0.002	0.02
Parathion	0.04	0.4
Pentachloronitrobenzene	0.02	0.2
Phenol	4.2	42
2,3,5,6-Tetrachloroterephthalate	3.5	35
Trithion	0.007	0.07

On February 27, 2015 OEHHA updated the PHG for perchlorate by lowering it from 6 ug/L to 1 ug/L. This was reduced to reflect current science on health impacts to infants. There were five updated PHGs in April 2014, including; a revised chlorobenzene PHG (from 200 ug/L to 70 ug/L), a revised endothall PHG (from 580 ug/L to 94 ug/L), a revised hexachlorocyclopentadiene PHG (from 50 ug/L to 2 ug/L), a revised silvex PHG (from 25 ug/L to 3 ug/L), and a revised trichlorofluoromethane PHG (from 700 ug/L to 1,300 ug/L). Whenever a PHG is updated, DDW must re-evaluate the current MCL. The perchlorate re-evaluation will likely occur in 2016 and may lead to a revised MCL.

There is currently a proposal for a new PHG for TTHMs at 0.8 ug/L. OEHHA announced in September 2012 that they have initiated reviews to the PHGs for 1,1-dichloroethane and trichloroethylene and in October 2014 they announced reviews to the PHGs for carbofuran, diquat, endrin, picloram, radium-226, radium-228, strontium-90, thiobencarb, toxaphene, and tritium.

ANTICIPATED FUTURE REGULATIONS

The USEPA and DDW are developing new drinking water regulations. The major anticipated future regulations that are projected to impact surface water supplies within the next five years are shown in **Table 11** and those regulations are discussed below. It should be noted that there are other constituents of public interest on the drinking water horizon, such as cyanotoxins and pharmaceutical compounds. However, the human health impacts of these constituents are not well understood yet and there is no specific regulatory path for them at this time so they are not specifically addressed in this section (they are indirectly discussed in the Endocrine Disrupters Screening Program and the Contaminant Candidate List subsections).

Table 11
Summary of Anticipated Major Federal and State Drinking Water Quality Regulations for Surface Water Supplies

Regulation	Year Projected	Number of Contaminants	Targeted Contaminants
USEPA Revised Fluoride Regulation	2015/2016	1	Fluoride
USEPA Contaminant Candidate List 4	2015/2016	Unknown	Chemical and Microbial
USEPA Unregulated Contaminant Monitoring Rule 4	2016	20 – 30	Chemical and Microbial
USEPA Long Term Revisions to the Lead and Copper Rule	2016	2	Lead and Copper
USEPA Perchlorate Regulation	2016/2017	1	Perchlorate
USEPA Hexavalent Chromium Regulation	2016/2017	1	Hexavalent Chromium
USEPA cVOCs Regulation	2018	Up to 16	Carcinogenic VOCs
CA Cross Connection Control Program	Unknown	None	None

[1] Draft/Final Rule Dates

USEPA Revised Fluoride Regulation

The USEPA announced in January 2011 that they would review the primary and secondary standards for fluoride based on the new health and exposure assessments. The National Research Council recommended the review based on newly available

data for orally ingested fluoride. Data show that children may have overexposure to fluoride, which could result in a decrease in the drinking water standards and the optimum dosing for fluoridation systems.

The US Department of Health and Human Services announced in April 2015 a recommended optimal level of fluoride in drinking water at 0.7 mg/L, based on the health review. In response, the DDW updated their optimal level of fluoride in drinking water to allow systems to implement the optimal level, with a control range of 0.6 to 1.2 mg/L. USEPA will decide whether revisions to the drinking water standards are appropriate.

USEPA Contaminant Candidate List 4

In May 2012 the USEPA put out a request for nominations to the CCL4. The USEPA published a draft list of the fourth CCL in January 2015. See **Attachment 3** for a list of constituents on the Draft CCL4. This list includes 112 constituents; 100 chemicals and 12 microbiological contaminants. The CCL4 is largely comprised of the same constituents on the CCL3, except the following; manganese and nonylphenol were added and perchlorate, strontium, dimethoate, 1,3-dinitrobenzene, terbufos, and terbufos sulfone were removed. The list is expected to be finalized in 2015 or 2016 and then USEPA will have five years to review the constituents and make regulatory determinations for at least five constituents on the list.

USEPA Unregulated Monitoring Contaminant Rule 4

The goal of the Unregulated Contaminant Monitoring Program is to generate national occurrence data for CCL contaminants (and other selected contaminants) that can be used to make future regulatory determinations under the Safe Drinking Water Act. There have been three rounds of UCMR monitoring and a fourth round is impending. USEPA is currently working with stakeholders to develop the next program, including; analyte selection, analytical methods, sampling design, reporting limits, and other revisions to the current program. The constituent lists will be based on the CCL4 and may include constituents such as cyanotoxins, now that analytical methods are improving. A final UCMR4 is expected in 2016 with monitoring conducted between 2018 and 2021.

USEPA Long Term Revisions to the Lead and Copper Rule

The goal for the Long-Term Revisions to the Lead and Copper Rule is to improve public health protection by making substantive changes based on topics that were identified in the 2004 National Review, and to streamline the rule requirements. Example categories of potential changes to the rule include:

- Sample site collection criteria and sampling procedures for lead and copper tap monitoring,
- Corrosion control treatment and water quality parameter monitoring requirements,
- Lead service line replacement requirements,
- Schools and day care facilities,
- Consecutive system requirements, and
- Potentially outdated requirements, rule relevancy and simplicity for systems.

USEPA's National Drinking Water Advisory Council Lead and Copper Working Group has been meeting regularly in 2014 and 2015 to prepare a report on recommendations for proposed changes to the Lead and Copper Rule. This report is expected to be finalized in 2015 and will be used by the USEPA to initiate Long-Term Revisions to the Lead and Copper Rule.

USEPA Perchlorate Regulation

The USEPA is developing a regulation for perchlorate. A proposed rule was expected in February 2013, but has now been delayed until 2016 with a final rule to follow. Any standard developed by USEPA would need to be adopted by the DDW within two years, and may result in changes to the current California primary MCL for perchlorate. This effort would likely be coordinated with the DDW review triggered by the revision of the PHG by OEHHA.

USEPA Hexavalent Chromium Regulation

USEPA began a review of the health effects of hexavalent chromium following the 2008 release of toxicity studies by the Department of Health and Human Service's National Toxicology Program. In September, 2010, USEPA released a draft of the scientific human health assessment for public comment and external peer review. Currently, there is no schedule identified for the final hexavalent chromium human health assessment. USEPA will review the final assessment once it is available and consider all other relevant information to determine if a new drinking water regulation for hexavalent chromium, or a revision to the current total chromium standard, is warranted. Any revisions would need to be adopted by DDW and may result in changes to the current California primary MCL.

USEPA recommends that water systems voluntarily implement enhanced monitoring for hexavalent chromium (as discussed previously). Also, the UCMR 3 required many public water systems to monitor for hexavalent chromium.

USEPA Carcinogenic VOC Regulation

As part of the new Drinking Water Strategy USEPA announced that it will move forward with development of regulatory standards for a group of carcinogenic VOCs. A draft rule was projected for early 2015, with a final in 2016, but it has been delayed possibly until 2018. These are largely industrial contaminants and include 16 VOCs, eight of which are already regulated so this Rule may result in reduced MCLs. The regulated list includes; TCE, PCE, benzene, carbon tetrachloride, 1,2-dichloroethane, 1,2-dichloropropane, dichloro-methane, and vinyl chloride. The unregulated list includes; aniline, benzyl chloride, 1,3-butadiene, 1,1-dichloroethane, nitrobenzene, methyl oxirane, 1,2,3-trichloropropane, and urethane.

California Cross Connection Control Program

This will apply to all PWSs. The DDW published a draft version of the Proposed Cross Connection Control Rule in December 2005. The existing requirements have been modified substantially in format, and somewhat in content.

The Rule will now include a section on dual plumbed recycled water systems with design and operations criteria. The Rule has been reorganized into seven sections; definitions, hazard assessment, backflow protection selection criteria and standards, backflow protection installation/ testing/ repairs, additional cross connection control requirements for CWSs, and recordkeeping and public notification.

Key components include a new table with hazard criteria and appropriate backflow protection, and more details on all sections.

ATTACHMENT 1
Summary of Regulated Contaminants

Summary of Contaminants
Currently Regulated by USEPA and DDW

Classification	Contaminant	Regulation	MCL (mg/L)
Inorganics (Section 64432)			
	Aluminum	DDW	1
	Antimony	Phase V	0.006
	Arsenic	Arsenic Rule	0.010
	Barium	DDW	1
	Beryllium	Phase V	0.004
	Cadmium	Phase II	0.005
	Chromium	DDW	0.05
	Copper	LCR	1.3 [1,2]
	Cyanide	Phase V	0.15
	Fluoride	DDW	2
	Hexavalent Chromium	DDW	0.010
	Lead	LCR	0.015 [1,2]
	Mercury	Phase II	0.002
	Nickel	Phase V	0.1 [3]
	Perchlorate	Perchlorate	0.006
	Selenium	Phase II	0.05
	Thalium	Phase V	0.002
Nitrate, Nitrite (Section 64432.1)			
	Nitrate	Phase II	10 as N (45 as NO3)
	Nitrite	Phase II	1 as N
	Nitrate + Nitrite	Phase II	10 (sum as N)
Asbestos (Section 64432.2)			
	Asbestos	Phase II	7 MFL (>10um)
Secondary Standards (Section 64449, Table 64449-A)			
	Aluminum	DDW	0.2
	Color	DDW	15 Units
	Copper	DDW	1
	Foaming Agents	DDW	0.5
	Iron	DDW	0.3
	Manganese	DDW	0.05
	Methyl-tert-butyl-ether (MTBE)	DDW	0.005
	Odor-Threshold	DDW	3 Units
	Silver	DDW	0.1
	Thiobencarb	DDW	0.001
	Turbidity	DDW	5 NTU
	Zinc	DDW	5
Secondary Standards (Section 64449, Table 64449-B)			
	Total Dissolved Solids	DDW	500/1,000/1,500 [4]
	Specific Conductance	DDW	900/1,600/2,200 [4]
	Chloride	DDW	250/500/600 [4]
	Sulfate	DDW	250/500/600 [4]
General Mineral (Section 64449 (c) (2))			
	Bicarbonate	DDW	MO
	Carbonate	DDW	MO
	Hydroxide	DDW	MO
	Alkalinity	DDW	MO
	pH	DDW	MO
	Calcium	DDW	MO
	Magnesium	DDW	MO
	Sodium	DDW	MO
	Hardness	DDW	MO
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))			
	Benzene	DDW	0.001
	Carbon Tetrachloride	DDW	0.0005
	o-Dichlorobenzene	Phase II	0.6
	p-Dichlorobenzene	DDW	0.005
	1,1-Dichloroethane	DDW	0.005
	1,2-Dichloroethane	DDW	0.0005
	1,1-Dichloroethylene	DDW	0.006

Summary of Contaminants
Currently Regulated by USEPA and DDW

Classification	Contaminant	Regulation	MCL (mg/L)
	cis-1,2-Dichloroethylene	DDW	0.006
	trans-1,2-Dichloroethylene	DDW	0.01
	Dichloromethane (Methylene chloride)	Phase V	0.005
	1,2-Dichloropropane	Phase II	0.005
	1,3-Dichloropropene	DDW	0.0005
	Ethylbenzene	DDW	0.3
	Methyl-tert-butyl ether (MTBE)	DDW	0.013
	Monochlorobenzene	DDW	0.07
	Styrene	Phase II	0.1
	1,1,2,2-Tetrachloroethane	DDW	0.001
	Tetrachloroethylene	Phase II	0.005
	Toluene	DDW	0.15
	1,2,4-Trichlorobenzene	DDW	0.005
	1,1,1-Trichloroethane	Phase I	0.2
	1,1,2-Trichloroethane	Phase V	0.005
	Trichloroethylene	Phase I	0.005
	Trichlorofluoromethane	DDW	0.15
	1,1,2-Trichloro-1,2,2-Triflouroethane	DDW	1.2
	Vinyl Chloride	DDW	0.0005
	Xylenes (total)	DDW	1.75
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))			
	Acrylamide	Phase II	TT (PAP)
	Alachlor	Phase II	0.002
	Atrazine	DDW	0.001
	Bentazon	DDW	0.018
	Benzo(a)pyrene	Phase V	0.0002
	Carbofuran	DDW	0.018
	Chlordane	DDW	0.0001
	2,4,-D	Phase II	0.07
	Dalapon	Phase V	0.2
	Dibromochloropropane	Phase II	0.0002
	Di (2-ethylhexyl) Adipate	Phase V	0.4
	Di (2-ethylhexyl) Phthalate	DDW	0.004
	Dinoseb	Phase V	0.007
	Diquat	Phase V	0.02
	Endothall	Phase V	0.1
	Endrin	Phase V	0.002
	Epichlorohydrin	Phase II	TT (PAP)
	Ethylene Dibromide	Phase II	0.00005
	Glyphosate	Phase V	0.7
	Heptachlor	DDW	0.00001
	Heptachlor Epoxide	DDW	0.00001
	Hexachlorobenzene	Phase V	0.001
	Hexachlorocyclopentadiene	Phase V	0.05
	Lindane	Phase II	0.0002
	Methoxychlor	DDW	0.03
	Molinate	DDW	0.02
	Oxamyl	DDW	0.05
	Pentachlorophenol	Phase II	0.001
	Picloram	Phase V	0.5
	PCBs	Phase II	0.0005
	Simazine	Phase V	0.004
	Thiobencarb	DDW	0.07
	Toxaphene	Phase II	0.003
	2,3,7,8-TCDD (Dioxin)	Phase V	3.00E-08
	2,4,5-TP (Silvex)	Phase II	0.05
Natural Radioactivity (Section 64441)			
	Gross Alpha Particle Activity	NPDWR	15 pCi/L
	Combined Radium 226 & 228	NPDWR	5 pCi/L
	Uranium	DDW	20 pCi/L
Man-Made Radioactivity (Section 64443)			
	Tritium	DDW	20,000 pCi/L
	Strontium-90	DDW	8 pCi/L
	Gross Beta Particle Activity	NPDWR	50 pCi/L

Summary of Contaminants
Currently Regulated by USEPA and DDW

Classification	Contaminant	Regulation	MCL (mg/L)
Disinfection By-Products			
	Total Trihalomethanes (Chloroform, Bromoform, Chlorodibromomethane, Bromodichloromethane)	Stage 1 D/DBP Rule	0.08
	Haloacetic Acids 5 (Mono, di, and tri-chloroacetic acid, mono and di-bromoacetic acid)	Stage 1 D/DBP Rule	0.06
	Chlorite	Stage 1 D/DBP Rule	1
	Bromate	Stage 1 D/DBP Rule	0.01
Disinfection By-Product Precursors			
	Total Organic Carbon	Stage 1 D/DBP Rule	TT (% Removal)
Disinfectants			
	Chlorine (as Cl2)	Stage 1 D/DBP Rule	4 [5]
	Chloramines (as Cl2)	Stage 1 D/DBP Rule	4 [5]
	Chlorine Dioxide (as ClO2)	Stage 1 D/DBP Rule	0.8 [5]
Microbial			
	Giardia Lamblia	SWTR	TT (3-log Reduction)
	Legionella	SWTR	TT
	Viruses	SWTR	TT (4-Log Reduction)
	Disinfectant Residual	SWTR	TT (detectable)
	Fecal Coliform	TCR	TT (positive sample)
	E. Coli	TCR	TT (positive sample)
	Total Coliform	TCR	TT (<5% mo. samples pos., if >40 samples per month)
	Turbidity	IESWTR	TT (<0.3 in 95% CFE samples, <1 in 100% CFE)
	Cryptosporidium	IESWTR/ LT1ESWTR/ LT2ESWTR	TT (2-log Reduction)

[1] - Action Level

[2] - Based on 90th Percentile of Tap Water Samples

[3] - CDPH MCL lower than EPA, EPA remanded in 1995

[4] - Recommended/Upper/Short Term MCLs

[5] - Maximum Residual Disinfectant Level (MRDL)

Acronyms:
USEPA - United States Environmental Protection Agency
DDW - California Division of Drinking Water
MCL - Maximum Contaminant Level
NPDWR - National Primary Drinking Water Regulation
LCR - Lead and Copper Rule
MO - Monitored Only
TT - Treatment Technology
PAP - Polymer Addition Practices
D/DBP - Disinfectants and Disinfection By-Products
SWTR - Surface Water Treatment Rule
TCR - Total Coliform Rule
IESWTR - Interim Enhanced Surface Water Treatment Rule
CFE - Combined Filter Effluent

ATTACHMENT 2
OEHHA Public Health Goals

OEHHA PHGs

Chemical	California PHG (ppb)
1,1-Dichloroethane	3
1,1-Dichloroethylene	10
1,1,1-Trichloroethane	1000
1,2-Dibromo-3-chloropropane	0.0017
1,2-Dichloroethane	0.4
1,2-Dichloroethylene, cis	100
1,2-Dichloroethylene, trans	60
1,2-Dichloropropane	0.5
1,1,2-Trichloroethane	0.3
1,1,2,2-Tetrachloroethane	0.1
1,2,3-Trichloropropane	0.0007
1,2,4-Trichlorobenzene	5
1,2-Dichlorobenzene	600
1,3-Dichloropropene (Telone II®)	0.2
1,4-Dichlorobenzene	6
2,4-Dichlorophenoxyacetic acid	20
Alachlor	4
Aluminum	600
Antimony	20
Arsenic	0.004
Asbestos	7x106 fibers/L
Atrazine	0.15
Barium	2,000
Bentazon	200
Benzene	0.15
Benzo[a]pyrene	0.007
Beryllium	1
Bromate	0.1
Cadmium	0.04
Carbofuran	1.7
Carbon Tetrachloride	0.1
Chlordane	0.03
Chlorite	50
Chlorobenzene	70
Chromium, Hexavalent	0.02
Copper	300
Cyanide	150
Dalapon	790
Dichloromethane	4
Diethylhexyl adipate	200
Diethylhexylphthalate (DEHP)	12
Dinoseb	14
Diquat	15
Endothall (updated 04/24/14)	94
Endrin	1.8
Ethylbenzene	300

OEHHA PHGs

Chemical	California PHG (ppb)
Ethylene dibromide	0.01
Fluoride	1,000
Glyphosate	900
Gross Alpha Particle Activity	N/A
Gross Beta Particle Activity	N/A
Heptachlor	0.008
Heptachlor epoxide	0.006
Hexachlorobenzene	0.03
Hexachlorocyclopentadiene (updated 04/24/14)	2
Lead	0.2
Lindane	0.032
Mercury, inorganic	1.2
Methoxychlor	0.09
Methyl tertiary butyl ether (MTBE)	13
Molinate	1
N-Nitrosodimethylamine	0.003
Nickel	12
Nitrate	10,000 as N
Nitrate and Nitrite	10,000 as N
Nitrite	1,000 as N
Oxamyl	26
Pentachlorophenol	0.3
Perchlorate (updated 02/27/15)	1
Picloram	500
Polychlorinated Biphenyls (PCBs)	0.09
Radium-226	0.05 pCi/L
Radium-228	0.019 pCi/L
Selenium	30
Silvex	3
Simazine	4
Strontium-90	0.35 pCi/L
Styrene	0.5
2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)	0.00005 parts per trillion (ppt)
Tetrachloroethylene	0.06
Thallium	0.1
Thiobencarb	70
Toluene	150
Toxaphene	0.03
Trichloroethylene	1.7
Trichlorofluoromethane (Freon 11) (updated 04/24/14)	1,300
Trichlorotrifluoroethane (Freon 113)	4,000
Tritium	400 pCi/L
Uranium	0.5
Vinyl Chloride	0.05
Xylene	1,800

ATTACHMENT 3
Contaminant Candidate List 4

CONTAMINANT CANDIDATE LIST 4

MICROBIAL CONTAMINANTS

Adenovirus
Calicivirus
Campylobacter jejuni
Enterovirus
Escherichia coli (0157)
Helicobacter pylori
Hepatitis A virus
Legionella pneumophila
Mycobacterium avium
Naegleria fowleri
Salmonella enterica
Shigella sonnei

CHEMICAL CONTAMINANTS

Common name--registry name	**CASRN**
1,1,1,2-Tetrachloroethane	630-20-6
1,1-Dichloroethane[1]	75-34-3
1,2,3-Trichloropropane[2]	96-18-4
1,3-Butadiene	106-99-0
1,4-Dioxane[2]	123-91-1
1-Butanol	71-36-3
17-alpha estradiol	57910
2-Methoxyethanol	109-86-4
2-Propen-1-ol	107-18-6
3-Hydroxycarbofuran	16655-82-6
4,4'-Methylenedianiline	101-77-9
Acephate	30560-19-1
Acetaldehyde	75-07-0
Acetamide	60-35-5
Acetochlor	34256-82-1
Acetochlor ethanesulfonic acid (ESA)	187022-11-3
Acetochlor oxanilic acid (OA)	184992-44-4
Acrolein	107-02-8
Alachlor ethanesulfonic acid (ESA)	142363-53-9
Alachlor oxanilic acid (OA)	171262-17-2
alpha-Hexachlorocyclohexane	319-84-6
Aniline	62-53-3
Bensulide	741-58-2
Benzyl chloride	100-44-7
Butylated hydroxyanisole	25013-16-5
Captan[3]	133-06-2
Chlorate	14866683
Chloromethane (Methyl chloride)	74-87-3
Clethodim	110429-62-4
Cobalt	7440-48-4
Cumene hydroperoxide	80-15-9
Cyanotoxins (3)	
Dicrotophos	141-66-2
Dimethipin	55290-64-7

Common name--registry name	CASRN
Disulfoton	298-04-4
Diuron	330-54-1
Equilenin	517099
Equilin	474862
Erythromycin	114078
Estradiol (17-beta estradiol)	50282
Estrinol	50271
Estrone	53167
Ethinyl estradiol (17-alpha ethinyl estradiol)	57636
Ethoprop	13194-48-4
Ethylene glycol[2]	107-21-1
Ethylene oxide	75-21-8
Ethylene thiourea	96-45-7
Fenamiphos	22224-92-6
Formaldehyde[2]	50-00-0
Germanium	7440-56-4
Halon 1011	74975
HCFC-22	75-45-6
Hexane	110-54-3
Hydrazine	302-01-2
Manganese	
Mestranol	72333
Methamidophos	10265-92-6
Methanol	67-56-1
Methyl bromide (Bromomethane)	74-83-9
Methyl tert-butyl ether[1]	1634-04-4
Metolachlor	51218-45-2
Metolachlor ethanesulfonic acid (ESA)	171118-09-5
Metolachlor oxanilic acid (OA)	152019-73-3
Molinate[1]	2212-67-1
Molybdenum	7439-98-7
Nitrobenzene	98-95-3
Nitroglycerin	55-63-0
N-Methyl-2-pyrrolidone	872-50-4
N-nitrosodiethylamine (NDEA) [2]	55-18-5
N-nitrosodimethylamine (NDMA) [2]	62-75-9
N-nitroso-di-n-propylamine (NDPA)	621-64-7
N-Nitrosodiphenylamine	86-30-6
N-nitrosopyrrolidine (NPYR)	930-55-2
Nonylphenol	
Norethindron (19-Noresthisterone)	68224
n-Propylbenzene[2]	103-65-1
o-Toluidine	95-53-4
Oxirane, methyl-	75-56-9
Oxydemeton-methyl	301-12-2
Oxyfluorfen	42874-03-3
Perfluorooctane sulfonic acid (PFOS)	1763231
Permethrin	52645-53-1
PFOA (perfluorooctanoic acid)	335-67-1
Profenofos	41198-08-7
Quinoline	91-22-5
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	121-82-4

Common name--registry name	CASRN
sec-Butylbenzene[2]	135-98-8
Tebuconazole	107534-96-3
Tebufenozide	112410-23-8
Tellurium	13494-80-9
Thiodicarb	59669-26-0
Thiophanate-methyl	23564-05-8
Toluene diisocyanate	26471-62-5
Tribufos	78-48-8
Triethylamine	121-44-8
Triphenyltin hydroxide (TPTH)	76-87-9
Urethane	51-79-6
Vanadium[2]	7440-62-2
Vinclozolin	50471-44-8
Ziram	137-30-4

[1]Primary Regulated Chemical in California
[2]Current Notification Level in California
[3]Archived Advisory Level in California

APPENDIX C – PARTICIPATING WATER AGENCY WATER QUALITY DATA

Woodland Davis Clean Water Agency

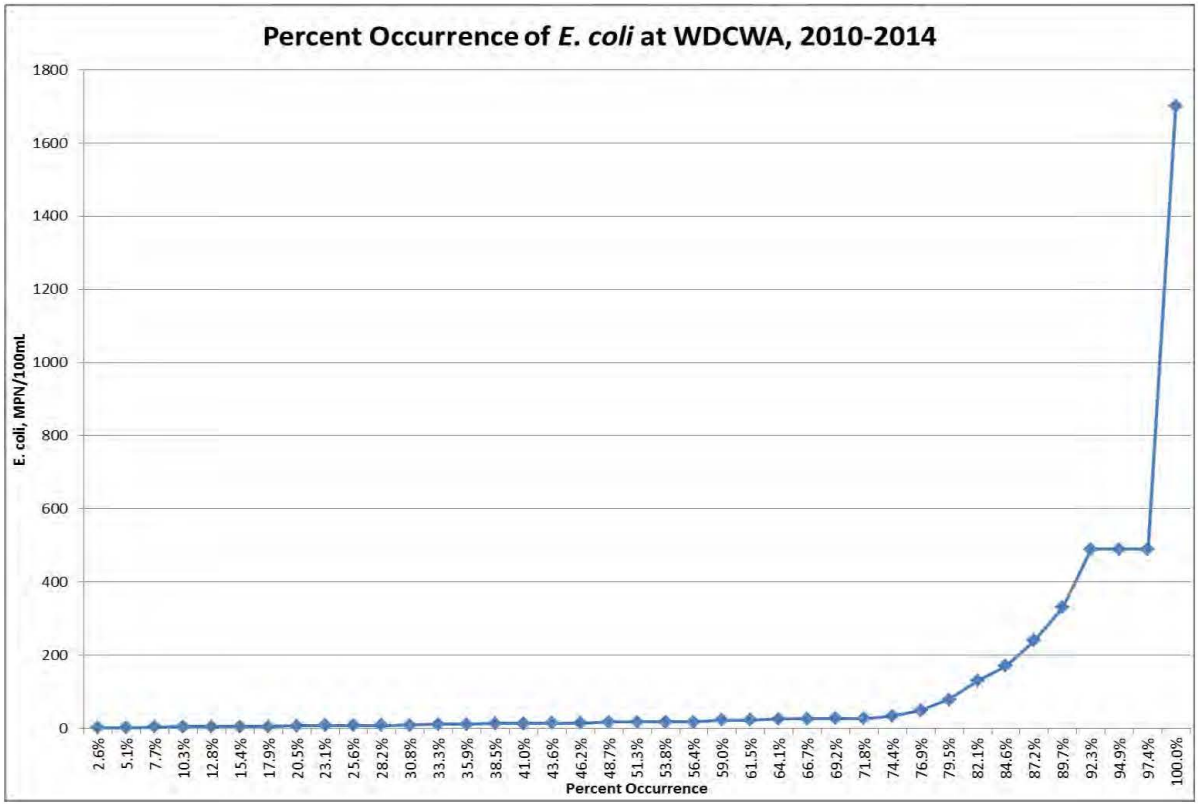
Date	Total	Fecal	E. coli
1/26/2010	3500	330	330
2/24/2010	430	17	17
3/30/2010	79	4.5	2
4/27/2010	1300	26	17
5/25/2010	170	23	23
6/29/2010	2300	63	26
7/27/2010	790	6.8	6.8
8/31/2010	3100	170	130
9/7/2010	1700	21	7.8
9/14/2010	2400	170	26
9/21/2010	700	11	4.5
9/28/2010	1700	14	9.3
10/5/2010	790	7.8	4.5
10/12/2010	790	7.8	2
10/19/2010	350	7.8	7.8
10/26/2010	3300	490	490
11/2/2010	1300	49	49
11/9/2010	920	11	11
11/16/2010	230	6.8	4
11/17/2010			
11/23/2010	3300	130	170
11/30/2010	3300	22	7.8
12/7/2010	1100	240	240
12/14/2010	1700	33	33
12/21/2010	2200	490	490
12/28/2010	17000	1100	1700
1/25/2011	330	23	23
2/22/2011	3300	490	490
3/29/2011	1600	79	79
4/26/2011	170	27	27
5/31/2011	790	33	17
6/28/2011	170	130	27
7/26/2011	110	23	13
8/30/2011	1100	79	14
9/28/2011	540	13	13
10/25/2011	490	21	14
11/29/2011	3300	31	17
12/20/2011	350	11	4.5
1/31/2012	2800	21	11
2/28/2012	350	6.8	4.5
min		4.5	2
max		1100	1700
average		113.82821	116.98718
median		23	17
95th			490

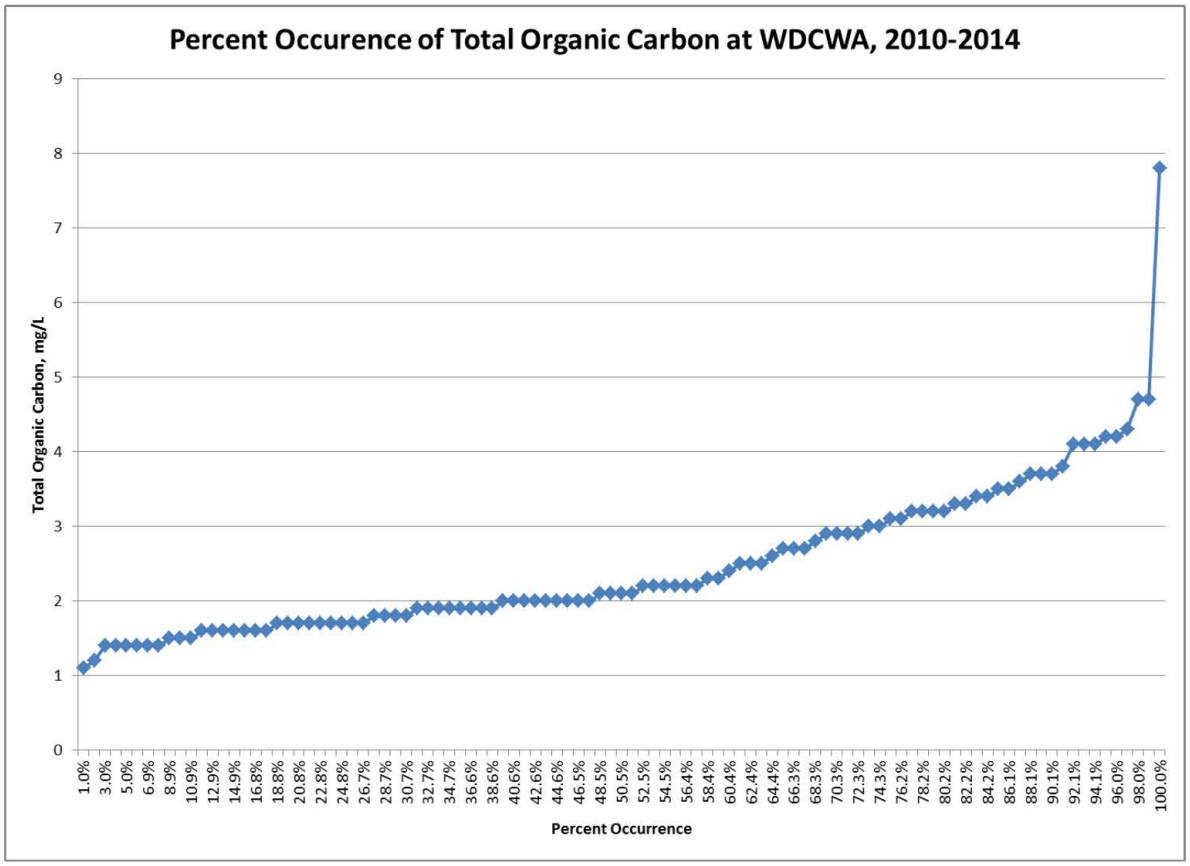
	TOC mg/L
1/5/2010	3.3
1/12/2010	3.4
1/19/2010	3.7
1/26/2010	3.7
2/2/2010	3.4
2/9/2010	4.1
2/16/2010	4.2
2/24/2010	4.7
3/2/2010	4.2
3/9/2010	2.5
3/16/2010	2
3/23/2010	2.2
3/30/2010	3
4/6/2010	2.8
4/13/2010	1.7
4/20/2010	2.7
4/27/2010	2
5/4/2010	2
5/11/2010	1.7
5/18/2010	2.9
5/25/2010	2.2
6/1/2010	3.3
6/8/2010	1.6
6/15/2010	2.6
6/22/2010	2.7
6/29/2010	2.9
7/6/2010	1.6
7/13/2010	2.1
7/20/2010	1.5
7/27/2010	1.1
8/3/2010	1.7
8/10/2010	1.9
8/17/2010	1.4
8/24/2010	1.9
8/31/2010	2.5
9/7/2010	2
9/14/2010	2.2
9/21/2010	3.1
9/28/2010	2.9
10/5/2010	3.2
10/12/2010	1.9
10/19/2010	3.1
10/26/2010	2.9
11/2/2010	2

11/9/2010	2.3
11/16/2010	2.1
11/23/2010	3
11/30/2010	3.5
12/7/2010	3.2
12/14/2010	4.3
12/21/2010	3.5
12/28/2010	4.1
1/25/2011	1.7
2/22/2011	3.2
3/29/2011	2.5
4/26/2011	1.4
5/31/2011	1.9
6/28/2011	1.7
7/26/2011	1.7
8/30/2011	2
9/28/2011	1.7
10/25/2011	1.5
11/29/2011	3.2
12/20/2011	2.7
1/31/2012	3.7
2/28/2012	1.9
3/27/2012	2.2
5/1/2012	1.9
5/29/2012	1.6
6/26/2012	2.1
7/31/2012	1.6
8/28/2012	1.9
9/25/2012	1.6
10/31/2012	1.7
11/28/2012	3.8
12/5/2012	7.8
12/19/2012	4.1
1/29/2013	2.1
2/26/2013	1.9
3/27/2013	2
4/30/2013	1.6
5/28/2013	2.2
6/25/2013	1.8
7/30/2013	1.8
8/27/2013	2.0
9/24/2013	1.6
10/29/2013	2.2
11/19/2013	2.3
12/17/2013	2.4

1/28/2014	1.8
2/25/2014	3.6
3/25/2014	2.0
4/29/2014	1.8
5/27/2014	1.7
6/24/2014	1.4
7/29/2014	1.4
8/26/2014	1.5
9/30/2014	1.4
10/28/2014	1.4
11/18/2014	1.2
12/16/2014	4.7

min	1.1
max	7.8
average	2.46930693
median	2.1
95th percentile	4.2


Percent Occurrence of E. coli at WDCWA, 2010-2014
E. coli, MPN/100mL
1800
1600
1400
1200
1000
800
600
400
200
0
2.6%
5.1%
7.7%
10.3%
12.8%
15.4%
17.9%
20.5%
23.1%
25.6%
28.2%
30.8%
33.3%
35.9%
38.5%
41.0%
43.6%
46.2%
48.7%
51.3%
53.8%
56.4%
59.0%
61.5%
64.1%
66.7%
69.2%
71.8%
74.4%
76.9%
79.5%
82.1%
84.6%
87.2%
89.7%
92.3%
94.9%
97.4%
100.0%
Percent Occurrence


Percent Occurence of Total Organic Carbon at WDCWA, 2010-2014
Total Organic Carbon, mg/L
9
8
7
6
5
4
3
2
1
0
1.0%
3.0%
5.0%
6.9%
8.9%
10.9%
12.9%
14.9%
16.8%
18.8%
20.8%
22.8%
24.8%
26.7%
28.7%
30.7%
32.7%
34.7%
36.6%
38.6%
40.6%
42.6%
44.6%
46.5%
48.5%
50.5%
52.5%
54.5%
56.4%
58.4%
60.4%
62.4%
64.4%
66.3%
68.3%
70.3%
72.3%
74.3%
76.2%
78.2%
80.2%
82.2%
84.2%
86.1%
88.1%
90.1%
92.1%
94.1%
96.0%
98.0%
100.0%
Percent Occurrence

	Giardia	Crypto
1/26/2010	<0.0909	0.272
2/24/2010	<0.0909	<0.0909
3/30/2010	<0.093	<0.093
4/27/2010	0.186047	<0.093
5/25/2010	<0.0952	<0.0952
6/29/2010	<0.0976	<0.0976
7/27/2010	<0.1	<0.1
8/31/2010	<0.093	<0.093
9/28/2010	<0.0952	<0.0952
10/26/2010	0.285714	<0.0952
11/30/2010	<0.093	<0.093
12/28/2010	0.095238	<0.095
1/25/2011	0.093023	<0.093
2/22/2011	0.095238	0.095
3/29/2011	<0.0909	<0.0909
4/26/2011	<0.0952	<0.0952
5/31/2011	0.095238	<0.0952
6/28/2011	0.074074	<0.0741
7/26/2011	<0.093	<0.093
8/30/2011	0.190476	<0.0952
9/28/2011	0.095238	<0.0952
10/25/2011	0.186047	<0.093
11/29/2011	0.2	<0.1
12/20/2011	0.2	<0.1
1/31/2012	0.1905	<0.0952
2/28/2012	<0.0952	<0.0952

Aluminum	
Date	Result
2/24/2010	760
5/25/2010	550
12/7/2010	380
12/14/2010	700
12/28/2010	2400
1/25/2011	880
2/22/2011	1300
3/29/2011	1200
4/26/2011	820
5/31/2011	470
6/28/2011	240
7/26/2011	810
10/25/2011	120
1/31/2012	1800
5/1/2012	220
7/31/2012	280
10/31/2012	260
1/29/2013	1100
4/30/2013	270
7/30/2013	110
10/29/2013	280
1/28/2014	280
4/29/2014	150
7/29/2014	91
10/28/2014	250
min	91
max	2400
ave	628.84
median	380
both average and median greater than secondary MCL of 200	

Iron	
Date	Result
2/24/2010	980
5/25/2010	630
12/14/2010	1000
12/28/2010	2800
1/25/2011	1400
2/22/2011	530
3/29/2011	1200
4/26/2011	360
5/31/2011	2000
6/28/2011	1000
7/26/2011	840
8/30/2011	580
1/31/2012	950
5/1/2012	1000
7/31/2012	560
10/31/2012	210
1/29/2013	1500
4/30/2013	550
7/30/2013	450
10/24/2013	570
1/28/2014	560
4/29/2014	210
7/29/2014	400
10/28/2014	440
min	210
max	2800
ave	863.3333
median	605
both average and median greater than secondary MCL of 300	

Manganese	
Date	Result
1/26/2010	95
2/24/2010	58
4/27/2010	38
5/25/2010	26
6/29/2010	36
7/27/2010	36
8/31/2010	31
9/28/2010	20
10/26/2010	32
12/14/2010	43
12/28/2010	73
1/25/2011	46
2/22/2011	44
3/29/2011	42
4/26/2011	35
5/31/2011	47
6/28/2011	31
7/26/2011	36
8/30/2011	32
9/28/2011	24
10/25/2011	20
11/29/2011	56
12/20/2011	41
1/31/2012	63
2/28/2012	36
3/27/2012	37
5/1/2012	28
5/29/2012	35
6/26/2012	40
7/31/2012	31
8/28/2012	30
9/25/2012	37
10/31/2012	18
11/28/2012	58
12/5/2012	200
12/19/2012	78
1/29/2013	48
2/26/2013	23
3/27/2013	29
4/30/2013	22
5/28/2013	42
6/25/2013	25
7/30/2013	21
8/27/2013	44
9/24/2013	22
10/29/2013	33
11/19/2013	34

12/17/2013	27
1/28/2014	37
2/25/2014	52
3/25/2014	39
4/29/2014	25
5/27/2014	40
6/24/2014	20
7/29/2014	17
8/26/2014	24
10/28/2014	23
min	17
max	200
ave	40
median	36

City of West Sacramento

George Kristoff Water Treatment Plant

GKWTP Raw Water Monitoring

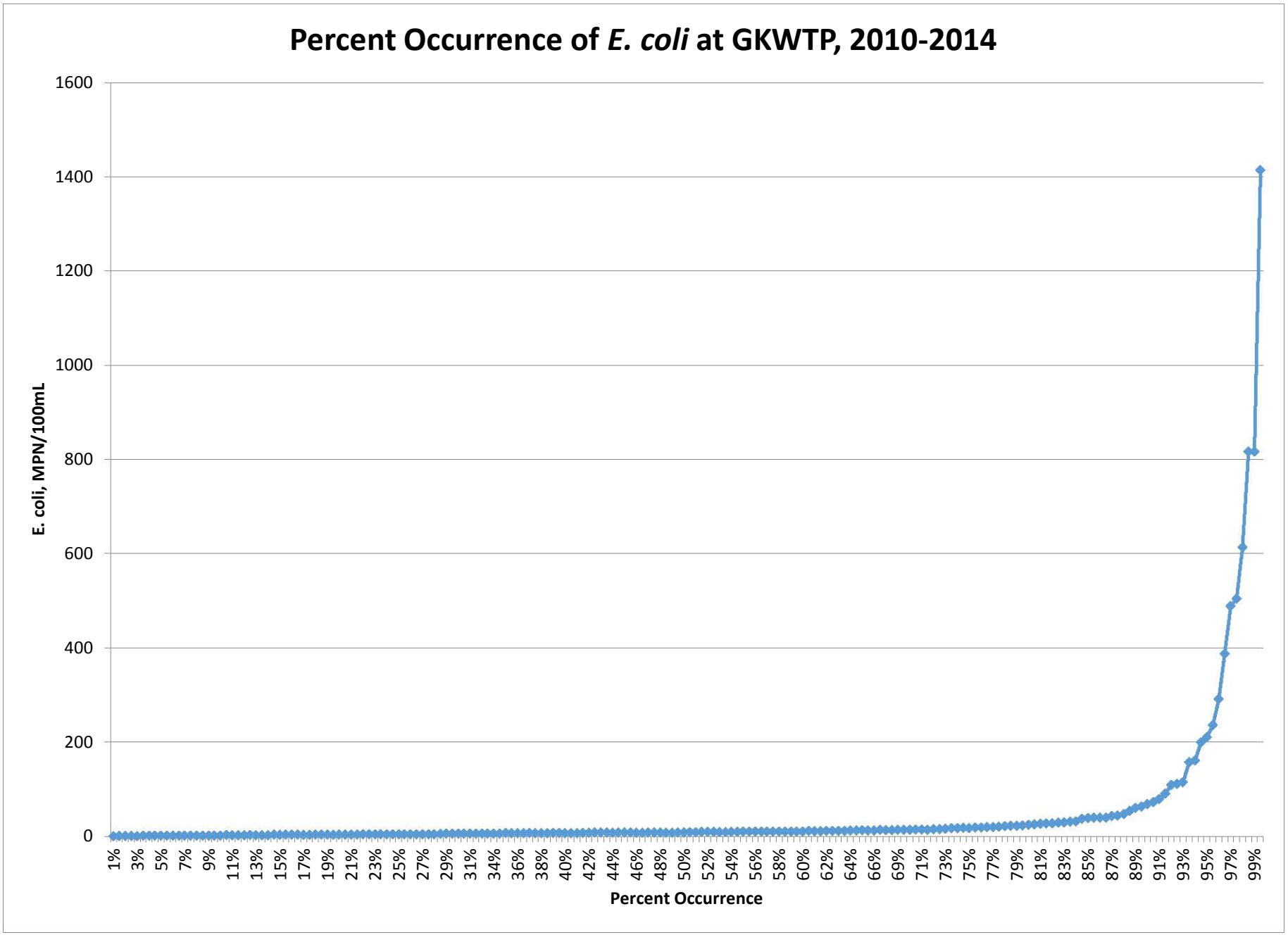
Date	Total Coli	e Coli
1/5/2010	547.5	22.8
1/12/2010	325.5	12.2
1/21/2010	>2419.2	816.4
1/28/2014	2254	504
2/2/2010	770.1	21.8
2/8/2010	>2419.2	613.1
2/16/2010	1413.6	17.1
2/22/2010	816.4	11
3/1/2010	>2419.2	1413.6
3/8/2010	1986.3	71.7
3/15/2010	235.9	12.2
3/22/2010	240	6.3
3/29/2010	145	2
4/5/2010	185	3.1
4/13/2010	325.5	25.9
4/22/2010	686.7	43.5
4/26/2010	980.4	26.9
5/5/2010	770.1	6.3
5/13/2010	770.1	6.1
5/17/2010	613.1	12.2
5/27/2010	1119.9	9.8
6/2/2010	1119.9	31.3
6/8/2010	980.4	28.8
6/16/2010	648.8	4.1
6/23/2010	1119.9	5.2
6/30/2010	1553.1	14.5
7/6/2010	770.1	8.4
7/15/2010	1299.7	5.1
7/19/2010	2419.2	2
7/29/2010	1986.3	3.1
8/5/2010	1119.9	7.3
8/12/2010	1413.6	6.3
8/16/2010	1413.6	2
8/26/2010	>2419.2	5.2
9/2/2010	2419.2	6.3
9/8/2010	980.4	5.2
9/13/2010	2419.2	18.7
9/20/2010	1732.9	8.4
9/30/2010	1046.9	1
10/5/2010	920.8	4.1
10/11/2010	686.7	1

10/20/2010	325.5	1
10/28/2010	>2419.2	156.5
11/4/2010	1046.9	12
11/8/2010	314.8	9.8
11/18/2010	204.6	7.4
11/23/2010	>2419.2	160.7
12/2/2010	214.3	11
12/8/2010	2419.2	209.8
12/14/2010	866.4	39.3
12/21/2010	>2419.2	387.3
12/27/2010	>2419.2	198.9
1/4/2011	>2419.2	39.3
1/13/2011	307.6	13.2
1/18/2011	204.6	18.7
1/27/2011	204.6	9.6
2/3/2011	204.6	10.6
2/9/2011	344.8	17.3
2/16/2011	214.3	6.2
2/24/2011	547.5	38.4
3/3/2011	1986.3	27.2
3/7/2011	686.7	78.4
3/16/2011	1986.3	816.4
3/24/2011	410.6	111.2
3/29/2011	387.3	59.8
4/6/2011	1986.3	11.9
4/14/2011	648.8	6.3
4/19/2011	410.6	5.2
4/28/2011	613.1	7.4
5/4/2011	648.8	8.5
5/12/2011	613.1	9.7
5/19/2011	461.1	24.6
5/25/2011	410.6	6.3
6/2/2011	435.2	13.5
6/8/2011	613.1	42.8
6/15/2011	1119.9	16.8
6/23/2011	488.4	7.3
6/29/2011	920.8	18.5
7/7/2011	1413.6	3.1
7/14/2011	1553.1	6.3
7/18/2011	816.4	7.4
7/25/2011	920.8	7.4
8/2/2011	1413.6	8.6
8/8/2011	2419.2	10.8
8/17/2011	1119.9	7.4
8/22/2011	>2419.2	7.4
8/29/2011	>2419.2	13.4
9/8/2011	1986.3	6.2

9/14/2011	1732.9	8.5
9/27/2011	2419.2	6.3
10/6/2011	1203.3	24
10/12/2011	1413.6	39.3
10/17/2011	816.4	1
10/25/2011	770.1	<1
11/3/2011	547.5	5.2
11/7/2011	579.4	7.4
11/16/2011	866.4	3
11/22/2011	1299.7	8.6
11/30/2011	1203.3	18.5
12/8/2011	770.1	21.1
12/28/2011	686.7	5.2
1/4/2012	261.3	11
1/26/2012	2419.2	488.4
1/31/2012	1413.6	22.3
2/9/2012	613.1	13.2
2/16/2012	410.6	13.4
2/23/2012	125.9	7.2
3/1/2012	119.8	8.5
3/8/2012	69.1	5.2
3/22/2012	1986.3	62.7
3/26/2012	365.4	16.1
4/5/2012	>2419.2	53.7
4/12/2012	260.2	14.6
4/18/2012	2419.2	67.7
4/26/2012	1553.1	20.1
5/3/2012	344.8	4.1
5/10/2012	387.3	4.1
5/17/2012	870.4	3.1
5/23/2012	1986.3	4.1
6/7/2012	1299.7	10.9
6/14/2012	2419.2	9.8
6/19/2012	>2419.2	4.1
6/28/2012	1553.1	16.6
7/12/2012	1553.1	9.7
7/19/2012	1986.3	9.7
7/26/2012	1986.3	1
8/16/2012	1986.3	5.1
8/29/2012	1986.3	3
9/18/2012	>2419.2	7.2
9/27/2012	1413.6	1
10/4/2012	686.7	9.5
10/11/2012	2419.2	7.4
10/18/2012	410.6	3.1
10/25/2012	>2419.2	114.5
11/1/2012	365.4	5.2

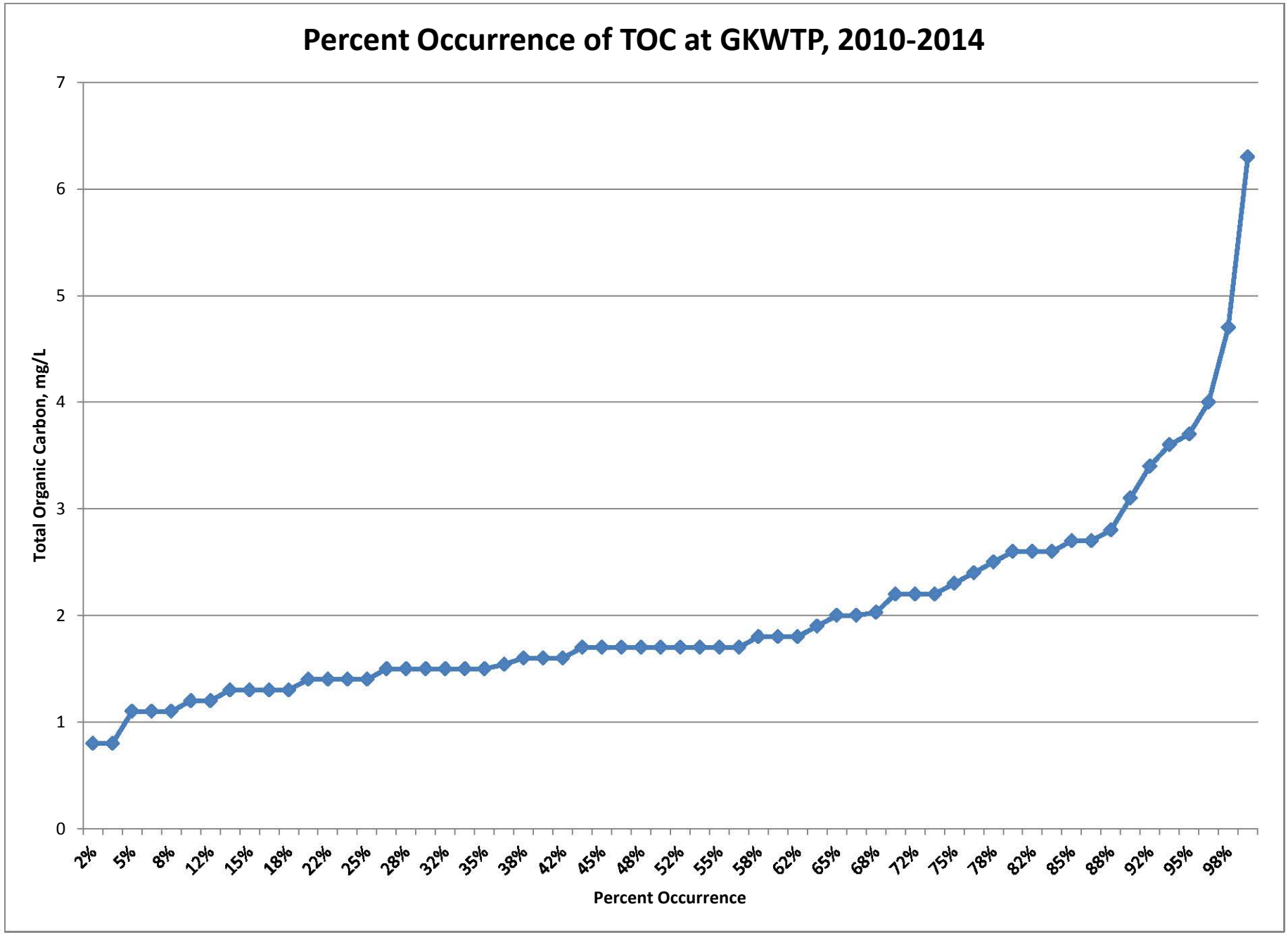
11/8/2012	410.6		4.1
11/15/2012	325.5		9.7
11/20/2012	1732.9		90.6
12/12/2012	>2419.2		47.1
12/18/2012	1119.2		30.9
1/10/2013	344.8		36.4
1/17/2013	365.4		13.2
1/24/2013	224.7		8.6
2/7/2013	248.1		13.2
2/14/2013	125.9		7.3
2/28/2013	24	<1	
3/7/2013	663		1
3/21/2013	133.4		7.4
4/3/2013	920.8		29.5
4/9/2013	387.3		13.1
4/24/2013	488.4		4.1
5/7/2013	1413.6		9.6
5/23/2013	1299.7		3.1
5/30/2013	1732.9		13.4
6/6/2013	1046.2	<1	
7/2/2013	1986.3		7.4
7/11/2013	1413.6		5.2
7/18/2013	980.4		3
8/7/2013	1986.3		4.1
8/15/2013	1299.7		4.1
9/5/2013	866.4		6.3
9/12/2013	1413.6		3.1
10/10/2013	770.1		6.1
10/17/2013	275.5		3
12/5/2013	461.9		10.8
1/30/2014	387.3		1
4/24/2014	435.2		2
5/1/2014	387.3		7.4
5/8/2014	648.8		1
5/14/2014	770.1	<1	
5/22/2014	1299.7		9.8
5/29/2014	1732.9		7.3
6/5/2014	1986.3		4.1
6/19/2014	1413.6		3.1
6/26/2014	1299.7		4.1
6/30/2014	1203.3		1
7/17/2014	>2419.2		2
7/24/2014	1732.9		1
7/31/2014	727		1
8/6/2014	>2419.2		3.1
8/13/2014	980.4	<1	
8/20/2014	1986.3		2

8/28/2014	2419.2	6.3
9/3/2014	1732.9	1
9/11/2014	2419.2	2
9/25/2014	866.4	4.1
10/2/2014	1203.3	2
10/16/2014	547.5	3.1
10/30/2014	410.6	3
11/13/2014	547.5	1
11/20/2014	307.6	8.6
12/4/2014	2419.2	108.6
12/10/2014	2419.2	235.9
12/18/2014	>2419.2	290.9


Percent Occurrence of E. coli at GKWTP, 2010-2014
E. coli, MPN/100mL
1600
1400
1200
1000
800
600
400
200
0
1%
3%
5%
7%
9%
11%
13%
15%
17%
19%
21%
23%
25%
27%
29%
31%
34%
36%
38%
40%
42%
44%
46%
48%
50%
52%
54%
56%
58%
60%
62%
64%
66%
69%
71%
73%
75%
77%
79%
81%
83%
85%
87%
89%
91%
93%
95%
97%
99%
Percent Occurrence

Sample Date	Source Water Alkalinity (mg/L)	Source Water TOC (mg/L)	Treated Water TOC (mg/L)
1/5/2010	90	2.7	1.6
2/9/2010	38	2.5	0.99
3/8/2010	72	4	3
4/6/2010	64	2.03	1.12
5/12/2010	83	1.54	1.14
6/10/2010	39	1.7	1.11
7/6/2010	57	1.1	0.89
8/5/2010	52	1.1	0.89
9/8/2010	71	1.5	1.1
10/11/2010	66	1.3	0.89
11/8/2010	49	1.4	1.2
12/8/2010	73	2.6	1.6
1/4/2011	60	2.6	1.6
2/3/2011	66	1.7	1
3/7/2011	63	2.2	1.3
4/6/2011	55	1.6	1
5/13/2011	43	1.3	0.9
6/13/2011	43	1.8	1
7/13/2011	51	1.2	0.74
8/26/2011	73	1.5	1.3
9/12/2011	76	1.7	1.3
10/12/2011	56	0.8	0.5
11/1/2011	54	0.8	0.4
12/6/2011	66	1.7	1.1
1/3/2012	77	1.3	0.6
2/8/2012	94	2.2	1.2
3/5/2012	74	1.1	0.8
4/12/2012	62	1.4	1.1
5/2/2012	51	1.3	1
6/5/2012	74	2	1.5
7/9/2012	52	1.9	1.5
8/1/2012	59	2.2	1.6
9/5/2012	70	2.6	1.9
10/1/2012	58	2	1.7
11/5/2012	60	2.7	2
12/5/2012	52	6.3	2.6
1/8/2013	74	3.1	2
2/7/2013	82	2.4	1.7
3/5/2013	78	1.7	1.4
4/8/2013	64	1.7	1.4
5/3/2013	55	1.6	1.3
6/7/2013	61	3.7	3.2
7/11/2013	63	1.5	1.2

8/8/2013	71	1.7		1.3
9/4/2013	78	1.7		1.4
10/2/2013	64	1.5		1.2
11/5/2013	67	1.8		1.3
12/10/2013	86	2.8		1.7
1/3/2014	85	1.8		1.3
2/4/2014	92	2.3		1.8
3/13/2014	57	3.6		2.1
4/3/2014	61	3.4		2
5/9/2014	72	1.7		1.1
6/4/2014	54	1.5		1.3
7/7/2014	55	1.2		1
8/7/2014	69	1.4		1.2
9/10/2014	69	1.6		1.3
10/2/2014	69	1.5	ND	
11/5/2014	60	1.4		1.2
12/10/2014	66	4.7		2.7
	64.91666667			
min	38	0.8		0.4
max	94	6.3		3.2
ave	64.91666667	2.011166667		1.377457627
median	64	1.7		1.3
95th	86.2	3.715		2.61


Percent Occurrence of TOC at GKWTP, 2010-2014
Total Organic Carbon, mg/L
0
1
2
3
4
5
6
7
2%
5%
8%
12%
15%
18%
22%
25%
28%
32%
35%
38%
42%
45%
48%
52%
55%
58%
62%
65%
68%
72%
75%
78%
82%
85%
88%
92%
95%
98%
Percent Occurrence

State of California — CA Dept. of Public Health

Drinking Water Program

Stage 1 DBPR

Quarterly TTHM Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: City of West Sacramento System No.: 571-0003 Year: 2013 Quarter: 4th

Year:	2010				2011				2012				2013			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	3/3	5/3	8/3	11/2	2/1	5/2	8/1	11/1	2/1	5/8	8/1	11/1	2/4	5/1	8/1	11/4
Site 1	50.0	64.0	56.0	44.0	23.0	32.0	57.0	29.7	29.2	43.7	45.8	43.8	35.1	46.7	45.0	42.0
Site 2	***	***	***	36.0	29.0	31.0	43.0	30.6	41.1	33.6	46.5	45.0	31.6	43.6	38.0	37.0
Site 3	44.0	58.0	66.0	49.0	26.0	32.0	53.0	45.0	31.6	40.2	43.4	45.9	35.8	46.9	30.0	33.0
Site 4	49.0	50.0	47.0	52.0	28.0	31.0	45.0	32.1	36.2	38.8	33.0	40.8	34.1	37.9	44.0	34.0
Quarterly Average	47.7	57.3	56.3	45.3	26.5	31.5	49.5	34.4	34.5	39.1	42.2	43.9	34.2	43.8	39.3	36.5
Running Annual Average	51.2	51.2	51.2	51.2	45.4	42.7	43.8	35.5	37.5	39.4	37.5	39.9	39.8	41.0	40.3	38.4
Meets Standard?*	Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes
(check box)	X No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Number of Samples Taken	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4

Identify the sample locations in the table below.

Site	Sample Location
1	DBP1 - PSIP Water Storage Reservoir
2	DBP2 - Central Water Storage Reservoir
3	DBP3 - Northeast Water Storage Reservoir
4	DBP4 - 2874 Leslie Ln.

Comments: ***3/3/2010 Central Tank down for maintenance. ***5/3/10Central Tank down for maintenance***8/3/10 Central Tank down for maintenance.

State of California — **Stage 1 DBPR** — Department of Health Services

Drinking Water Program

Quarterly HAA5 Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: City of West Sacramento System No.: 571-0003 Year: 2013 Quarter: 4th

Year:	2010				2011				2012				2013			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	3/3	5/3	8/3	11/2	2/1	5/2	8/1	11/1	2/1	5/8	8/1	11/1	2/4	5/1	8/1	11/4
Site 1	37.0	46.0	31.0	36.0	14.0	23.0	24.0	19.0	34.0	29.0	24.0	20.0	23.0	35.0	34.0	38.0
Site 2	***	***	***	34.0	19.0	24.0	26.0	30.0	42.0	22.0	20.0	21.0	22.0	36.0	30.0	35.0
Site 3	31.0	39.0	29.0	31.0	15.0	24.0	31.0	24.0	32.0	35.0	24.0	23.0	20.0	34.0	23.0	29.0
Site 4	40.0	36.0	23.0	32.0	16.0	20.0	29.0	20.0	37.0	31.0	21.0	21.0	21.0	25.0	34.0	34.0
Quarterly Average	36.0	40.3	27.7	33.3	16.0	22.8	27.5	23.3	36.3	29.3	22.3	21.3	21.5	32.5	30.3	34.0
Running Annual Average	36.0	38.2	34.7	34.2	29.9	28.6	28.4	22.4	27.4	29.1	27.7	26.5	23.6	24.4	26.4	29.6
Meets Standard?*	Yes	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X
(check box)	No X	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Number of Samples Taken	**3**	**3**	**3**	**4**	4	4	4	4	4	4	4	4	4	4	4	4

Identify the sample locations in the table below.

Site	Sample Location
1	DBP1 - PSIP Water Storage Reservoir
2	DBP2 - Central Water Storage Reservoir
3	DBP3 - Northeast Water Storage Reservoir
4	DBP4 - 2874 Leslie Ln.

Comments: ***3/3/2010 Central tank down for maintenance. ***5/3/10 Central Tank down for maintenance.8/3/10 Central Tank down for maintenance.

State of California — CA Dept. of Public Health

Drinking Water Program

Stage 1 DBPR

Quarterly TTHM Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: y of West Sacrame System No.: 571-0003 Year: 2014 Quarter: 4th

Year:	2011				2012				2013				2014			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	2/1	5/2	8/1	11/1	2/1	5/8	8/1	11/1	2/4	5/1	8/1	11/4	2/3	5/5	8/6	10/4
Site 1	23.0	32.0	57.0	29.7	29.2	43.7	45.8	43.8	35.1	46.7	45.0	42.0	35.0	52.0	33.0	46.0
Site 2	29.0	31.0	43.0	30.6	41.1	33.6	46.5	45.0	31.6	43.6	38.0	37.0	34.0	49.0	36.0	45.0
Site 3	26.0	32.0	53.0	45.0	31.6	40.2	43.4	45.9	35.8	46.9	30.0	33.0	31.0	41.0	31.0	41.0
Site 4	28.0	31.0	45.0	32.1	36.2	38.8	33.0	40.8	34.1	37.9	44.0	34.0	30.0	64.0	46.0	48.0
Quarterly Average	26.5	31.5	49.5	34.4	34.5	39.1	42.2	43.9	34.2	43.8	39.3	36.5	32.5	51.5	36.5	45.0
Running Annual Average	26.5	29.0	35.8	35.5	37.5	39.4	37.5	39.9	39.8	41.0	40.3	38.4	38.0	39.9	39.3	41.4
Meets Standard?*	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes	X Yes
(check box)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Number of Samples Taken	4	4	4	4	STG	4	4	4	4	4	4	4	4	4	4	4

Identify the sample locations in the table below.

Site	Sample Location
1	DBP1 - PSIP Water Storage Reservoir
2	DBP2 - Central Water Storage Reservoir
3	DBP3 - Northeast Water Storage Reservoir
4	DBP4 - 2874 Leslie Ln.

State of California — **Stage 1 DBPR** — Department of Health Services

Drinking Water Program

Quarterly HAA5 Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: y of West Sacrame System No.: 571-0003 Year: 2014 Quarter: 4th

Year:	2011				2012				2013				2014			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st. Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	2/1	5/2	8/1	11/1	2/1	5/8	8/1	11/1	2/4	5/1	8/1	11/4	2/3	5/5	8/6	10/4
Site 1	14.0	23.0	24.0	19.0	34.0	29.0	24.0	20.0	23.0	35.0	34.0	38.0	23.0	35.0	21.0	27.0
Site 2	19.0	24.0	26.0	30.0	42.0	22.0	20.0	21.0	22.0	36.0	30.0	35.0	24.0	33.0	24.0	26.0
Site 3	15.0	24.0	31.0	24.0	32.0	35.0	24.0	23.0	20.0	34.0	23.0	29.0	22.0	29.0	19.0	24.0
Site 4	16.0	20.0	29.0	20.0	37.0	31.0	21.0	21.0	21.0	25.0	34.0	34.0	21.0	44.0	25.0	28.0
Quarterly Average	16.0	22.8	27.5	23.3	36.3	29.3	22.3	21.3	21.5	32.5	30.3	34.0	22.5	35.3	22.3	26.3
Running Annual Average	16.0	19.4	22.1	22.4	27.4	29.1	27.7	26.5	23.6	24.4	26.4	29.6	29.8	30.5	28.5	26.6
Meets Standard?*	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X	Yes X
(check box)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Number of Samples Taken	4	4	4	0	4	4	4	4	4	4	4	4	4	4	4	4

Identify the sample locations in the table below.

Site	Sample Location
1	DBP1 - PSIP Water Storage Reservoi
2	DBP2 - Central Water Storage Reserv
3	DBP3 - Northeast Water Storage Rese
4	DBP4 - 2874 Leslie Ln.

State of California — **Stage 2 DBPR** — Department of Health Services

Drinking Water Program

Quarterly TTHM Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: City of West Sacramento System No.: 571-0003 Year: 2014 Quarter: 4th

Year:	2013				2014				2015				2016		
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.
Sample Date (month/date):	[redacted]			10/1	1/2	4/2	7/1	10/1							
Site 1				40.0	30.0	42.0	28.0	41.0							
Site 2				34.0	29.0	40.0	31.0	38.0							
Site 3				28.0	33.0	37.0	28.0	34.0							
Site 4				46.0	38.0	49.0	29.0	60.0							
Site 5				25.0	24.0	31.0	42.0	30.0							
Site 6				25.0	26.0	37.0	29.0	34.0							
Site 7				27.0	25.0	32.0	28.0	32.0							
Site 8				48.0	26.0	32.0	37.0	50.0							
Quarterly Average				34.1	28.9	37.5	31.5	39.9							
Running Annual Average				34.1	31.5	33.5	33.0	34.4							
Meets Standard?*	Yes	Yes	Yes	Yes X	Yes X	Yes X	Yes X	Yes X	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(check box)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Number of Samples Taken	NA	NA	NA	8	8	8	8	8							

Identify the sample locations in the table below.

Site	Sample Location
1	DBP1 - PSIP Water Storage Reservoir
2	DBP2 - Central Water Storage Reservoir
3	DBP3 - Golden Gate Sample Tap
4	DBP4 - Bridgeway Lakes Storage Reservoir
5	DBP5 - 3081 Mareca Way
6	DBP6 - 2100 Manchester Road
7	DBP7 - 1494 Redding Road
8	DBP3 - Northeast Water Storage Reservoir

Signature Date

State of California — **Stage 2 DBPR** — Department of Health Services

Drinking Water Program

Quarterly HAA5 Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: City of West Sacramento System No.: 571-0003 Year: 2014 Quarter: 4th

Year:	2013				2014				2015				2016		
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.
Sample Date (month/date):	[redacted]			10/1	1/2	4/2	7/1	10/1							
Site 1				30.0	28.0	29.0	19.0	25.0							
Site 2				27.0	23.0	28.0	26.0	25.0							
Site 3				21.0	28.0	28.0	20.0	19.0							
Site 4				37.0	33.0	44.0	20.0	38.0							
Site 5				20.0	21.0	24.0	34.0	17.0							
Site 6				21.0	23.0	30.0	20.0	20.0							
Site 7				20.0	19.0	24.0	20.0	18.0							
Site 8				30.0	20.0	26.0	29.0	28.0							
Quarterly Average				25.8	24.4	29.1	23.5	23.8							
Running Annual Average				25.8	25.1	26.4	25.7	25.2							
Meets Standard?*	Yes	Yes	Yes	Yes X	Yes X	Yes X	Yes X	Yes X	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(check box)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Number of Samples Taken	NA	NA	NA	8	8	8	8	8							

Identify the sample locations in the table below.

Site	Sample Location
1	DBP1 - PSIP Water Storage Reservoir
2	DBP2 - Central Water Storage Reservoir
3	DBP3 - Golden Gate Sample Tap
4	DBP4 - Bridgeway Lakes Storage Reservoir
5	DBP5 - 3081 Mareca Way
6	DBP6 - 2100 Manchester Road
7	DBP7 - 1494 Redding Road
8	DBP3 - Northeast Water Storage Reservoir

Signature Date

*If, during the first year of monitoring, any individual quarter's average will cause the running annual average of that system to exceed the standard, then the system is out of compliance at the end of that quarter.

City of West Sacramento - Bryte Bend Water Treatment Plant

SOURCE: Treated Water

CONSTITUENT	METHOD	MCL	DLR	PHG/(MCLG)	UNITS					MIN	MAX	AVG
						8/12/2010	5/26/2011	8/11/2011	7/9/2012			
64432 - Primary (IOC)												
Aluminum (Al)		1000	50	600	ug/L	43		39	30	30	43	37
Antimony (Sb)		6.0	6.0	20.0	ug/L	ND		ND	ND	ND	ND	ND
Arsenic		50	2.0	0.004	ug/L	ND		1.3	ND	ND	1.3	1.3
Barium (Ba)		1000	2.0	2000.0	ug/L	19		23	19	19	23	20
Beryllium (Be)		4	1.0	0.1	ug/L	ND		ND	ND	ND	ND	ND
Cadmium (Cd)		5	1.0		ug/L	ND		ND	ND	ND	ND	ND
Chromium (Total Cr)		50	10		ug/L	ND		ND	ND	ND	ND	ND
Chromium (Total Cr - Cr VI screen)			1.0		ug/L	NA				NA	NA	NA
Chromium , hexavalent (Cr VI)			1.0		ug/L	NA		ND[1]	NA	ND	ND	ND
Copper		1300	2.0	170.0	ug/L	3.7		ND[1]	ND	ND	3.7	3.7
Cyanide		150		150.0	ug/L	*ND		ND[1]	ND	ND	ND	ND
Mercury (Hg)		2	1.0	1.2	ug/L	*ND		ND[1]	ND	ND	ND	ND
Nickel (Ni)		100	5.0	12.0	ug/L	ND		ND	ND	ND	ND	ND
Selenium (Se)		50	5.0	50.0	ug/L	ND		ND	ND	ND	ND	ND
Thallium (Tl)		2	1.0	0.1	ug/L	ND		ND	ND	ND	ND	ND
Lead (Pb)		50 (AL = 15)	0.5	2.0	ug/L	ND		ND	ND	ND	ND	ND
64432 - Fluoride												
Fluoride		1.4 - 2.4	0.05	1000	mg/L	0.89			0.5	0.5	0.89	0.70
64432.2 - Asbestos												
Asbestos		7	0.2	7	MFL	NA		<0.2	NA	<0.2	<0.2	<0.2
64432.1 - Nitrate/ Nitrite												
Nitrate (as NO3)		45	2.0	10.0	mg/L	ND		ND[1]	ND	ND	ND	ND
Nitrite (N02)(as N)		1000	300.0	1000.0	ug/L	ND		ND[1]	ND	ND	ND	ND
Total Nitrate/Nitrite		10000	400.0		ug/L	ND		ND[1]	ND	ND	ND	ND
64449-A - Secondary Standards												
Aluminum (Al)		200	20		ug/L	43		39	30	30	43	37
Foaming Agent (MBAS)		0.5	0.05		mg/L	ND		NA	ND	ND	ND	ND
Iron (Fe)		300	20		ug/L	ND		ND	ND	ND	ND	ND
Manganese (Mn)		50	2		ug/L	ND		ND	ND	ND	ND	ND
Methyl tert-butyl ether	MTBE	5	0.5	13	ug/L	ND		ND	ND	ND	ND	ND
Odor		3	1		TON	1		ND	ND	ND	3	1
64449-B - Secondary Standards												
TDS		500 - 1000 (1500)	10		mg/L	91		100	80	80	100	90
Specific Conductance		900 - 1600 (2200)	2		umho/cm	180		160	124	124	180	155
Chloride (Cl)		250 - 500 (600)	1		mg/L	7.4		6.4	6.0	6.0	7.4	6.6
Sulfate (as SO4)		250 - 500 (600)	0.5	0.5	mg/L	6.4		6.8	5.0	5.0	6.8	6.1
pH (25 C)		6.5 - 8.5			Units	8.2		8.1	8.2	8.1	8.2	8.2

* Sample collected on 10/19/10

SOURCE: Treated Water

CONSTITUENT	METHOD		MCL	DLR	PHG/(MCLG)	UNITS					MIN	MAX	AVG
							8/12/2010	5/26/2011	8/11/2011	7/9/2012			
64449 (h) - General Mineral													
Bicarbonate				2		mg/L	64		60	60	60	64	61
Carbonate				2		mg/L	ND		ND	ND	ND	ND	ND
Hydroxide Alkalinity				2		mg/L	ND		ND	ND	ND	ND	ND
Total Alkalinity				2		mg/L	64		60	50	50	64	58
Calcium (Ca)				1		mg/L	12		13	10	10	13	12
Magnesium (Mg)				0.1		mg/L	6.4		7.0	5.0	5.0	7.0	6.1
Sodium (Na)				1		mg/L	12		13	6.0	6	13	10
Potassium (K)				1		mg/L	1.0		0.95	1.0	0.95	1.0	1.0
Hardness (as CaCO3)				3		mg/L	56		62	46	46	62	55
Aggressiveness Index				1			11		11	NA	11	11	11
Langlier Index				1		mg.L				NA	NA	NA	NA
Table 64444 -A (VOC)													
Benzene	524.2		1	0.5	0.15	ug/L	ND		ND	ND	ND	ND	ND
Carbon Tetrachloride	524.2		0.5	0.5	0.1	ug/L	ND		ND	ND	ND	ND	ND
1,2-Dichlorobenzene	524.2	o-Dichlorobenzene	600	0.5	600	ug/L	ND		ND	ND	ND	ND	ND
1,4-Dichlorobenzene	524.2	p-DCB	5	0.5	6	ug/L	ND		ND	ND	ND	ND	ND
1,1-Dichloroethane	524.2	1,1-DCA	5	0.5	3	ug/L	ND		ND	ND	ND	ND	ND
1,2-Dichloroethane	524.2	1,2-DCA	0.5	0.5	0.4	ug/L	ND		ND	ND	ND	ND	ND
1,1-Dichloroethene	524.2	1,1-DCE	6	0.5	10	ug/L	ND		ND	ND	ND	ND	ND
Cis-1,2-Dichloroethylene	524.2		6	0.5	100	ug/L	ND		ND	ND	ND	ND	ND
Trans-1,2-Dichloroethylene	524.2		10	0.5	60	ug/L	ND		ND	ND	ND	ND	ND
Dichloromethane	524.2	Methylene Chloride	5	0.5	4	ug/L	ND		ND	ND	ND	ND	ND
1,2-Dichloropropane	524.2		5	0.5	0.5	ug/L	ND		ND	ND	ND	ND	ND
1,3-Dichloropropene	524.2		0.5	0.5	0.2	ug/L	ND		ND	ND	ND	ND	ND
Ethylbenzene	524.2		300	0.5	300	ug/L	ND		ND	ND	ND	ND	ND
Monochlorobenzene	524.2	Chlorobenzene	70	0.5	200	ug/L	ND		ND	ND	ND	ND	ND
Styrene	524.2		100	0.5	100	ug/L	ND		ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	524.2		1	0.5	0.1	ug/L	ND		ND	ND	ND	ND	ND
Tetrachloroethylene	524.2	PCE	5	0.5	0.06	ug/L	ND		ND	ND	ND	ND	ND
Toluene	524.2		150	0.5	150	ug/L	ND		ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	524.2	Unsym-trichlorobenzene	5	0.5	5	ug/L	ND		ND	ND	ND	ND	ND
1,1,1-Trichloroethane	524.2	1,1,1-TCA	200	0.5	1000	ug/L	ND		ND	ND	ND	ND	ND
1,1,2-Trichloroethane	524.2	1,1,2-TCA	5	0.5	0.3	ug/L	ND		ND	ND	ND	ND	ND
Trichloroethylene	524.2	TCE	5	0.5	0.8	ug/L	ND		ND	ND	ND	ND	ND
Trichlorofluoromethane	524.2	Freon 11	150	5.0	700.0	ug/L	ND		ND	ND	ND	ND	ND
Trichlorotrifluoroethane	524.2	Freon 113	1200	10.0	4000.0	ug/L	ND		ND	ND	ND	ND	ND
Vinyl Chloride	524.2	VC	0.5	0.5		ug/L	ND		ND	ND	ND	ND	ND
Xylenes (total)	524.2		1750	0.5	1800	ug/L	ND		ND	ND	ND	ND	ND

SOURCE: Treated Water

CONSTITUENT	METHOD		MCL	DLR	PHG/(MCLG)	UNITS					MIN	MAX	AVG
							8/12/2010	5/26/2011	8/11/2011	7/9/2012			
Table 64444 -B (SOC)													
Alachlor	508	Alanex or Lasso	2	1.0	4.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Atrazine	525.2	AAtrex	1	1.0	0.2	ug/L	ND	ND	ND	NA	ND	ND	ND
Bentazon	515.1	Basagran	18	2.0	200.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Benzo (a) pyrene	525.2		0.2	0.1	0.004	ug/L	ND	ND	ND	NA	ND	ND	ND
Carbofuran	531.1	Furadan	18	5.0	1.7	ug/L	ND	ND	ND	NA	ND	ND	ND
Chlordane	508		0.1	0.1	0.03	ug/L	**ND	ND	ND	NA	ND	ND	ND
2,4-D	515.1		70	10.0	70.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Dalapon	515.1	Dowpon	200	10.0	790.0	ug/L	ND	ND	ND	NA	ND	ND	ND
1,2-Dibromo-3-chloropropane	504	DBCP	0.2	0.01		ug/L	ND	ND	ND	NA	ND	ND	ND
Di(2-ethylhexl)adipate			400	5.0	200.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Diethylhexylphthalate	525.2	DEHP	4	3.0	12.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Dinoseb	515.1	DNBP	7	2.0	14.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Diquat			20	4.0	15.0	ug/L	ND		ND	NA	ND	ND	ND
Endothall			100	45.0	580.0	ug/L	ND		ND	NA	ND	ND	ND
Endrin	508		2	0.1	1.8	ug/L	ND	ND	ND	NA	ND	ND	ND
Ethylene Dibromide	504	EDB	0.05	0.02	0.01	ug/L	ND	ND	ND	NA	ND	ND	ND
Glyphosate			700	25.0	1000.0	ug/L	ND		ND	NA	ND	ND	ND
Heptachlor	508		0.01	0.01	0.008	ug/L	ND	ND	ND	NA	ND	ND	ND
Heptachlor Epoxide	508		0.01	0.01	0.006	ug/L	ND	ND	ND	NA	ND	ND	ND
Hexachlorobenzene	508		1	0.05	0.03	ug/L	ND	ND	ND	NA	ND	ND	ND
Hexachlorocyclopentadiene	508		50	1.0	50.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Lindane	508	gamma-BHC	0.2	0.2	0.032	ug/L	ND	ND	ND	NA	ND	ND	ND
Methoxychlor	508		30	10.0	30.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Molinate	525.2	Ordram	20	2.0	1.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Oxamyl	531.1	Vydate		20.0	50.0	ug/L	**ND	ND	ND	NA	ND	ND	ND
Pentachlorophenol	515.1	PCP	1	0.2	0.4	ug/L	ND	ND	ND	NA	ND	ND	ND
Picloram	515.1	Tordon	500	1.0	500.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Polychlorinated Biphenyls	508	PCBs	0.5	0.5	0.09	ug/L	ND	ND	ND	NA	ND	ND	ND
Simazine	525.2	Princep	4	1.0	4.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Thiobencarb	525.2	Bolero	70	1.0	70.0	ug/L	ND	ND	ND	NA	ND	ND	ND
Toxaphene	508		3	1.0	0.03	ug/L	ND	ND	ND	NA	ND	ND	ND
2,3,7,8-TCDD		Dioxin	3E-05	5E-06		ug/L	ND		ND	NA	ND	ND	ND
2,4,5-TP	515.1	Silvex	50	1.0		ug/L	ND	ND	ND	NA	ND	ND	ND
Table 64450-A (Unregulated VOC)													
Bromobenzene	524.2			0.5		ug/L				ND	ND	ND	ND
Bromodichloromethane	524.2			0.5		ug/L	6.8		6.3	3.7	3.7	6.8	5.6
Bromoform	524.2			0.5		ug/L	ND		ND	ND	ND	ND	ND
Bromomethane	524.2	Methyl Bromide		0.5		ug/L				ND	ND	ND	ND
Chlorodibromomethane	524.2			0.5		ug/L	1.2		ND	1.2	ND	1.2	1.2
Chloroethane	524.2			0.5		ug/L				ND	ND	ND	ND
Chloroform	524.2			0.5		ug/L	29		28	20.1	28	29	26
Chloromethane	524.2	Methyl Chloride		0.5		ug/L				ND	ND	ND	ND
2-Chlorotoluene	524.2			0.5		ug/L				ND	ND	ND	ND
4-Chlorotoluene	524.2			0.5		ug/L				ND	ND	ND	ND
Dibromomethane	524.2			0.5		ug/L				ND	ND	ND	ND
1,3-Dichlorobenzene	524.2			0.5		ug/L				ND	ND	ND	ND
Dichlolodifluoromethane	524.2			1.0		ug/L				ND	ND	ND	ND
1,3-Dichloropropane	524.2			0.5		ug/L				ND	ND	ND	ND
2,2-Dichloropropane	524.2			0.5		ug/L				ND	ND	ND	ND
1,1-Dichloropropene	524.2			0.5		ug/L				ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	524.2			0.5		ug/L				ND	ND	ND	ND
1,2,3-Trichloropropane	524.2			0.5		ug/L				ND	ND	ND	ND

**Sample collected on 8/16/10

SOURCE: Treated Water

CONSTITUENT	METHOD	MCL	DLR	PHG/(MCLG)	UNITS					MIN	MAX	AVG
						8/12/2010	5/26/2011	8/11/2011	7/9/2012			
Table 64450-B (Unreg. Organics)												
Bromochloromethane	524.2		0.5		ug/L				ND	ND	ND	ND
Bromacil	525.2		0.5		ug/L				NA	NA	NA	NA
n-Butylbenzene	524.2		0.5		ug/L				ND	ND	ND	ND
sec-Butylbenzene	524.2		0.5		ug/L				ND	ND	ND	ND
tert-Butylbenzene	524.2		0.5		ug/L				ND	ND	ND	ND
Chlorothalonil	508 Daconil, Bravo		0.5		ug/L				NA	NA	NA	NA
Diazinon	525.2		0.5		ug/L				NA	NA	NA	NA
Dimethoate	525.2		0.5		ug/L				NA	NA	NA	NA
Diuron			1.0		ug/L				NA	NA	NA	NA
Ethyl tert butyl ether	524.2 ETBE		3.0		ug/L				ND	ND	ND	ND
Hexachlorobutadiene	524.2		0.5		ug/L				ND	ND	ND	ND
Isopropylbenzene	524.2 Cumene		0.5		ug/L				ND	ND	ND	ND
p-Isopropyltoluene	524.2		0.5		ug/L				ND	ND	ND	ND
Methyl tert-butyl ether	524.2 MTBE		3.0		ug/L	ND		ND	ND	ND	ND	ND
Naphthalene	524.2		0.5		ug/L				ND	ND	ND	ND
1-Phenylpropane	524.2 n-Propybenzne		0.5		ug/L				ND	ND	ND	ND
Prometryn	525.2		2.0		ug/L				NA	NA	NA	NA
Tert amyl methyl ether	524.2 TAME		3.0		ug/L				ND	ND	ND	ND
1,2,3-Trichlorobenzene	524.2		0.5		ug/L				ND	ND	ND	ND
1,2,4-Trimethylbenzene	524.2		0.5		ug/L				ND	ND	ND	ND
1,3,5-Trimethylbenzene	524.2		0.5		ug/L				ND	ND	ND	ND
Table 64450-C (Unreg. Organics)												
Aldicarb	531.1 Temik		3.0		ug/L	ND	ND	ND	NA	ND	ND	ND
Aldicarb sulfoxide	531.1		3.0		ug/L	**ND	ND	ND	NA	ND	ND	ND
Aldicarb sulfone	531.1		4.0		ug/L	ND	ND	ND	NA	ND	ND	ND
Aldrin	508		0.075		ug/L				NA	NA	NA	NA
Butachlor	525.2		0.38		ug/L				NA	NA	NA	NA
Carbaryl	531.1		5.0		ug/L	ND	ND	ND	NA	ND	ND	ND
Dicamba	515.1 Banvel		0.081		ug/L				NA	NA	NA	NA
Dieldrin	508		0.02		ug/L				NA	NA	NA	NA
3 - Hydroxycarbofuran	531.1		3.0		ug/L	ND	ND	ND	NA	ND	ND	ND
Methomyl	531.1		2.0		ug/L	ND	ND	ND	NA	ND	ND	ND
Metolachlor	525.2				ug/L				NA	NA	NA	NA
Metribuzin	525.2				ug/L				NA	NA	NA	NA
Propachlor	508 Caparol		2.0		ug/L				NA	NA	NA	NA
Table 64450-D												
Boron	200.7 & 200.8		100		ug/L				NA	NA	NA	NA
Chromium VI	218.6 Hexavalent Chromium		1		ug/L				NA	NA	NA	NA
Dichlorodifluoromethane	524.2 Freon 12		0.5		ug/L				ND	ND	ND	ND
Ethyl-tert-methyl ether	524.2 ETBE		0.5		ug/L				ND	ND	ND	ND
Perchlorate			4		ug/L	***ND		ND	ND	ND	ND	ND
tert-Amyl-methyl ether	524.2 TAME		3		ug/L				ND	ND	ND	ND
tert-Butyl alcohol	524.2 TBA		2		ug/L				NA	NA	NA	NA
1,2,3,-trichloropropane	504.1 TCP		0.005		ug/L				ND	ND	ND	ND
Vanadium	200.8 & 200.9		3		ug/L				3.0	3.0	3.0	3.0
Section 64441 - Radioactivity												
Gross Alpha		15	1.0		pCi/L	ND		ND	NA	ND	ND	ND
Gross Beta		50	4.0		pCi/L	0.0067		0.34	NA	0.0067	0.3	0.2
Radium 226			0.5	50	pCi/L				NA	NA	NA	NA
Radium 228			0.5	19	pCi/L				NA	NA	NA	NA
Uranium		20	2.0	430.0	pCi/L				NA	NA	NA	NA
Strontium 90		8	2.0	350.0	pCi/L				NA	NA	NA	NA
Tritium		20000	1000.0	400000.0	pCi/L				NA	NA	NA	NA

**Sample collected on 8/16/10

***Sample collected on 11/30/10

City of West Sacramento - Bryte Bend Water Treatment Plant

SOURCE: Treated Water

CONSTITUENT	METHOD	MCL	DLR	PHG/(MCLG)	UNITS						MIN	MAX	AVG
						8/11/2011	7/9/2012	9/24/2013	3/13/2014	8/7/2014			
64432 - Primary (IOC)													
Aluminum (Al)		1000	50	600	ug/L	39	30	50	NA	39	30	50	40
Antimony (Sb)		6.0	6.0	20.0	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Arsenic		50	2.0	0.004	ug/L	1.3	ND	1.4	NA	1.2	ND	1.4	1.35
Barium (Ba)		1000	2.0	2000.0	ug/L	23	19	21	NA	20	19	23	21
Beryllium (Be)		4	1.0	0.1	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Cadmium (Cd)		5	1.0		ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Chromium (Total Cr)		50	10		ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Chromium (Total Cr - Cr VI screen)			1.0		ug/L				NA		NA	NA	NA
Chromium , hexavalent (Cr VI)			1.0		ug/L	ND[1]	NA	NA	NA	NA	ND	ND	ND
Copper		1300	2.0	170.0	ug/L	ND[1]	ND	ND	NA	ND	ND	0.0	ND
Cyanide		150		150.0	ug/L	ND[1]	ND	ND	NA	ND	ND	ND	ND
Mercury (Hg)		2	1.0	1.2	ug/L	ND[1]	ND	ND	NA	ND	ND	ND	ND
Nickel (Ni)		100	5.0	12.0	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Selenium (Se)		50	5.0	50.0	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Thallium (Tl)		2	1.0	0.1	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Lead (Pb)		50 (AL = 15)	0.5	2.0	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
64432 - Fluoride													
Fluoride		1.4 - 2.4	0.05	1000	mg/L		0.5	0.87	NA	0.86	0.5	0.87	0.74
64432.2 - Asbestos													
Asbestos		7	0.2	7	MFL	<0.2	NA	NA	NA	NA	<0.2	<0.2	<0.2
64432.1 - Nitrate/ Nitrite													
Nitrate (as NO3)		45	2.0	10.0	mg/L	ND[1]	ND	ND	NA	ND	ND	ND	ND
Nitrite (N02)(as N)		1000	300.0	1000.0	ug/L	ND[1]	ND	ND	NA	ND	ND	ND	ND
Total Nitrate/Nitrite		10000	400.0		ug/L	ND[1]	ND	ND	NA	ND	ND	ND	ND
64449-A - Secondary Standards													
Aluminum (Al)		200	20		ug/L	39	30	50	NA	39	30	50	40
Foaming Agent (MBAS)		0.5	0.05		mg/L	NA	ND	ND	NA	ND	ND	ND	ND
Iron (Fe)		300	20		ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Manganese (Mn)		50	2		ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Methyl tert-butyl ether	MTBE	5	0.5	13	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Odor		3	1		TON	ND	ND	2.0	NA	2.0	ND	2.0	2
64449-B - Secondary Standards													
TDS		500 - 1000 (1500)	10		mg/L	100	80	86	NA	84	80	100	88
Specific Conductance		900 - 1600 (2200)	2		umho/cm	160	124	170	NA	180	124	180	159
Chloride (Cl)		250 - 500 (600)	1		mg/L	6.4	6.0	7.5	NA	6.7	6.0	7.5	6.7
Sulfate (as SO4)		250 - 500 (600)	0.5	0.5	mg/L	6.8	5.0	6.1	NA	6.7	5.0	6.8	6.2
pH (25 C)		6.5 - 8.5			Units	8.1	8.2	8.5	NA	8	8	8.5	8.2

SOURCE: **Treated Water**

CONSTITUENT	METHOD		MCL	DLR	PHG/(MCLG)	UNITS						MIN	MAX	AVG
							8/11/2011	7/9/2012	9/24/2013	3/13/2014	8/7/2014			
64449 (h) - General Mineral														
Bicarbonate				2		mg/L	60	60	79	NA	73	60	79	68
Carbonate				2		mg/L	ND	ND	ND	NA	ND	ND	ND	ND
Hydroxide Alkalinity				2		mg/L	ND	ND	ND	NA	ND	ND	ND	ND
Total Alkalinity				2		mg/L	60	50	65	NA	60	50	65	59
Calcium (Ca)				1		mg/L	13	10	12	NA	13	10	13	12
Magnesium (Mg)				0.1		mg/L	7.0	5.0	7.1	NA	7.6	5.0	7.6	6.7
Sodium (Na)				1		mg/L	13	6.0	11	NA	14	6	14	11
Potassium (K)				1		mg/L	0.95	1.0	1.3	NA	1.2	0.95	1.3	1.1
Hardness (as CaCO3)				3		mg/L	62	46	59	NA	64	46	64	58
Aggressiveness Index				1			11	NA	11	NA	11	11	11	11
Langlier Index				1		mg.L		NA	-0.80	NA	-0.50	-0.50	-0.80	-0.65
Table 64444 -A (VOC)														
Benzene	524.2		1	0.5	0.15	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Carbon Tetrachloride	524.2		0.5	0.5	0.1	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,2-Dichlorobenzene	524.2	o-Dichlorobenzene	600	0.5	600	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,4-Dichlorobenzene	524.2	p-DCB	5	0.5	6	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,1-Dichloroethane	524.2	1,1-DCA	5	0.5	3	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,2-Dichloroethane	524.2	1,2-DCA	0.5	0.5	0.4	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,1-Dichloroethene	524.2	1,1-DCE	6	0.5	10	ug/L	ND	ND	NA	NA	NA	ND	ND	ND
Cis-1,2-Dichloroethylene	524.2		6	0.5	100	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Trans-1,2-Dichloroethylene	524.2		10	0.5	60	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Dichloromethane	524.2	Methylene Chloride	5	0.5	4	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,2-Dichloropropane	524.2		5	0.5	0.5	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,3-Dichloropropene	524.2		0.5	0.5	0.2	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Ethylbenzene	524.2		300	0.5	300	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Monochlorobenzene	524.2	Chlorobenzene	70	0.5	200	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Styrene	524.2		100	0.5	100	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	524.2		1	0.5	0.1	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Tetrachloroethylene	524.2	PCE	5	0.5	0.06	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Toluene	524.2		150	0.5	150	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,2,4-Trichlorobenzene	524.2	Unsym-trichlorobenzene	5	0.5	5	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,1,1-Trichloroethane	524.2	1,1,1-TCA	200	0.5	1000	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
1,1,2-Trichloroethane	524.2	1,1,2-TCA	5	0.5	0.3	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Trichloroethylene	524.2	TCE	5	0.5	0.8	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Trichlorofluoromethane	524.2	Freon 11	150	5.0	700.0	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Trichlorotrifluoroethane	524.2	Freon 113	1200	10.0	4000.0	ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Vinyl Chloride	524.2	VC	0.5	0.5		ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Xylenes (total)	524.2		1750	0.5	1800	ug/L	ND	ND	ND	NA	ND	ND	ND	ND

SOURCE: **Treated Water**

CONSTITUENT	METHOD		MCL	DLR	PHG/(MCLG)	UNITS						MIN	MAX	AVG
							8/11/2011	7/9/2012	9/24/2013	3/13/2014	8/7/2014			
Table 64444 -B (SOC)														
Alachlor	508	Alanex or Lasso	2	1.0	4.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Atrazine	525.2	AAtrex	1	1.0	0.2	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Bentazon	515.1	Basagran	18	2.0	200.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Benzo (a) pyrene	525.2		0.2	0.1	0.004	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Carbofuran	531.1	Furadan	18	5.0	1.7	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Chlordane	508		0.1	0.1	0.03	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
2,4-D	515.1		70	10.0	70.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Dalapon	515.1	Dowpon	200	10.0	790.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	504	DBCP	0.2	0.01		ug/L	ND	NA	NA	NA	ND	ND	ND	ND
Di(2-ethylhexl)adipate			400	5.0	200.0	ug/L	ND	NA	NA	ND	ND	ND	ND	ND
Diethylhexylphthalate	525.2	DEHP	4	3.0	12.0	ug/L	ND	NA	NA	ND	NA	ND	ND	ND
Dinoseb	515.1	DNBP	7	2.0	14.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Diquat			20	4.0	15.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Endothall			100	45.0	580.0	ug/L	ND	NA	ND	ND	NA	ND	ND	ND
Endrin	508		2	0.1	1.8	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	504	EDB	0.05	0.02	0.01	ug/L	ND	NA	ND	NA	ND	ND	ND	ND
Glyphosate			700	25.0	1000.0	ug/L	ND	NA	NA	ND	NA	ND	ND	ND
Heptachlor	508		0.01	0.01	0.008	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	508		0.01	0.01	0.006	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	508		1	0.05	0.03	ug/L	ND	NA	NA	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	508		50	1.0	50.0	ug/L	ND	NA	NA	0.0690	ND	ND	0.069	0.069
Lindane	508	gamma-BHC	0.2	0.2	0.032	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Methoxychlor	508		30	10.0	30.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Molinate	525.2	Ordram	20	2.0	1.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Oxamyl	531.1	Vydate		20.0	50.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Pentachlorophenol	515.1	PCP	1	0.2	0.4	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Picloram	515.1	Tordon	500	1.0	500.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls	508	PCBs	0.5	0.5	0.09	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Simazine	525.2	Princep	4	1.0	4.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Thiobencarb	525.2	Bolero	70	1.0	70.0	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Toxaphene	508		3	1.0	0.03	ug/L	ND	NA	ND	ND	ND	ND	ND	ND
2,3,7,8-TCDD		Dioxin	3E-05	5E-06		ug/L	ND	NA	NA	ND	ND	ND	ND	ND
2,4,5-TP	515.1	Silvex	50	1.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Table 64450-A (Unregulated VOC)														
Bromobenzene	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Bromodichloromethane	524.2			0.5		ug/L	6.3	3.7	4.8	5	5	3.7	6.3	5.0
Bromoform	524.2			0.5		ug/L	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	524.2	Methyl Bromide		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Chlorodibromomethane	524.2			0.5		ug/L	ND	1.2	0.65	0.62	0.71	ND	1.2	0.8
Chloroethane	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Chloroform	524.2			0.5		ug/L	28	20.1	18	25	20	18	28	22
Chloromethane	524.2	Methyl Chloride		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
2-Chlorotoluene	524.2			0.5		ug/L		ND	NA	NA	NA	ND	ND	ND
4-Chlorotoluene	524.2			0.5		ug/L		ND	NA	NA	NA	ND	ND	ND
Dibromomethane	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
1,3-Dichlorobenzene	524.2			0.5		ug/L		ND	NA	NA	ND	ND	ND	ND
Dichlolodifluoromethane	524.2			1.0		ug/L		ND	ND	NA	ND	ND	ND	ND
1,3-Dichloropropane	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
2,2-Dichloropropane	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
1,1-Dichloropropene	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
1,2,3-Trichloropropane	524.2			0.5		ug/L		ND	ND	NA	ND	ND	ND	ND

SOURCE: **Treated Water**

CONSTITUENT	METHOD	MCL	DLR	PHG/(MCLG)	UNITS						MIN	MAX	AVG
						8/11/2011	7/9/2012	9/24/2013	3/13/2014	8/7/2014			
Table 64450-B (Unreg. Organics)													
Bromochloromethane	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Bromacil	525.2		0.5		ug/L		NA	ND	ND	ND	NA	NA	NA
n-Butylbenzene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
sec-Butylbenzene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
tert-Butylbenzene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Chlorothalonil	508	Daconil, Bravo	0.5		ug/L		NA	ND	ND	NA	NA	NA	NA
Diazinon	525.2		0.5		ug/L		NA	ND	ND	ND	NA	NA	NA
Dimethoate	525.2		0.5		ug/L		NA	ND	ND	ND	NA	NA	NA
Diuron			1.0		ug/L		NA	NA	NA	NA	NA	NA	NA
Ethyl tert butyl ether	524.2	ETBE	3.0		ug/L		ND	ND	NA	NA	ND	ND	ND
Hexachlorobutadiene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Isopropylbenzene	524.2	Cumene	0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
p-Isopropyltoluene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Methyl tert-butyl ether	524.2	MTBE	3.0		ug/L	ND	ND	ND	NA	ND	ND	ND	ND
Naphthalene	524.2		0.5		ug/L		ND	ND	ND	ND	ND	ND	ND
1-Phenylpropane	524.2	n-Propybenzne	0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Prometryn	525.2		2.0		ug/L		NA	NA	NA	NA	NA	NA	NA
Tert amyl methyl ether	524.2	TAME	3.0		ug/L		ND	ND	NA	ND	ND	ND	ND
1,2,3-Trichlorobenzene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
1,2,4-Trimethylbenzene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
1,3,5-Trimethylbenzene	524.2		0.5		ug/L		ND	ND	NA	ND	ND	ND	ND
Table 64450-C (Unreg. Organics)													
Aldicarb	531.1	Temik	3.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Aldicarb sulfoxide	531.1		3.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Aldicarb sulfone	531.1		4.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Aldrin	508		0.075		ug/L		NA	ND	ND	ND	NA	NA	NA
Butachlor	525.2		0.38		ug/L		NA	NA	ND	ND	NA	NA	NA
Carbaryl	531.1		5.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Dicamba	515.1	Banvel	0.081		ug/L		NA	NA	ND	ND	NA	NA	NA
Dieldrin	508		0.02		ug/L		NA	ND	ND	ND	NA	NA	NA
3 - Hydroxycarbofuran	531.1		3.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Methomyl	531.1		2.0		ug/L	ND	NA	ND	ND	ND	ND	ND	ND
Metolachlor	525.2				ug/L		NA	NA	ND	ND	NA	NA	NA
Metribuzin	525.2				ug/L		NA	NA	ND	ND	NA	NA	NA
Propachlor	508	Caparol	2.0		ug/L		NA	NA	ND	ND	NA	NA	NA
Table 64450-D													
Boron	200.7 & 200.8		100		ug/L		NA	NA	NA	NA	NA	NA	NA
Chromium VI	218.6	Hexavalent Chromium	1		ug/L		NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	524.2	Freon 12	0.5		ug/L		ND	ND	NA	NA	ND	ND	ND
Ethyl-tert-methyl ether	524.2	ETBE	0.5		ug/L		ND	ND	NA	NA	ND	ND	ND
Perchlorate			4		ug/L	ND	ND		ND	ND	ND	ND	ND
tert-Amyl-methyl ether	524.2	TAME	3		ug/L		ND	ND	NA	ND	ND	ND	ND
tert-Butyl alcohol	524.2	TBA	2		ug/L		NA	NA	NA	NA	NA	NA	NA
1,2,3,-trichloropropane	504.1	TCP	0.005		ug/L		ND	ND	NA	ND	ND	ND	ND
Vanadium	200.8 & 200.9		3		ug/L		3.0	NA	NA	NA	3.0	3.0	3.0
Section 64441 - Radioactivity													
Gross Alpha		15	1.0		pCi/L	ND	NA	NA	NA	NA	ND	ND	ND
Gross Beta		50	4.0		pCi/L	0.34	NA	NA	NA	NA	0.3400	0.3	0.3
Radium 226			0.5	50	pCi/L		NA	NA	NA	NA	NA	NA	NA
Radium 228			0.5	19	pCi/L		NA	NA	NA	NA	NA	NA	NA
Uranium		20	2.0	430.0	pCi/L		NA	NA	NA	ND	NA	NA	NA
Strontium 90		8	2.0	350.0	pCi/L		NA	NA	NA	ND	NA	NA	NA
Tritium		20000	1000.0	400000.0	pCi/L		NA	NA	NA	ND	NA	NA	NA

City of Sacramento

Sacramento River Water Treatment Plant

Sample Date	Total Coliform	E. Coli
1/4/2010	1300	4
1/11/2010	790	13
1/19/2010	5400	490
4/12/2010	16000	700
4/15/2010	9208	1918
4/19/2010	1300	110
4/26/2010	1300	43
5/3/2010	1700	23
5/10/2010	1400	33
5/17/2010	280	7
5/24/2010	1700	17
5/31/2010	940	49
6/7/2010	490	22
6/13/2010	350	49
6/21/2010	170	6
6/27/2010	460	49
7/5/2010	94	7
7/12/2010	490	13
7/19/2010	790	23
7/26/2010	490	14
8/2/2010	1700	40
8/9/2010	3500	49
8/16/2010	700	17
8/23/2010	490	11
8/30/2010	2400	490
9/6/2010	5400	110
9/13/2010	700	140
9/20/2010	790	79
9/27/2010	330	4
10/4/2010	220	33
10/11/2010	700	33
10/18/2010	1100	70
10/25/2010	21000	3400
11/1/2010	1733	24
11/8/2010	>16000	490
11/15/2010	580	6
11/22/2010	770	52
2/2/2011	710	36
2/7/2011	220	13
2/14/2011	520	20

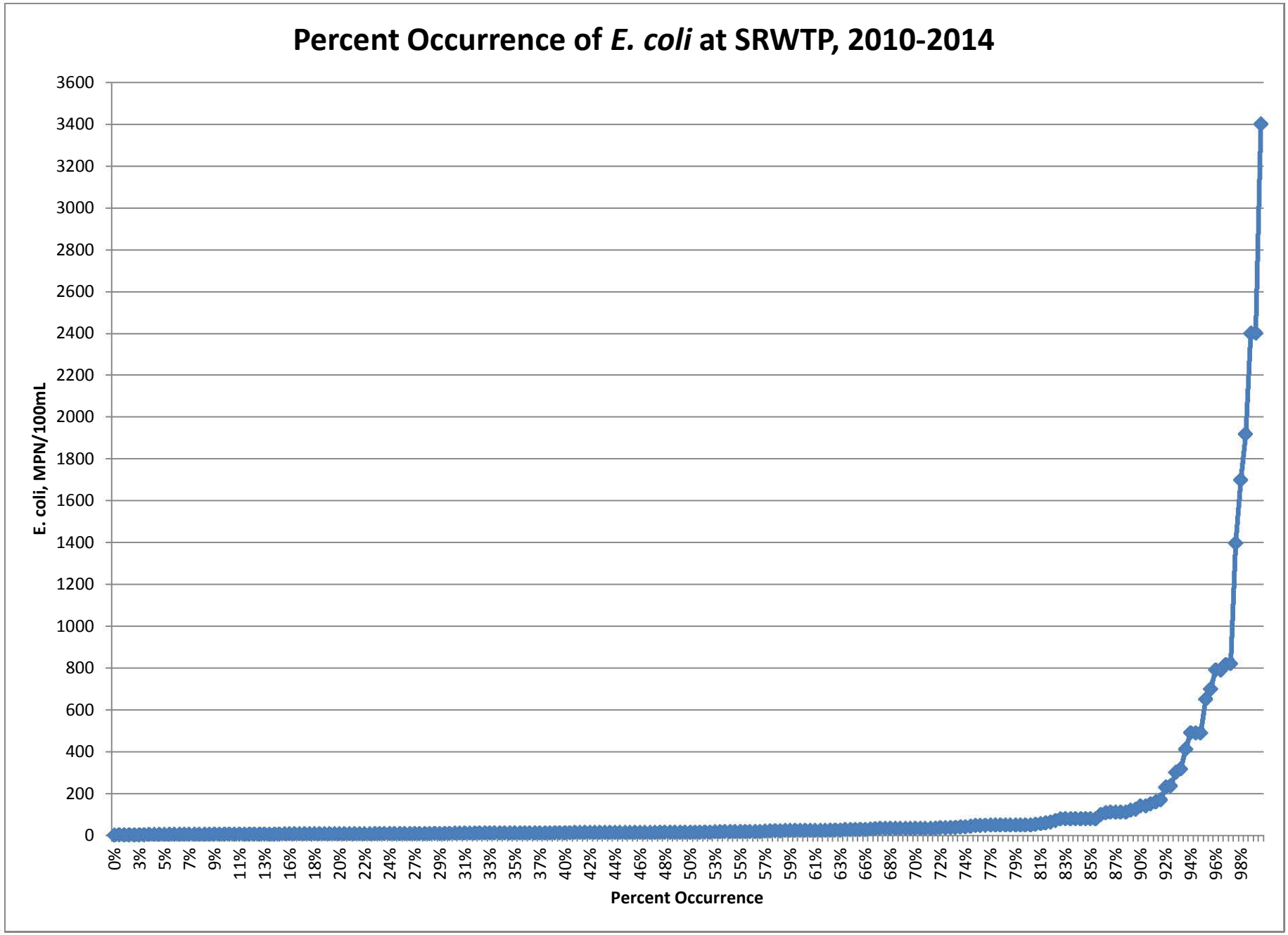
2/22/2011	16000	790
3/1/2011	170	170
3/7/2011	1300	230
3/14/2011	12000	1700
3/16/2011	8164	816
3/21/2011	2500	160
3/28/2011	330	79
4/6/2011	>2400	7
4/8/2011	1800	12
4/11/2011	330	17
4/18/2011	280	6
4/25/2011	700	79
5/2/2011	1700	4
5/9/2011	700	23
5/16/2011	5800	110
5/23/2011	430	33
5/30/2011	1200	23
6/6/2011	1700	33
6/13/2011	1600	15
6/20/2011	816	7
6/27/2011	330	49
7/4/2011	350	49
7/11/2011	330	27
7/18/2011	140	4
7/26/2011	700	6.3
8/1/2011	840	4.1
8/8/2011	330	79
8/15/2011	1700	49
8/22/2011	1500	12
8/29/2011	790	47
9/6/2011	1700	23
9/12/2011	1100	13
9/19/2011	790	13
9/26/2011	330	7
10/2/2011	280	6
10/10/2011	>2400	33
10/11/2011	24000	820
10/18/2011	1300	11
10/24/2011	650	4.1
10/30/2011	790	13
11/7/2011	>2400	79
11/9/2011	3900	32

11/14/2011	1100	7.4
11/21/2011	2400	59
11/28/2011	>2400	>2400
11/29/2011	1300	13
2/7/2012	690	28
2/10/2012	1600	28
2/13/2012	310	16
2/20/2012	870	14
2/21/2012	550	22
2/27/2012	410	7
3/5/2012	200	5.1
3/12/2012	530	8.6
3/19/2012	3600	300
3/26/2012	2500	99
4/2/2012	9200	110
4/10/2012	1050	28
4/17/2012	1800	140
4/23/2012	730	11
4/30/2012	1600	23
5/7/2012	460	13
5/14/2012	1100	13
5/21/2012	700	13
5/28/2012	790	33
6/4/2012	790	13
6/11/2012	460	13
6/18/2012	3500	7
6/28/2012	1700	8.5
7/2/2012	1100	49
7/9/2012	630	33
7/16/2012	1300	33
7/23/2012	3500	23
7/30/2012	880	11
8/6/2012	5400	17
8/13/2012	490	11
8/20/2012	3500	14
8/27/2012	2200	79
9/4/2012	2000	8.6
9/10/2012	1300	79
9/17/2012	3500	6
9/24/2012	1100	11
10/1/2012	490	7
10/8/2012	2400	33
10/15/2012	1300	27

10/22/2012	1700	49
10/29/2012	700	13
11/5/2012	1700	23
11/14/2012	613	4.1
11/19/2012	3800	120
11/26/2012	1400	31
12/3/2012	21000	2400
12/10/2012	2753	40.2
12/17/2012	1785	33.6
12/24/2012	19350	1396
12/31/2012	4350	47.2
1/7/2013	2900	125
1/14/2013	3500	11
1/21/2013	430	11
1/28/2013	920	25
2/4/2013	300	6.3
2/11/2013	390	17
2/20/2013	240	8
2/25/2013	325	14.8
3/4/2013	1700	13
3/11/2013	49	7.8
3/18/2013	170	3.1
3/25/2013	350	9.8
4/1/2013	>16000	790
4/8/2013	512	24.6
4/15/2013	920	8.5
4/22/2013	789	9.4
4/29/2013	260	17
5/6/2013	2800	6.3
5/13/2013	1400	2
5/20/2013	1600	14
5/27/2013	1126	10.9
6/3/2013	1022	10.9
6/10/2013	1565	10.8
6/17/2013	980	5.2
6/24/2013	770	5.2
7/1/2013	790	11
7/8/2013	770	5.2
7/15/2013	730	5.2
7/22/2013	730	6.3
7/29/2013	1300	14
8/5/2013	1700	6.2
8/12/2013	1000	7.4

8/19/2013	1664	7.4
8/26/2013	1050	6.3
9/2/2013	980	3.1
9/9/2013	1100	7.4
9/16/2013	580	2
9/23/2013	9200	78
9/30/2013	610	7.2
10/7/2013	210	2
10/14/2013	368	6.3
10/21/2013	350	5.1
10/28/2013	907	2
11/4/2013	800	11
11/11/2013	12000	2
11/18/2013	3200	14
11/25/2013	2200	11
12/2/2013	520	13
12/9/2013	700	14
3/3/2014	6900	650
3/10/2014	2500	63
3/17/2014	2400	36
3/24/2014	870	17.1
4/1/2014	2500	150
4/7/2014	1500	38
4/15/2014	460	3.1
4/21/2014	613	4.1
4/28/2014	2000	29
5/5/2014	460	5.2
5/12/2014	690	17
5/19/2014	1400	13
5/26/2014	920	9.8
6/2/2014	1414	6.3
6/9/2014	1300	7.3
6/16/2014	921	3.1
6/23/2014	687	5.1
6/30/2014	490	2
7/7/2014	1300	7.4
7/14/2014	1120	9.7
7/21/2014	816	12.2
7/28/2014	770	11
8/4/2014	1414	14.6
8/11/2014	1120	7.3
8/18/2014	816	9.6
8/25/2014	1120	20.9

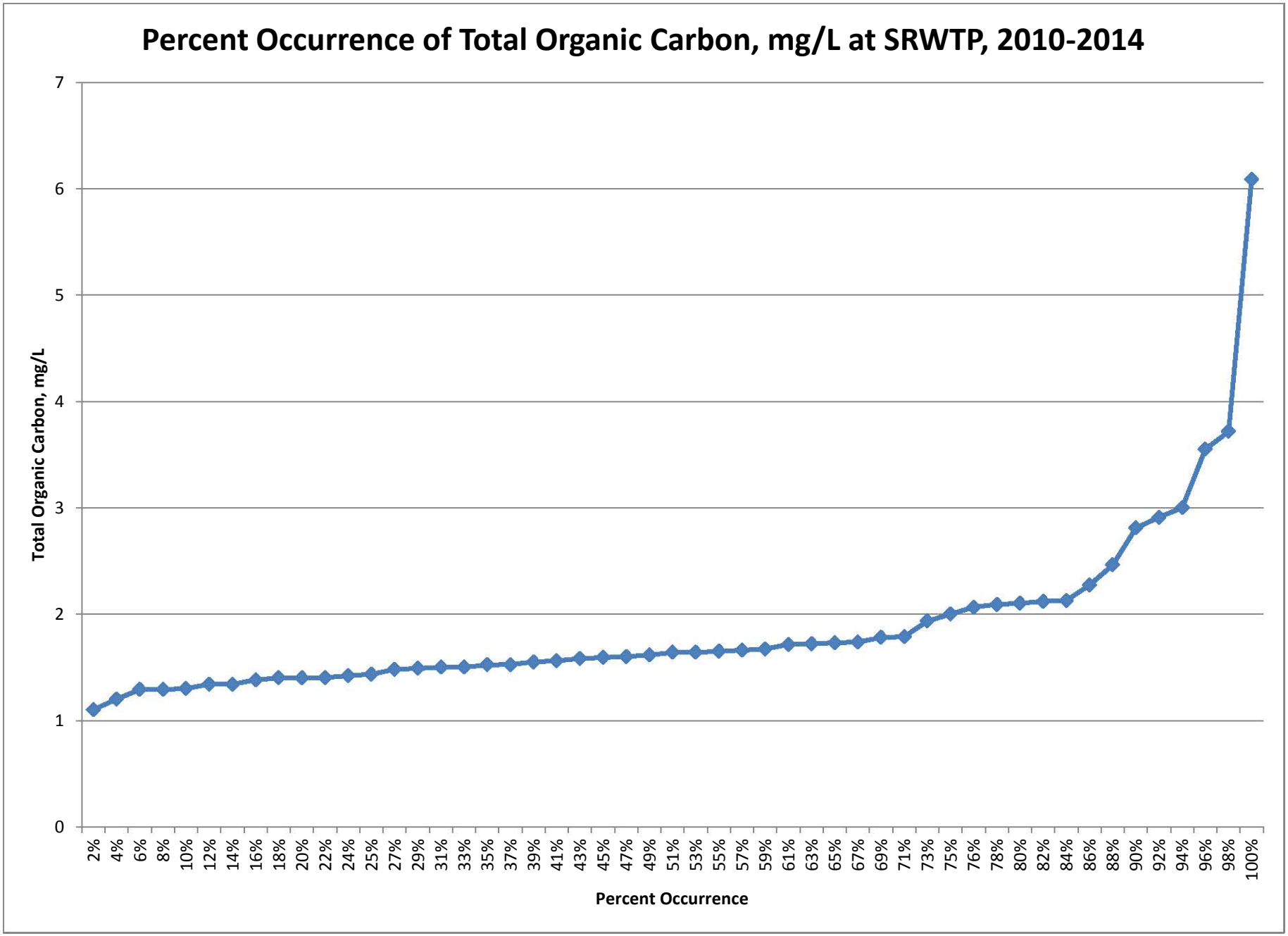
9/1/2014	2000	12
9/8/2014	770	14
9/15/2014	770	7.4
9/22/2014	560	0
9/29/2014	6900	38
10/6/2014	648.8	8.5
10/13/2014	435	6.2
10/20/2014	260.2	4.1
10/27/2014	220.9	13
10/29/2014	280.9	5.2
11/3/2014	2382	108.1
11/10/2014	361	6.3
11/17/2014	410.6	16.1
11/24/2014	649	22.6
12/1/2014	2900	55
12/8/2014	4106	236
12/16/2014	1246	316.9
12/22/2014	7215	411
12/29/2014	2419	46.4


Percent Occurrence of E. coli at SRWTP, 2010-2014
E. coli, MPN/100mL
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0%
3%
5%
7%
9%
11%
13%
16%
18%
20%
22%
24%
27%
29%
31%
33%
35%
37%
40%
42%
44%
46%
48%
50%
53%
55%
57%
59%
61%
63%
66%
68%
70%
72%
74%
77%
79%
81%
83%
85%
87%
90%
92%
94%
96%
98%
Percent Occurrence

Total Organic Carbon (ppm)

collectdate	SRWTP Tap 01 (Raw)	SRWTP Tap 09 (Filter Effluent)
04-Jan-10	2.0	1.3
05-May-10	1.3	0.8
02-Jun-10	1.6	1.1
02-Jul-10	1.3	0.9
06-Aug-10	1.5	1.1
01-Sep-10	1.4	1.0
22-Oct-10	1.1	0.8
01-Nov-10	1.6	1.1
01-Feb-11	1.7	1.0
01-Mar-11	3.0	1.6
01-Apr-11	2.1	1.2
02-May-11	1.3	0.7
01-Jun-11	1.5	0.9
01-Jul-11	1.7	1.1
08-Aug-11	1.5	1.1
01-Sep-11		1.0
06-Sep-11	1.3	
03-Oct-11	1.3	0.9
01-Nov-11	1.4	0.9
03-Feb-12	2.9	1.8
01-Mar-12	2.1	1.6
02-Apr-12	2.8	1.5
01-May-12	1.7	1.0
01-Jun-12	1.7	1.1
02-Jul-12	1.4	0.9
01-Aug-12	1.2	0.8
04-Sep-12	1.6	1.2
01-Oct-12	1.4	1.1
01-Nov-12	1.6	1.1
04-Dec-12	6.1	2.4
01-Jan-13	3.6	2.1
01-Feb-13	2.1	1.4
01-Mar-13	1.8	1.2
01-Apr-13	2.5	1.7
01-May-13	1.5	1.1
03-Jun-13	2.1	1.5
01-Jul-13	1.6	1.3
01-Aug-13	1.6	1.2
02-Sep-13	1.7	1.3
02-Oct-13	1.6	1.1
01-Nov-13	1.7	1.4
02-Dec-13	2.3	1.7
02-Mar-14	3.7	2.4
01-Apr-14	2.1	1.3

01-May-14	1.6	1.4
02-Jun-14	1.7	1.4
01-Jul-14	1.4	1.1
01-Aug-14	1.4	1.1
02-Sep-14	1.5	1.3
01-Oct-14	1.5	1.2
04-Nov-14	1.8	1.2
01-Dec-14	1.9	1.5


Percent Occurrence of Total Organic Carbon, mg/L at SRWTP, 2010-2014
Total Organic Carbon, mg/L
0
1
2
3
4
5
6
7
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%
22%
24%
25%
27%
29%
31%
33%
35%
37%
39%
41%
43%
45%
47%
49%
51%
53%
55%
57%
59%
61%
63%
65%
67%
69%
71%
73%
75%
76%
78%
80%
82%
84%
86%
88%
90%
92%
94%
96%
98%
100%
Percent Occurrence

System Name: SACRAMENTO MAIN 3410020 Year: 2012 Quarter: 1

Year:	2010				2011				2012			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	03/09/10	06/08/10	09/07/10	12/07/10	01/11/11	04/12/11	07/12/11	10/11/11	01/10/12			
Site 1	47	48	46	39	36	53	47	45	26			
Site 2	38	46	48	39	36	37	50	40	27			
Site 3	43	50	49	38	34	16	37	35	25			
Site 4	40	46	42	24	34	37	52	57	22			
Site 5	33	43	46	54	37	41	61	56	28			
Site 6	34	47	50	38	39	54	50	32	28			
Site 7	0	0	27	0	37	50	42	47	29			
Site 8	0	0	1.3	0	37	42	60	40	28			
Site 9	0	0.64	0.52	0	38	43	61	41	28			
Site 10	0	0	0	0	39	48	56	69	28			
Site 11	50	54	52	39	34	43	40	45	23			
Site 12	50	54	50	39	o/s	37	36	45	17			
Quarterly Average	27.9	32.4	34.3	25.8	36.4	41.7	49.4	46.0	25.7			
Running Annual Average				30.1	32.2	34.6	38.4	43.4	40.7			
Meets Standard?*	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☐	Yes ☐	Yes ☐
(check box)	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐
Number of Samples Taken	12	12	12	12	11	12	12	12	12			

☑

State of California Department of Health Services
Drinking Water Program

Quarterly HAA5 Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: SACRAMENTO MAIN 3410020 Year: 2012 Quarter: 1

Year:	2010				2011				2012			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	03/09/10	06/08/10	09/07/10	12/07/10	01/11/11	04/12/11	07/12/11	10/11/11	01/10/12			
Site 1	21	20	30	22	22	20	18	27	15			
Site 2	28	23	34	25	22	15	19	15	16			
Site 3	29	46	33	29	23	10	20	25	14			
Site 4	28	21	27	17	28	28	25	34	14			
Site 5	25	40	31	14	23	24	25	22	12			
Site 6	27	40	32	24	25	23	25	27	14			
Site 7	0	0	24	0	21	23	23	28	14			
Site 8	0	0	0	0	24	20	24	18	14			
Site 9	0	0	0	0	23	21	26	22	15			
Site 10	0	0	0	0	24	21	24	22	15			
Site 11	22	25	33	22	23	24	25	25	13			
Site 12	25	20	28	23	o/s	26	23	28	12			
Quarterly Average	17.1	19.6	22.7	14.7	23.5	21.3	23.1	24.4	14.0			
Running Annual Average	21.5	19.4	18.7	18.5	20.1	20.5	20.6	23.1	20.7			
Meets Standard?*	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☑	Yes ☐	Yes ☐	Yes ☐
(check box)	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐	No ☐
Number of Samples Taken	12	12	12	12	11	12	12	12	12			

State of California Department of Health Services
Drining Water Program

System Name: SACRAMENTO MAIN
System No.: 3410020

Disinfection Byproducts LRAA Compliance (Stage 2)

Year: 2012 **Quarter:** 4

		TTHM, ppb				HAA5, ppb			
Sample Date		1/10/2012	4/10/2012	7/10/2012	10/9/2012	1/10/2012	4/10/2012	7/10/2012	10/9/2012
1SA	Quarterly Result	26	58	44	38	15	28	15	15
	LRAA	*n/a*	*n/a*	*n/a*	*42*	*n/a*	*n/a*	*n/a*	*18*
1SI	Quarterly Result	27	54	64	63	16	30	27	21
	LRAA	*n/a*	*n/a*	*n/a*	*52*	*n/a*	*n/a*	*n/a*	*23*
2319 E St.	Quarterly Result	25	46	43	36	14	38	15	15
	LRAA	*n/a*	*n/a*	*n/a*	*37*	*n/a*	*n/a*	*n/a*	*21*
3S6	Quarterly Result	22	57	51	55	14	37	29	26
	LRAA	*n/a*	*n/a*	*n/a*	*46*	*n/a*	*n/a*	*n/a*	*26*
3SB	Quarterly Result	28	73	61	60	12	34	31	22
	LRAA	*n/a*	*n/a*	*n/a*	*55*	*n/a*	*n/a*	*n/a*	*25*
404 Blue Dolphin	Quarterly Result	28	56	53	43	14	31	19	16
	LRAA	*n/a*	*n/a*	*n/a*	*45*	*n/a*	*n/a*	*n/a*	*20*
5SC	Quarterly Result	29	57	47	38	14	31	19	16
	LRAA	*n/a*	*n/a*	*n/a*	*43*	*n/a*	*n/a*	*n/a*	*20*
5SE	Quarterly Result	28	65	61	54	14	35	29	20
	LRAA	*n/a*	*n/a*	*n/a*	*52*	*n/a*	*n/a*	*n/a*	*24*
5SF	Quarterly Result	28	64	77	49	15	28	26	14
	LRAA	*n/a*	*n/a*	*n/a*	*54*	*n/a*	*n/a*	*n/a*	*21*
5SJ	Quarterly Result	23	61	75	67	15	31	28	23
	LRAA	*n/a*	*n/a*	*n/a*	*57*	*n/a*	*n/a*	*n/a*	*24*
7467 S. Land Park	Quarterly Result	23	57	43	36	13	31	19	17
	LRAA	*n/a*	*n/a*	*n/a*	*40*	*n/a*	*n/a*	*n/a*	*20*
SRWTP	Quarterly Result	17	41	34	27	12	33	15	12
	LRAA	*n/a*	*n/a*	*n/a*	*29*	*n/a*	*n/a*	*n/a*	*18*

State of California Department of Health Services

Drining Water Program

Disinfection Byproducts Stage 2 Compliance (LRAA)

Quarter: 4

		TTHM, µg/L				HAA5, µg/L			
	Sample Date	1/10/2013	4/9/2013	7/9/2013	10/8/2013	1/10/2013	4/9/2013	7/9/2013	10/8/2013
1SA	Quarterly Result	52	46	50	46	41	36	24	22
	LRAA	*48*	*45*	*46*	*49*	*25*	*27*	*29*	*31*
1SI*	Quarterly Result	46	49	54	59	37	24	35	24
	LRAA	*57*	*56*	*53*	*52*	*29*	*27*	*29*	*30*
2319 E St.	Quarterly Result	37	51	55	50	42	27	22	25
	LRAA	*40*	*42*	*45*	*48*	*28*	*25*	*26*	*29*
3S6	Quarterly Result	55	40	50	60	40	35	31	27
	LRAA	*55*	*50*	*50*	*51*	*33*	*32*	*33*	*33*
3SB	Quarterly Result	66	49	57	60	40	29	34	26
	LRAA	*65*	*59*	*58*	*58*	*32*	*31*	*31*	*32*
4N12*	Quarterly Result	--	60	73	54	--	30	23	21
	LRAA	*n/a*	*n/a*	*67*	*62*	*n/a*	*n/a*	*27*	*25*
404 Blue Dolphin	Quarterly Result	71	56	57	47	40	33	26	28
	LRAA	*56*	*56*	*57*	*58*	*26*	*27*	*29*	*32*
5SC	Quarterly Result	53	50	57	49	42	34	24	25
	LRAA	*49*	*47*	*49*	*52*	*27*	*28*	*29*	*31*
5SE	Quarterly Result	54	53	60	50	44	35	33	24
	LRAA	*58*	*55*	*55*	*54*	*32*	*32*	*33*	*34*
5SF	Quarterly Result	60	50	56	55	46	29	28	23
	LRAA	*62*	*59*	*53.8*	*55*	*29*	*29*	*29*	*32*
5SJ	Quarterly Result	74	56	60	61	37	31	30	22
	LRAA	*69*	*68*	*64*	*63*	*30*	*30*	*30*	*30*
7467 S. Land Park	Quarterly Result	53	46	48	40	46	32	24	26
	LRAA	*47*	*45*	*46*	*47*	*28*	*28*	*30*	*32*
SRWTP	Quarterly Result	42	45	39	40	35	35	21	19
	LRAA	*36*	*37*	*38*	*41*	*24*	*24*	*26*	*28*

*Both 1SI and 4N12 will be sampled until four quarters of data for 4N12 are collected, at which point sampling at 1SI will be concluded. Attachment confirms DPH acceptance of monitoring plan change.

DISINFECTION BYPRODUCTS STAGE 2 COMPLIANCE

System Name:	City of Sacramento Main	System Number:	3410020
Contact Person:	Pravani Vandeyar	Telephone Number:	916-808-3765
		Quarter:	2014 Q4

Total Trihalomethanes (TTHMs), µg/L

	Sample Quarter				Calculations	
Site	2014Q1	2014Q2	2014Q3	2014Q4	LRAA	Op. Eval.
2319 E St.	23	51	58	44	44	49
404 Blue Dolphin	27	115	73	48	66	71
7467 South Land Park Dr.	24	58	56	45	46	51
Sampler 1SA	25	59	61	46	48	53
Sampler 3S6	23	62	67	65	54	65
Sampler 3SB	24	104	74	68	68	79
Sampler 4N12	10	74	82	44	52	61
Sampler 5SC	24	89	66	49	57	63
Sampler 5SE	25	70	86	57	60	68
Sampler 5SF	25	81	59	57	55	63
Sampler 5SJ	27	123	69	73	73	84*
SRWTP Tap 13 (Treated)	O/S	39	39	32	37	36

Is the system in compliance for TTHMs? (All LRAA < MCL of 80 µg/L) Yes

Haloacetic Acids (HAA5), µg/L

	Sample Quarter				Calculations	
Site	2014Q1	2014Q2	2014Q3	2014Q4	LRAA	Op. Eval.
2319 E St.	21	22	36	26	27	28
404 Blue Dolphin	24	60	39	26	37	38
7467 South Land Park Dr.	24	41	39	26	33	33
Sampler 1SA	23	24	32	24	26	26
Sampler 3S6	20	35	42	47	36	43
Sampler 3SB	23	47	41	47	39	45
Sampler 4N12	5	52	32	18	27	30
Sampler 5SC	24	58	36	28	37	38
Sampler 5SE	22	46	41	32	35	38
Sampler 5SF	22	46	36	29	33	35
Sampler 5SJ	25	47	36	31	35	36
SRWTP Tap 13 (Treated)	O/S	20	29	19	23	22

Is the system in compliance for HAA5? (All LRAA < MCL of 60 µg/L) Yes

O/S: Sacramento River Water Treatment Plant Out of Service for routine cleaning and maintenance.

*: Operational Evaluation report forthcoming. DDW notified on 12/9/14.

Signature: _____ Date: 12/9/2014

Aluminum (ppb)

collectdate	SRWTP Tap 01 (Raw)	SRWTP Tap 13 (Treated)
10-Aug-10	89	<50
18-Aug-11	129	<50
21-Aug-12	96	<50
06-Aug-13	249	<50
07-Aug-14	189	51

Iron (ppb)

collectdate	SRWTP Tap 01 (Raw)	SRWTP Tap 13 (Treated)
21-Aug-12	135	<100
06-Aug-13	359	<100
07-Aug-14	297	<100

Manganese (ppb)

collectdate	SRWTP Tap 01 (Raw)	SRWTP Tap 13 (Treated)
21-Aug-12	22.6	<20
06-Aug-13	<20	<20
07-Aug-14	<20	<20

Sacramento County Water Agency

Vineyard Water Treatment Plant

Date	Total Coliform	Fecal Coliform	E. coli	TOC (Finish)	TOC (Raw)	Alkalinity	
9/8/2011	800		9				
9/13/2011	5000	170	13				
9/14/2011				1.4	1.9		69
9/19/2011	1300		13				
9/26/2011	700		17				
10/4/2011	500	80	23				
10/11/2011	7000		500				
10/12/2011				0.92	2		49
10/17/2011	220		13				
10/24/2011	130		6				
10/31/2011	1300		11				
11/8/2011	1300	30	30				
11/9/2011				1.3	1.6		56
11/15/2011	1100		22				
11/21/2011	80		< 2				
11/29/2011	280		11				
12/8/2011	140	7	7				
12/12/2011	170		4				
12/14/2011				1.0	1.5		60
12/19/2011	170		4				
12/27/2011	300		8				
1/3/2012	300	14	9				
1/9/2012	280		4				
1/11/2012				1.1	1.5		96
1/12/2012	170		3				
1/25/2012	21000		2000				
2/6/2012	300	30	30				
2/8/2012				1.7	2		83
2/14/2012	900		30				
2/21/2012	500		13				
2/27/2012	80		8				
3/5/2012	170	50	9				
3/12/2012	500		4				
3/14/2012				1.1	1.4		71
3/19/2012	3000		230				

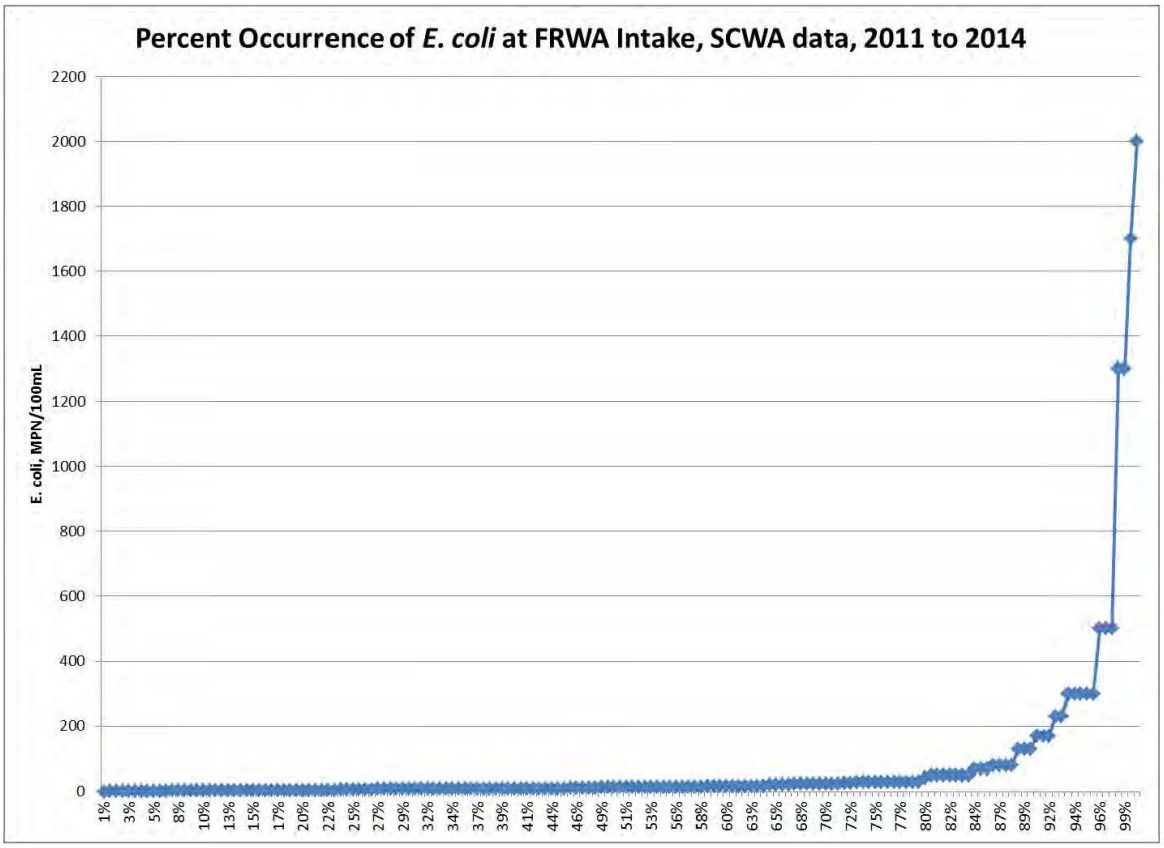
3/26/2012	3000		23			
4/2/2012	1400	170	170			
4/9/2012	1100		23			
4/11/2012				1.6	1.8	59
4/16/2012	5000		130			
4/23/2012	1700		2			
4/30/2012	220		13			
5/7/2012	300	17	17			
5/9/2012				1.1	1.4	83
5/14/2012	500		4			
5/21/2012	800		30			
5/29/2012	500		23			
6/4/2012	500	80	80			
6/11/2012	300		22			
6/13/2012				1.4	1.7	54
6/18/2012	500		7			
6/25/2012	800		17			
7/2/2012	700	27	9			
7/9/2012	300		4			
7/11/2012				1.3	1.5	51
7/16/2012	500		8			
7/23/2012	300		8			
7/30/2012	800		30			
8/6/2012	1300	17	8			
8/8/2012				1.6	1.4	56
8/13/2012	700		4			
8/21/2012	800		4			
8/27/2012	500		2			
9/4/2012	800	30	13			
9/8/2012				1.2	1.8	71
9/10/2012	500		8			
9/17/2012	800		4			
9/24/2012	800		70			
10/1/2012	300	50	8			
10/9/2012	300		4			
10/11/2012				0.9	1.2	50
10/15/2012	500		2			
10/22/2012	700		50			

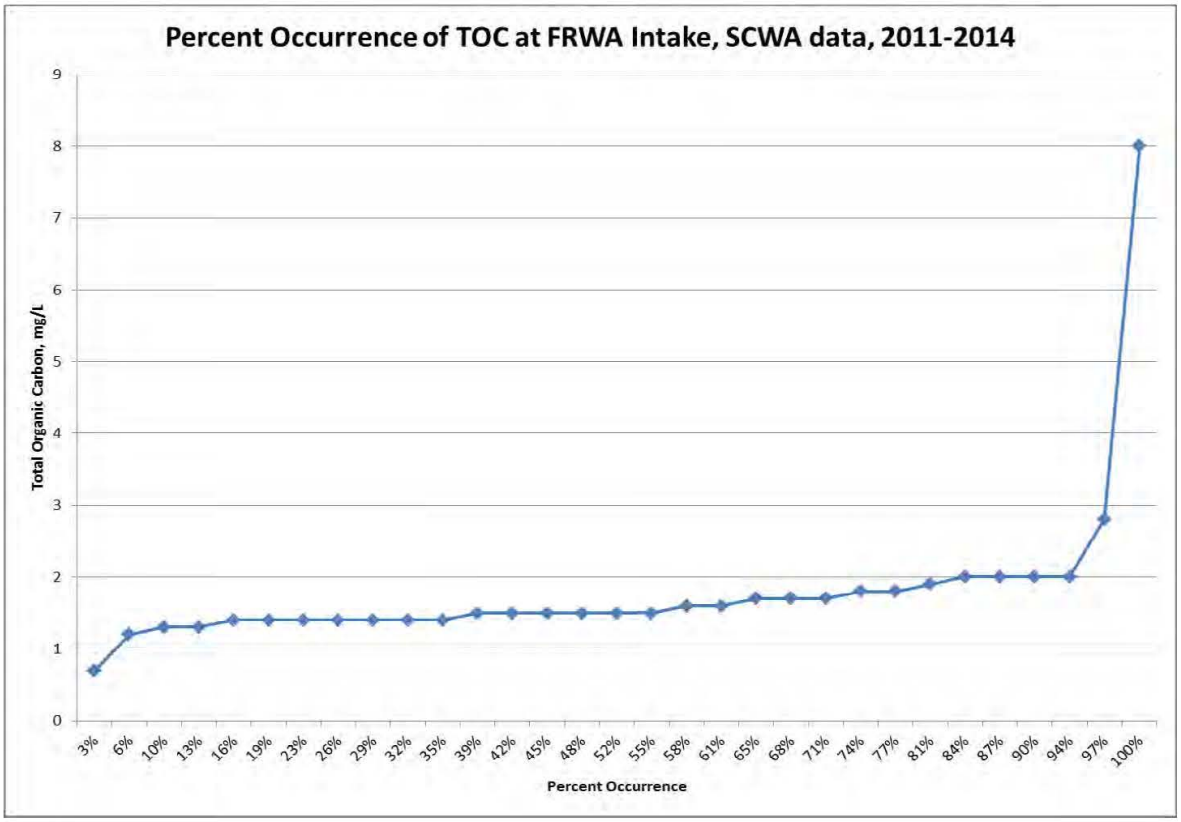
10/29/2012	700		7			
11/5/2012	500	30	13			
11/8/2012				0.96	1.5	59
11/14/2012	130		4			
11/19/2012	1700		170			
11/26/2012	1300		70			
12/3/2012	24000	1700	1700	0.66	2.8	68
12/10/2012	5000		130			
12/17/2012	5000		130			
12/19/2012						
12/24/2012	22000		1300			
1/2/2013	1300	50	14			
1/7/2013	7000		230			
1/14/2013	1400		7			
1/16/2013				1.1	2	71
1/22/2013	500		4			
2/5/2013	170	30	30			
2/11/2013	300		8			
2/13/2013				1.4	1.7	72
2/20/2013	110		8			
2/26/2013	170		2			
4/1/2013	30000	500	300			
4/9/2013	130		13			
4/15/2013	170		17			
4/18/2013				1.1	1.7	63
4/22/2013	80		2			
4/29/2013	500		50			
5/6/2013	1100	30	30			
5/8/2013				0.67	1.3	58
5/13/2013	300		30			
5/20/2013	500		4			
5/28/2013	110		50			
6/6/2013	300	70	26			
6/10/2013	300		50			
6/13/2013				0.91	1.6	64
6/17/2013	500		4			
6/24/2013	500		8			

7/1/2013	2300	110	42			
7/8/2013	300		9			
7/10/2013				1.2	1.4	56
7/15/2013	500		13			
7/22/2013	2300		8			
7/29/2013	1700		14			
8/5/2013	800	17	4			
8/12/2013	800		4			
8/15/2013				1.1	1.4	71
8/19/2013	230		17			
8/26/2013	1100		4			
9/3/2013	3000	30	11			
9/9/2013	300		4			
9/11/2013				0.93	1.3	73
9/16/2013	800		2			
9/23/2013	3000		300			
9/30/2013	500		22			
10/7/2013	300	22	8			
10/9/2013				0.68	0.7	60
10/15/2013	230		4			
10/21/2013	170		8			
10/28/2013	2300		170			
11/4/2013	800	26	26			
11/12/2013	11000		4			
11/13/2013				0.99	1.4	72
11/18/2013	1700		8			
11/27/2013	1100		8			
12/2/2013	500	9	9			
12/9/2013	1100		23			
12/11/2013				1.5	2	81
12/18/2013	220		2			
12/30/2013	170		8			
1/6/2014	30	4	4			
					TOC monitoring moved to	
1/13/2014	170		4		quarterly	
1/21/2014	8		8			
1/27/2014	30		2			
2/3/2014	300	7	7			

2/10/2014	8000		80			
2/18/2014	500		10			
2/24/2014	110		4			
3/3/2014	5000	500	500			
3/10/2014	1300		23			
3/17/2014	300		23			
3/24/2017	700		11			
3/26/2014				1.5	1.5	83
3/31/2014	3000		80			
4/7/2014	1300	30	30			
4/15/2014	230		17			
4/22/2014	1700		8			
4/28/2014	5000		13			
5/5/2014	230	30	11			
5/12/2014	800		22			
5/19/2014	700		13			
5/27/2014	300		14			
6/4/2014	900	2	2			
6/9/2014	2200		4			
6/16/2014	1700		9			
6/18/2014				1	1.4	55
6/23/2014	1700		13			
7/1/2014	500	13	8			
7/7/2014	350		8			
7/14/2014	800		14			
7/23/2014	300		4			
7/28/2014	800		23			
8/4/2014	900	22	17			
8/11/2014	800		17			
8/18/2014	500		9			
8/26/2014	1100		2			
9/2/2014	1700	130	8			
9/9/2014	1100		8			
9/12/2014				1.2	1.5	8
9/15/2014	350		30			
9/23/2014	170		4			
9/30/2014	3000		70			

10/7/2014	2300	500	300			
10/14/2014	110		13			
10/20/2014	280		17			
10/27/2014	1700		50			
11/5/2014	500	50	50			
11/10/2014	500		50			
11/18/2014	700		17			
11/26/2014	130		30			
12/1/2014	2200	300	300			
12/8/2014	3000		500			
12/15/2014	13000		1300			
12/22/2014	5000		300			
12/29/2014	800		80			
1/5/2015	1700	50	50			
12/10/2014				1.2	8	68
1/12/2015	500		14			
1/20/2015	110		11			
1/26/2015	130		8			


Percent Occurrence of *E. coli* at FRWA Intake, SCWA data, 2011 to 2014
E. coli, MPN/100mL
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1%
3%
5%
8%
10%
13%
15%
17%
20%
22%
25%
27%
29%
32%
34%
37%
39%
41%
44%
46%
49%
51%
53%
56%
58%
60%
63%
65%
68%
70%
72%
75%
77%
80%
82%
84%
87%
89%
92%
94%
96%
99%


Percent Occurrence of TOC at FRWA Intake, SCWA data, 2011-2014
Total Organic Carbon, mg/L
9
8
7
6
5
4
3
2
1
0
3%
6%
10%
13%
16%
19%
23%
26%
29%
32%
35%
39%
42%
45%
48%
52%
55%
58%
61%
65%
68%
71%
74%
77%
81%
84%
87%
90%
94%
97%
100%
Percent Occurrence

State of California
Drinking Water Program

Department of Health Services

Quarterly TTHM Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: **SCWA - Laguna / Vineyard / CCE / Grantline 99** System No.: **3410029** Year: **2011** Quarter: 4th

Year:	2009				2010				2011				2012				2013			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	Feb-09	May-09	Aug-09	Nov-09	Feb-10	May-10	Aug-10	Nov-10	Feb-11	May-11	Aug-11	Nov-11								
Site 1 - Clay Glen Way									5.0	34.0	53.0	17.0								
Site 2 - Claudied Way									2.4	2.3	1.6	12.0								
Site 3 - H. Wackman Park									4.3	0.0	0.0	17.0								
Site 4 - Jones Family									0.0	0.0	0.0	7.7								
Site 5 - Womack Park	2.6	1.1	42.0	1.9	0.0	6.4	23.0	2.1	4.9	4.8	7.3	20.0								
Site 6 - Walt Davis	0.0	0.0	0.0	1.8	1.8	0.0	0.0	0.0	4.0	0.6	0.0	11.0								
Site 7 - Fite Park	0.6	0.0	50.0	5.9	0.0	36.0	57.0	2.5	4.1	53.0	49.0	13.0								
Site 8 - E. Stockton	4.0	1.4	2.2	3.1	2.4	0.6	0.5	2.2	3.0	2.9	2.3	3.3								
Site 9 - Laguna Quail	0.6	0.0	0.6	0.0	0.0	40.0	62.0	2.3												
Site 10 - Clay Glen	1.4	1.3	67.0	9.2	3.0	40.0	64.0	1.2												
Site 11 - Izzy	3.0	2.0	1.3	2.5	1.3	2.3	1.8	4.4												
Site 12 - Mountain Bell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4												
Quarterly Average	1.4	1.3	20.4	3.1	1.1	15.7	26.0	2.0	3.5	12.2	14.2	12.6								
Running Annual Average	5.3	1.5	6.0	6.5	6.4	10.0	11.5	11.2	11.8	10.9	8.0	10.6								
Meets Standard?* (check box)	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Number of Samples Taken	26	26	8	8	8	8	8	8	8	8	8	8								

Identify the sample locations in the table below.

Site	Sample Location
1	8710 Clay Glen Way
2	5424 Claudied Way
3	Howard Wackman Park
4	Jones Family park
5	Womack Park
6	Walt Davis Park
7	Fite Park
8	10535D E. Stockton Blvd.
9	5817 Laguna Quail Way
10	8724 Clay Glen Way
11	10290 Izzy Way
12	8422 Mountain Bell Court
29	10435 Saddle Creek Drive
30	10145 Cavalletti Drive

Comments: Sites 1 - 4 are new locations as of 1st Quarter 2011.

Aaron Wyley
Signature

12/13/2011
Date

*If, during the first year of monitoring, any individual quarter's average will cause the running annual average of that system to exceed the standard, then the system is out of compliance at the end of that quarter.

State of California
Drinking Water Program

Department of Health Services

Quarterly HAA5 Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: **SCWA - Laguna / Vineyard / CCE / Grantline 99** System No.: **3410029** Year: **2011** Quarter: 4th

Year:	2009				2010				2011				2012				2013			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	Feb-09	May-09	Aug-09	Nov-09	Feb-10	May-10	Aug-10	Nov-10	Feb-11	May-11	Aug-11	Nov-11								
Site 1 - Clay Glen Way									11.0	17.0	27.0	14.0								
Site 2 - Claudied Way									0.0	0.0	0.0	4.9								
Site 3 - H. Wackman Park									7.0	0.0	0.0	13.0								
Site 4 - Jones Family Park									0.0	0.0	0.0	8.0								
Site 5 - Womack Park	0.0	0.0	23.0	2.3	0.0	0.0	14.0	0.0	6.6	1.3	5.8	12.0								
Site 6 - Walt Davis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	9.8								
Site 7 - Fite Park	0.0	0.0	14.0	1.1	0.0	26.0	27.0	0.0	7.5	21.0	25.0	11.0								
Site 8 - E. Stockton	1.6	0.0	0.0	1.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
Site 9 - Laguna Quail	0.0	0.0	0.0	0.0	0.0	24.0	26.0	0.0												
Site 10 - Clay Glen	0.0	0.0	32.0	3.5	0.0	24.0	27.0	0.0												
Site 11 - Izzy	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0												
Site 12 - Mountain Bell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0												
Quarterly Average	0.1	0.1	8.6	1.2	0.2	9.3	11.8	0.0	6.3	4.9	7.2	9.1								
Running Annual Average	1.2	0.1	2.2	2.5	2.5	4.8	5.6	5.3	6.8	5.7	4.6	6.9								
Meets Standard?* (check box)	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☐ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☐ No ☐	Yes ☑ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Number of Samples Taken	26	26	8	8	8	8	8	8	8	8	8	8								

Identify the sample locations in the table below.

Site	Sample Location
1	8710 Clay Glen Way
2	5424 Claudied Way
3	Howard Wackman Park
4	Jones Family park
5	Womack Park
6	Walt Davis Park
7	Fite Park
8	10535D E. Stockton Blvd.
9	5817 Laguna Quail Way
10	8724 Clay Glen Way
11	10290 Izzy Way
12	8422 Mountain Bell Court
29	10435 Saddle Creek Drive
30	10145 Cavalletti Drive

Comments: Sites 1 - 4 are new locations as of 1st Quarter 2011.

Aaron Wyley
Signature

12/13/2011
Date

*If, during the first year of monitoring, any individual quarter's average will cause the running annual average of that system to exceed the standard, then the system is out of compliance at the end of that quarter.

State of California
Drinking Water Program

Department of Health Services

Quarterly TTHM Report for Disinfection Byproducts Compliance (in μg/L or ppb)

System Name: SCWA - Laguna / Vineyard / CCE / Grantline 99 System No.: 3410029 Year: 2014 Quarter: 4th

Year:	2011				2012				2013				2014				2015			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	Feb-11	May-11	Aug-11	Nov-11	Feb-12	May-12	Aug-12	Nov-12	Feb-13	May-13	Aug-13	Nov-13	Feb-14	Jun-14	Aug-14	Nov-14				
Site 1 - Vineyard Point									25.0	27.0	32.0	33.0	0.0	49.0	33.0	32.0				
Site 2 - Joseph Perry Park									23.0	18.0	22.0	23.0	0.0	26.0	18.0	10.0				
Site 3 - Miwok Park									20.0	6.3	3.3	17.0	1.3	4.8	6.3	12.0				
Site 4 - Clay Glen Way	5.0	34.0	53.0	17.0	54.0	34.0	20.0	13.0	20.0	25.0	28.0	25.0	2.1	21.0	29.0	13.0				
Site 5 - Jones Family	0.0	0.0	0.0	7.7	31.0	35.0	22.0	19.0	10.0	20.0	21.0	23.0	0.0	15.0	17.0	9.1				
Site 6 - Womack Park	4.9	4.8	7.3	20.0	19.0	7.6	6.6	14.0	13.0	15.0	11.0	17.0	4.3	9.8	22.0	13.0				
Site 7 - Walt Davis	4.0	0.6	0.0	11.0	30.0	30.0	14.0	15.0	11.0	24.0	26.0	28.0	1.2	19.0	16.0	11.0				
Site 8 - Fite Park	4.1	53.0	49.0	13.0	34.0	29.0	17.0	24.0	15.0	19.0	27.0	23.0	0.9	12.0	19.0	12.0				
Site 9 - H. Wackman Park	4.3	0.0	0.0	17.0	34.0	2.5	4.9	19.0												
Site 10 - Claudied Way	2.4	2.3	1.6	12.0	4.3	11.0	1.4	0.9												
Site 11 - E. Stockton	3.0	2.9	2.3	3.3	2.9	4.0	0.5	0.8												
Site 12																				
Quarterly Average	3.5	12.2	14.2	12.6	26.2	19.1	10.8	13.2	17.1	19.3	21.3	23.6	1.2	19.6	20.0	14.0				
Running Annual Average	11.8	10.9	8.0	10.6	16.3	18.0	17.2	17.3	15.1	15.1	17.7	20.3	16.4	16.4	16.1	13.7				
Meets Standard?* (check box)	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Number of Samples Taken	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				

Identify the sample locations in the table below.

Site	Sample Location
1	Vineyard Point Apartments
2	Joseph Perry Park
3	Miwok Park
4	8710 Clay Glen Way
5	Jones Family Park
6	Womack Park
7	Walt Davis Park
8	Fite Park
9	Howard Wackman Park
10	5424 Claudied Way
11	10535 D E. Stockton Blvd.
12	

Comments: As of the 1st Quarter 2013, Sites 1 - 3 are new locations and site locations 9 - 11 are no longer used for DBP reporting.

Signature

11/26/2014
Date

*If, during the first year of monitoring, any individual quarter's average will cause the running annual average of that system to exceed the standard, then the system is out of compliance at the end of that quarter.

State of California
Drinking Water Program

Department of Health Services

Quarterly HAA5 Report for Disinfection Byproducts Compliance (in µg/L or ppb)

System Name: SCWA - Laguna / Vineyard / CCE / Grantline 99 System No.: 3410029 Year: 2014 Quarter: 4th

Year:	2011				2012				2013				2014				2015			
Quarter:	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Sample Date (month/date):	Feb-11	May-11	Aug-11	Nov-11	Feb-12	May-12	Aug-12	Nov-12	Feb-13	May-13	Aug-13	Nov-13	Feb-14	Jun-14	Aug-14	Nov-14				
Site 1 - Vineyard Point									21.0	18.0	22.0	22.0	0.0	31.0	21.0	16.0				
Site 2 - Joseph Perry Park									9.4	15.0	21.0	18.0	0.0	20.0	17.0	7.7				
Site 3 - Miwok Park									16.0	4.7	2.3	11.0	0.0	3.5	5.2	6.0				
Site 4 - Clay Glen Way	11.0	17.0	27.0	14.0	37.0	17.0	15.0	8.4	14.0	16.0	19.0	19.0	0.0	17.0	14.0	6.2				
Site 5 - Jones Family	0.0	0.0	0.0	8.0	33.0	22.0	17.0	18.0	8.7	18.0	20.0	18.0	0.0	14.0	14.0	5.0				
Site 6 - Womack Park	6.6	1.3	5.8	12.0	12.0	4.2	4.1	11.0	8.7	9.5	5.9	9.2	0.0	5.5	8.4	5.0				
Site 7 - Walt Davis	18.0	0.0	0.0	9.8	34.0	21.0	13.0	9.7	7.7	16.0	18.0	18.0	0.0	14.0	11.0	5.8				
Site 8 - Fite Park	7.5	21.0	25.0	11.0	29.0	20.0	14.0	17.0	13.0	15.0	18.0	16.0	0.0	7.8	12.0	5.6				
Site 9 - H. Wackman Park	7.0	0.0	0.0	13.0	33.0	2.7	5.0	15.0												
Site 10 - Claudied Way	0.0	0.0	0.0	4.9	0.0	3.9	0.0	0.0												
Site 11 - E. Stockton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0												
Site 12																				
Quarterly Average	6.3	4.9	7.2	9.1	22.3	11.4	8.5	9.9	12.3	14.0	15.8	16.4	0.0	14.1	12.8	7.2				
Running Annual Average	6.8	5.7	4.6	6.9	10.9	12.5	12.8	13.0	10.5	11.2	13.0	14.6	11.6	11.6	10.8	8.5				
Meets Standard?* (check box)	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☑ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Number of Samples Taken	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				

Identify the sample locations in the table below.

Site	Sample Location
1	Vineyard Point Apartments
2	Joseph Perry Park
3	Miwok Park
4	8710 Clay Glen Way
5	Jones Family Park
6	Womack Park
7	Walt Davis Park
8	Fite Park
9	Howard Wackman Park
10	5424 Claudied Way
11	10535 D E. Stockton Blvd.
12	

Comments: As of the 1st Quarter 2013, Sites 1 - 3 are new locations and site locations 9 - 11 are no longer used for DBP reporting.

Signature

11/26/2014
Date

*If, during the first year of monitoring, any individual quarter's average will cause the running annual average of that system to exceed the standard, then the system is out of compliance at the end of that quarter.

DEPARTMENT OF WATER RESOURCES
Sacramento County Water Agency (SCWA)
10151 Florin Road
SACRAMENTO, CA 95829
Last Update:

Chemical Monitoring Schedule
Vineyard

Well Number: VSWTP
Sample Year: 2014
Well Name:
System Number:
Status: Active - Treated Surface Water
PS Code: 3410029-097

Constituent(s)	MCL (mg/L) (u.o.n.)	Date Last Sampled	Next Sampling Period	9/28/2011	9/13/2012	9/11/2013	9/12/2014
Inorganics (Section 64432, Table 64432-A)							
Aluminum	1	9/11/2013	9/2014	ND	ND	ND	ND
Antimony	0.006	NR	NR				
Arsenic	0.01	NR	NR				
Barium	1	NR	NR				
Beryllium	0.004	NR	NR				
Cadmium	0.005	NR	NR				
Chromium (DLR = 1ppb)	0.05	NR	NR				
Cyanide	0.15	NR	NR				
Flouride	2	NR	NR				
Lead	AL=0.015	NR	NR				
Mercury	0.002	NR	NR				
Nickel	0.1	NR	NR				
Perchlorate	0.006	NR	NR				
Selenium	0.05	NR	NR				
Thallium	0.002	NR	NR				
Secondary Standards (Section 64449, Table 64449-A)							
Aluminum	0.2	9/11/2013	9/2014	ND	ND	ND	ND
pH, Lab	6.5-8.5	NR	NR				
Aggressive Index	Non-corrosive	NR	NR				
Corrosivity (Langelier Index)	Non-corrosive	NR	NR				
Color	15 units	NR	NR				
Copper	1	NR	NR				
Foaming Agents (MBAS)	0.5	NR	NR				
Iron at WTP	0.3	9/11/2013	9/2014	ND	ND	ND	ND
Manganese at WTP	0.05	9/11/2013	9/2014	ND	ND	ND	ND
Methyl-tert-butyl-ether (MTBE)	0.005	NR	NR				

Constituent(s)	MCL (mg/L) (u.o.n.)	Date Last Sampled	Next Sampling Period	9/28/2011	9/13/2012	9/11/2013	9/12/2014
Odor - Threshold	3 units	NR	NR				
Silver	0.1	NR	NR				
Thiobencarb	0.001	NR	NR				
Turbidity, Lab	5 NTU	NR	NR				
Zinc	5	NR	NR				
Secondary Standards (Section 64449, Table 64449-B)							
Total Dissolved Solids (TDS)	1000	NR	NR				
Specific Conductance (E.C.)	1600 microhms	NR	NR				
Chloride	500	NR	NR				
Sulfate	500	NR	NR				

Waiver Type or Footnote:

1. Not required by DPH.
2. Waived per DPH Drinking Water Monitoring Schedule, dated November 14, 2008.

Abbreviations:

AL	Action Level
DPH	Department of Public Health
HAL	Health Advisory Level
MCL	Maximum Contaminant Level
MFL	Million Fibers Per Liter
mg/L	Milligrams Per Liter

DEPARTMENT OF WATER RESOURCES
Chemical Monitoring Schedule
10151 Florin Road
SACRAMENTO, CA 95829
Last Update:

Chemical Monitoring Schedule
Vineyard

Well Number: FRWA
Sample Year: 2014
Well Name: Active - Raw Surface Water Source
System Number: 3410029-096

Constituent(s)	MCL (mg/L) (u.o.n.)	Next Sampling Period	Results					Annual Average
			9/28/2011	9/12/2012	11/8/2012	9/11/2013	9/12/2014	
Inorganics (Section 64432, Table 64432-A) (See note 1)								
Aluminum	1000	9/2015	ND	ND		ND	160	ND
Antimony	0.006	9/2015	ND	ND		ND	ND	ND
Arsenic	0.01	9/2015	ND	ND		ND	ND	ND
Barium	1	9/2015	ND	ND		ND	ND	ND
Beryllium	0.004	9/2015	ND	ND		ND	ND	ND
Cadmium	0.005	9/2015	ND	ND		ND	ND	ND
Chromium (DLR = 1ppb)	0.05	9/2015	ND	ND		ND	ND	ND
Cyanide	0.15	9/2015	ND	ND		ND	ND	ND
Flouride	2	9/2015	ND	ND		ND	ND	ND
Mercury	0.002	9/2015	ND	ND		ND	ND	ND
Nickel	0.1	9/2015	ND	ND		ND	ND	ND
Perchlorate	0.006	9/2015	ND	ND		ND	ND	ND
Selenium	0.05	9/2015	ND	ND		ND	ND	ND
Thallium	0.002	9/2015	ND	ND		ND	ND	ND
Secondary Standards (Section 64449, Table 64449-A)								
Aluminum	0.2	9/2015	0.18	0.46		0.15	0.16	0.26
pH, Lab	6.5-8.5	9/2015	8.1	8.1		8.1	8	8.07
Aggressive Index	Non-corrosive	9/2015			11	11	12	11.33
Corrosivity (Langelier Index)	Non-corrosive	9/2015			-0.67	-0.41	-0.41	-0.50
Color	15 units	9/2015	15	20		15	15	16.67
Copper	1	9/2015	ND	ND		ND	ND	ND
Foaming Agents (MBAS)	0.5	9/2015	<0.050	<0.050		<0.050	<0.050	<0.050
Iron	0.3	9/2015	0.27	0.68		0.25	0.24	0.39
Manganese	0.05	9/2015	ND	0.034		ND	ND	0.03
Methyl-tert-butyl-ether (MTBE)	0.005	9/2015	ND	ND		ND	ND	ND
Odor - Threshold	3 units	9/2015	2	ND		4	4	4.00
Silver	0.1	9/2015	ND	ND		ND	ND	ND
Thiobencarb	0.001	9/2015	ND	ND		ND	ND	ND
Turbidity, Lab	5 NTU	9/2015	4.1	7.2		5.3	5.3	5.93
Zinc	5	9/2015	ND	ND		ND	ND	ND
Secondary Standards (Section 64449, Table 64449-B)								
Total Dissolved Solids (TDS)	1000	9/2015	79	110		100	120	110.00
Specific Conductance (E.C.)	1600 microhms	9/2015	120	160		160	200	173.33
Chloride	500	9/2015	5.3	7		6.4	7.8	7.07
Sulfate	500	9/2015	3.9	6.3		5.2	7.1	6.20

Notes:
1. Inorganics monitoring consist of 3 years of initial monitoring from 2011-2013.
2. Nitrate must be sampled quarterly for one year, if annual average , 50% of MCL, then it can be reduced to annual monitoring.

Abbreviations:

AL	Action Level
DPH	Department of Public Health
HAL	Health Advisory Level
MCL	Maximum Contaminant Level
MFL	Million Fibers Per Liter
mg/L	Milligrams Per Liter

For Bin Classification constituents, see the LT2ESWTR Source Water Monitoring for Systems Serving At Least 10,000 People Factsheet

WHAT ARE THE INITIAL SOURCE WATER MONITORING REQUIREMENTS?
The source water monitoring requirements of the LT2ESWTR apply to all Subpart H PWSs. You are subject to initial source water monitoring requirements if you do not have existing monitoring data that meets grandfathering requirements. For more information on source water monitoring requirements, see EPA's Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule (EPA 815-R06-005 February 2006), available at www.epa.gov/safewater/disinfection/lt2/compliance.html. Prior to beginning initial source water monitoring, you must submit a sampling schedule that specifies the calendar dates when you will collect the required source water samples. The samples must be evenly

FILTERED SYSTEMS SERVING AT LEAST 10,000 PEOPLE – You must collect Cryptosporidium, E. coli and turbidity samples at least monthly for 24 months.
UNFILTERED SYSTEMS SERVING AT LEAST 10,000 PEOPLE – You must sample for Cryptosporidium at least monthly for 24 months.
Alternately, you may notify the EPA or the state that you elect not to conduct source water monitoring and commit to providing the maximum treatment of 5.5 log removal or inactivation for

East Bay Municipal Utility District

Freeport Regional Water Authority Diversion

Table 7 FSCC water quality data, Clay Station PP					
Parameter	**Monitoring Period**	**Number of Samples**	**Average**	**Min**	**Max**
Bromide (µg/L)	5/22/14 - 7/3/14	7	14.3	11	16
Manganese (µg/L)	5/22/14 - 7/3/14	7	10.2	9.1	11.6
Iron (µg/L)	5/22/14 - 7/3/14	7	40.9	33.5	48.9
E. coli (MPN/100 mL)	5/22/14 - 7/10/14	16	10.1	<1.8	19
Total coliforms (MPN/100 mL)	5/22/14 - 7/10/14	16	1783	<1.8	2400
Aluminum (µg/L)	5/22/14 - 7/3/14	14	30.0	11.4	49.8
Geosmin (ng/L)	5/22/14 - 7/3/14	7	14.2	7.8	42
2-methylisoborneol (ng/L)	5/22/14 - 7/3/14	7	3.9	1.5	9.5
Color	5/22/14 – 7/10/14	16	11.5	7	14

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Table 8 FSCC water quality data (WCPP/MOK2)					
Parameter	**Monitoring Period**	**Number of Samples**	**Average**	**Min**	**Max**
Alkalinity (total as $CaCO_3$) (mg/L)	4/28/14 - 7/7/14	22	58.7	50	74
Hardness (total as $CaCO_3$) (mg/L)	4/28/14 - 7/7/14	21	59	52	72
Total organic carbon (mg/L)	4/28/14 - 7/7/14	16	1.8	1.4	2
Bromide (µg/L)	4/28/14 - 7/7/14	16	4.4	0.6	16
Manganese (µg/L)	4/28/14 - 7/7/14	18	13.3	3.1	63.1
Iron (µg/L)	5/5/14 - 7/7/14	16	45.4	18.8	84.6
E. coli (MPN/100 mL)	4/28/14 - 7/7/14	6	3.7	<1	7.3
Total coliforms (MPN/100 mL)	4/28/14 - 7/7/14	6	2167	1400	>2400
Conductivity (µS/cm) [11]	6/16/14 - 7/7/14	9	154	107	170
Turbidity (NTU) [12]	6/16/14 - 7/7/14	9	1.17	0.77	1.6
Geosmin (ng/L)	5/28/14 - 7/7/14	10	6.2	4.1	11
2-methylisoborneol (ng/L)	5/28/14 - 7/7/14	10	5.3	1.9	8.9
Color	4/28/14 – 7/7/14	21	6	3	12

[11] YSI hand probe provided by System Water Quality (SWQ)
[12] HACH 2100N benchtop turbidimeter

APPENDIX D – WATERSHED CONTAMINANT SOURCES INFORMATION

Non-Rice Pesticides Used in the Sacramento River Watershed >1,000 Pounds Annually

CHEMICAL_NAME	2009 Total Annual (lbs)	2010 Annual Applied (lbs)	2011 Annual Applied (lbs)	2012 Annual Applied (lbs)	2013 Annual Applied (lbs)
GLYPHOSATE, All	982,482	1,146,203	1,295,274	1,453,232	1,525,209
METHYL BROMIDE	1,169,494	1,301,192	972,597	1,407,099	1,200,348
COPPER, All	645,762	833,445	810,021	682,988	1,030,627
CHLOROPICRIN	522,943	691,560	527,693	776,683	669,676
1,3-DICHLOROPROPENE	445,274	350,251	734,910	478,118	628,617
MANCOZEB	62,257	308,368	344,545	330,450	417,140
ZIRAM	269,372	438,818	316,611	478,670	317,533
CHLOROTHALONIL	96,888	170,408	242,454	254,124	245,807
METAM-SODIUM	723,805	267,485	122,331	167,867	244,383
SULFURYL FLUORIDE	75,175	87,678	134,040	183,648	173,888
PENDIMETHALIN	116,363	133,355	163,362	134,763	166,535
OXYFLUORFEN	86,908	64,508	107,052	83,587	147,295
CHLORPYRIFOS	137,957	128,547	118,229	126,561	137,031
POTASSIUM N-METHYLDITHIOCARBAMATE	57,740	116,864	95,714	224,704	124,764
2,4-D, All	113,576	166,853	116,392	116,734	117,003
PARAQUAT DICHLORIDE	99,981	93,103	105,376	122,082	111,763
ORYZALIN	138,940	103,645	165,308	127,120	98,390
CALCIUM HYPOCHLORITE	2,436	4,418	10,112	30,199	82,504
S-METOLACHLOR	69,856	68,414	46,131	51,610	58,311
DIURON	39,777	40,394	56,273	54,924	51,273
TRIFLURALIN	48,805	47,616	40,534	48,916	49,990
ETHALFLURALIN	22,768	20,351	26,306	34,031	48,646
ETHEPHON	20,208	36,176	40,549	46,602	47,732
SIMAZINE	44,947	37,704	52,836	48,501	42,088
BORIC ACID	2,336	5,848	20,906	36,517	41,061
HEXAZINONE	66,380	61,860	40,305	32,828	40,487
TRICLOPYR, All	20,320	22,026	34,791	34,559	36,810
METOLACHLOR	-	487	27,182	37,354	35,374
BORAX	26,941	31,446	35,103	12,027	34,691
BIFENTHRIN	20,001	22,633	49,696	55,443	34,587
ALUMINUM PHOSPHIDE	12,149	12,850	11,559	-	32,908
NALED	23,765	16,729	24,188	25,876	30,986
MCPA	37,826	28,636	36,717	33,145	30,465
CARBARYL	20,060	21,364	14,553	23,447	27,321
MALATHION	35,302	50,990	31,718	29,366	27,190
PERMETHRIN	14,369	15,429	7,092	39,510	26,816
CHLORPROPHAM	3,615	6,397	2,812	1,946	26,468
DIAZINON	25,673	23,222	18,047	26,607	23,401
BOSCALID	16,797	22,075	21,141	19,478	23,370
CAPTAN	56,798	70,880	36,732	59,100	22,338
SODIUM CHLORATE	12,638	30,280	28,843	28,795	22,246
ENDOTHALL, All	1,472	851	6,097	8,670	19,999
METRIBUZIN	15,344	13,196	16,695	15,079	17,545
IMAZAPYR	9,810	13,361	12,091	11,811	17,392
PIPERONYL BUTOXIDE	15,990	12,702	7,410	13,757	17,038
PYRACLOSTROBIN	15,328	16,074	16,325	13,371	16,541
DIMETHOATE	12,919	8,392	10,108	14,590	15,858
PROPICONAZOLE	11,878	13,158	17,507	14,278	15,769
IPRODIONE	16,326	18,143	21,130	20,054	13,837
METHOXYFENOZIDE	7,976	8,710	7,148	8,773	13,586
ACROLEIN	21,540	28,386	8,912	16,112	12,470
AZOXYSTROBIN	5,385	11,909	12,066	17,613	12,083
FIPRONIL	3,586	3,322	3,945	9,133	11,949
IMIDACLOPRID	10,057	10,140	12,138	12,495	11,419
BIFENAZATE	3,902	5,284	6,071	8,027	10,203
PROPARGITE	33,645	17,850	13,232	13,226	9,718
DISODIUM OCTABORATE TETRAHYDRATE	1,876	2,561	5,408	11,441	9,346
CYPRODINIL	15,058	14,119	14,931	14,531	8,974
DITHIOPYR	6,056	6,780	7,417	7,247	8,607
CLETHODIM	4,489	4,740	7,747	10,935	8,222
METHOMYL	10,855	8,453	7,918	8,641	8,086
SETHOXYDIM	6,392	4,726	4,886	8,099	8,017
ESFENVALERATE	8,275	6,124	5,884	-	7,810
CHLORANTRANILIPROLE	1,193	2,686	2,989	5,220	7,574
OXYTETRACYCLINE, CALCIUM COMPLEX	5,898	6,033	5,910	7,256	7,552
METCONAZOLE	-	4,534	6,622	7,334	6,978
LAMBDA-CYHALOTHRIN	5,042	3,869	4,432	4,781	6,883
SODIUM CARBONATE PEROXYHYDRATE	2,778	2,045	3,755	3,503	6,759
4-(2,4-DB), DIMETHYLAMINE SALT	8,227	8,544	9,116	7,180	6,373

Non-Rice Pesticides Used in the Sacramento River Watershed >1,000 Pounds Annually

CHEMICAL_NAME	2009 Total Annual (lbs)	2010 Annual Applied (lbs)	2011 Annual Applied (lbs)	2012 Annual Applied (lbs)	2013 Annual Applied (lbs)
FLUMIOXAZIN	5,857	7,357	9,180	8,515	6,324
HEXYTHIAZOX	5,253	4,811	3,736	11,003	6,289
AMINOPYRALID, TRIISOPROPANOLAMINE SAL	4,382	9,418	7,773	6,662	6,209
MAGNESIUM PHOSPHIDE	4,803	3,573	4,316	6,146	5,776
DIFENOCONAZOLE	1,509	2,373	3,399	8,265	5,665
DIGLYCOLAMINE SALT OF 3,6-DICHLORO-O-AI	4,997	3,587	3,967	4,414	5,582
MALEIC HYDRAZIDE, POTASSIUM SALT	8,345	2,996	6,406	5,253	5,170
DICAMBA, All	2,811	2,639	4,006	3,655	4,996
DAZOMET	8,605	5,801	17,566	9,360	4,837
DIQUAT DIBROMIDE	4,468	2,927	3,741	6,760	4,690
ABAMECTIN	1,306	1,930	2,378	-	4,555
ACETAMIPRID	1,087	2,080	3,232	4,940	4,473
ISOXABEN	2,191	2,269	3,797	3,792	4,470
EPTC	5,453	3,934	2,722	1,637	4,264
THIOPHANATE-METHYL	6,682	4,909	2,517	4,411	4,244
FOSETYL-AL	8,290	5,405	2,923	6,660	4,041
GLUFOSINATE-AMMONIUM	45,130	63,276	97,528	24,734	3,873
PYRIMETHANIL	2,648	3,378	4,126	4,714	3,652
PRODIAMINE	5,357	9,190	4,337	4,697	3,542
CHLORFENAPYR	442	354	540	1,817	3,540
TEBUCONAZOLE	2,372	2,739	4,185	2,302	3,416
OXAMYL	6,741	1,172	564	1,687	3,405
BROMOXYNIL OCTANOATE	2,689	1,869	3,385	2,733	3,400
METHYL PARATHION	4,245	1,757	2,515	4,875	3,395
NORFLURAZON	6,559	5,913	3,753	2,216	3,315
CYPERMETHRIN	7,138	4,946	4,204	3,452	3,205
ACEPHATE	8,375	2,981	2,803	3,387	3,077
PHENOTHRIN	1,164	2,815	3,131	5,204	2,657
BENTAZON, SODIUM SALT	5,646	1,455	1,140	2,143	2,579
PYRETHRINS	2,150	1,352	591	1,522	2,558
MEFENOXAM	12,478	2,713	1,402	5,460	2,511
INDOXACARB	3,325	1,744	3,874	2,599	2,506
ATRAZINE	6,235	1,888	672	2,669	2,466
SPIROMESIFEN	967	1,170	1,781	1,963	2,384
1,4-DIMETHYLNAPHTHALENE	1,544	1,152	544	893	2,194
RIMSULFURON	1,223	920	1,381	1,563	1,999
SULFOMETURON-METHYL	1,563	1,849	3,140	2,391	1,961
NAPROPAMIDE	2,409	1,609	2,702	1,662	1,903
TRIFLUMIZOLE	1,590	1,632	541	898	1,878
MYCLOBUTANIL	2,480	2,905	2,229	2,313	1,829
TRIFLOXYSTROBIN	2,750	1,179	1,864	1,307	1,739
TEBUTHIURON	1,321	333	1,304	1,382	1,710
QUINOXYFEN	1,302	1,458	1,410	1,642	1,629
2,2-DIBROMO-3-NITRILOPROPIONAMIDE	418	620	1,365	1,124	1,536
CLOPYRALID, All	956	1,029	1,274	1,595	1,535
CARFENTRAZONE-ETHYL	1,383	1,395	1,002	1,425	1,493
STREPTOMYCIN SULFATE	701	1,232	1,318	820	1,440
KRESOXIM-METHYL	1,892	3,244	2,726	1,867	1,371
FENHEXAMID	326	1,034	848	1,043	1,340
1-BROMO-3-CHLORO-5,5-DIMETHYL HYDANT	1,510	1,228	1,365	-	1,285
SPINETORAM	1,192	710	1,211	1,196	1,274
GLUTARALDEHYDE	5,728	6,209	1,071	1,198	1,240
PROPAMOCARB HYDROCHLORIDE	0	4,201	3,049	1,611	1,215
BETA-CYFLUTHRIN	1,633	1,309	991	19,603	1,128
BROMOXYNIL HEPTANOATE	1,964	1,508	2,432	2,266	1,102
ALPHA-ISOOCTADECYL-OMEGA-HYDROXYPOL	668	3,395	2,959	2,900	1,086
METHIDATHION	3,883	1,839	1,160	1,990	1,085
CRYOLITE	8	1,338	539	528	1,040
SODIUM HYPOCHLORITE	11,902	5,479	6,704	5,522	1,004
DICHLOBENIL	1,534	5,569	2,828	2,062	988
BUPROFEZIN	4,339	4,654	1,498	518	834
THIAMETHOXAM	12,977	4,544	1,041	794	771
CHLORSULFURON	1,046	805	1,224	756	655
1,3-DICHLORO-5,5-DIMETHYLHYDANTOIN	1,166	618	654	-	652
FLUTOLANIL	1,524	1,189	648	955	636
CLOFENTEZINE	939	305	2,434	1,973	633
FENBUCONAZOLE	1,566	957	519	260	632
CYFLUTHRIN	1,944	2,568	1,856	-	617
ETHOFUMESATE	269	1,006	407	689	606

Non-Rice Pesticides Used in the Sacramento River Watershed >1,000 Pounds Annually

CHEMICAL_NAME	2009 Total Annual (lbs)	2010 Annual Applied (lbs)	2011 Annual Applied (lbs)	2012 Annual Applied (lbs)	2013 Annual Applied (lbs)
SODIUM BROMIDE	1,567	5,879	1,033	1,049	577
HALOSULFURON-METHYL	907	7,028	388	447	562
MSMA	1,737	1,491	563	309	503
S-METHOPRENE	1,319	1,448	993	639	489
FLUDIOXONIL	1,030	1,376	546	1,008	483
DIFLUBENZURON	4,241	2,013	2,331	2,408	458
CYMOXANIL	571	1,518	982	974	427
FAMOXADONE	474	1,496	892	934	427
SPIRODICLOFEN	2,257	972	290	840	420
PHORATE	769	2,025	2,027	946	369
THYMOL	526	1,379	185	88	364
DICOFOL	1,469	1,827	876	412	347
PHOSMET	9,479	23,961	15,866	15,750	318
OXYTETRACYCLINE HYDROCHLORIDE	146	1,203	202	50	262
PROPANIL	492	1,840	100	1,136	180
SODIUM CHLORITE	1,869	1,731	-	-	141
MANEB	115,361	6,641	548	778	5
SODIUM METABORATE TETRAHYDRATE	-	7,537	-	10,125	-
ENDOSULFAN	1,715	3,785	1,423	1,729	-
METHAMIDOPHOS	2,864	1,715	16	-	-
ALDICARB	996	2,361	117	-	-
ETHOPROP	2,198	-	-	147	-
ALPHA-ALKYL (C9-C11)-OMEGA-HYDROXYPOL	1,287	-	-	-	-
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDR(	1,109	-	-	-	-

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Caltrans Construction	5S34C366935	3797U4 Yol SAC 80 Across The Top	560	Acres	Yolo and Sac Counties in and Near West Sac and Sac from Route 80 and 84 Separation to Watt Ave	Sacramento	Sacramento
Caltrans Construction	5R45C371914	Capstone HWY 299 Buckhorn Improvements	351.4	Acres	02 SHA 299 0 3 7 1	French Gulch	Shasta
Caltrans Construction	5R45C368515	Repair Roadway with Superpave HMA over AB	187.3	Acres	02 SHA 299 30 3 to 40 7	Bella Vista	Shasta
Caltrans Construction	5S51C366923	406604 Sac&Sut 99 Riego Rd Interchange	90	Acres	State Route 99 at Riego Rd	Antelope	Sutter
Caltrans Construction	5R45C366932	Antlers Bridge Replacement Project	51	Acres	Shasta County Interstate 5 PM 39 to 41	Lakehead	Shasta
Caltrans Construction	5R45C372268	02 2E74U4 Hat Creek Curve	45	Acres	Shasta 299 PM 82 to PM 85	Burney	Shasta
Caltrans Construction	5R52C372133	4E90U4 HWY 32 CURVE REALIGNMENT SMOKEY CREEK	34	Acres	02 TEH 32 5 1 to 6 2	Forest Ranch	Tehama
Caltrans Construction	5S31C370320	3E1004 PLA 80 Bridge Vertical Clearance	25	Acres	Highway 80 Var Locations	Newcastle	Placer
Caltrans Construction	5S34C372132	Route 50 Natoma Overhead	16.8	Acres	2366 Maritime Drive	Folsom	Sacramento
Caltrans Construction	5R52C367144	Deer Creek Curve	13.4	Acres	Teh32	Mill Creek	Tehama
Caltrans Construction	5R45C372469	02 1H2604 Buckhorn Mountain Emergency Slide Repair	3.5	Acres	Shasta 299 PM 2 to PM 5	Redding	Shasta

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5R04C369725	Feather River West Contract D	361.69	Acres	Feather River West Levee between Thermalito Afterbay to East	Yuba City	Butte
Construction	5R04C370371	CA BLM 1840 Butte Creek Bridge	10	Acres	Doe Mill Road	Paradise	Butte
Construction	5R04C369885	Neal Road Recycling and Waste Facility	8.5	Acres	1023 Neal Road	Paradise	Butte
Construction	5R04C369604	Paradise Airport Hangar Access Road	5.47	Acres	4405 Airport Road	Paradise	Butte
Construction	5R04C372087	Pheasant Ridge Commons	5.11	Acres	Skyway & Devore Lane	Paradise	Butte
Construction	5R04C367193	2125 Jarvis	60	Acres	9775 Ahart Lane	Oroville	Butte
Construction	5R04C347082	Riverbend Park	16.2	Acres	Hwy 70 & Montgomery St.	Oroville	Butte
Construction	5R04C367101	Calle Vista Estates Unit 2 Phase1	8.48	Acres	20th St and Golden Hills Dr	Oroville	Butte
Construction	5R04C370187	Butte County Hall of Records	4.4	Acres	155 Nelson Ave	Oroville	Butte
Construction	5R04C371508	Oro Lake Congregation of Jehovahs Witnesses	4.4	Acres	1240 10th Street	Oroville	Butte
Construction	5R04C359434	Ishi Hills Middle School Playfield Project	4	Acres	1 Ishi Hills Way	Oroville	Butte
Construction	5R04C368702	Oroville Ford	3.06	Acres	1350 Oro Dam Boulevard	Oroville	Butte
Construction	5R04C370787	All Metals Facility Upgrades	3.05	Acres	600 Ophir Road	Oroville	Butte
Construction	5R04W002075	Guidici Ranch	3	Acres	257 Guidici Lane	Oroville	Butte
Construction	5R04C370546	East Trunk Line Sewer Replacement Project	2.75	Acres	Oroville	Oroville	Butte
Construction	5R04C370771	Dollar General Oroville CA Olive HWY	1.8	Acres	5220 Olive HWY	Oroville	Butte
Construction	5R04C370644	Magalia CA Dollar General	1.65	Acres	300 ft east of Lakeridge Circle and Skyway Road	Magalia	Butte
Construction	5R04C365802	Eagle Meadows	20.41	Acres	Colusa Hwy at Jay Dr	Gridley	Butte
Construction	5R04C361216	Wild Goose Phase 3 Gas Storage Expansion	6	Acres	2780 West Liberty Road	Gridley	Butte
Construction	5R04C372349	LOST CREEK DAM CREST MODIFICATIONS	34	Acres	At Lost Creek Reservoir outside the town of Oroville	Forbestown	Butte
Construction	5R04C370234	Lakeview Terrace	4.5	Acres	Lakeview Terrace	Feather Falls	Butte
Construction	5R04C370672	Curve Street	13.6	Acres	24977 Curve Street	Fall River Mills	Butte
Construction	5R04C371959	Old Durham Wood Yard	87.2	Acres	974 Oroville Chico Highway	Durham	Butte
Construction	5R04C329983	Richardson Springs Rd Proj	18	Acres	Richardson Springs Rd	Cohasset	Butte
Construction	5R04C371145	Sierra Moon Subdivision	228.69	Acres	Caribbean Way	Chico	Butte
Construction	5R04C372073	Vista Terrace	77.3	Acres	Not Applicable	Chico	Butte
Construction	5R04C367259	Valley Oak Subdivision	55	Acres	Bruce and Humboldt Road	Chico	Butte
Construction	5R04C369779	Sycamore Glen Subdivision Phase 5	45.8	Acres	Mariposa Avenue	Chico	Butte
Construction	5R04C370559	Mountain Vista Phase 1	27.7	Acres	Eaton Road	Chico	Butte

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5R04C370762	Meriam Park Phase 3a	22.5	Acres	20th street	Chico	Butte
Construction	5R04C363473	Creekside Landing Unit 2	21.7	Acres	Chamberlian Run	Chico	Butte
Construction	5R04C366281	Sycamore Glen Subdivision Phase 4	21	Acres	Sweetwater Falls	Chico	Butte
Construction	5R04C362530	State Route 32 Widening Project	20.7	Acres	SR32 from Fir St to El Monte Ave	Chico	Butte
Construction	5R04C341832	Shastan Homes at Glenwood Ave	14.9	Acres	1134 1150 Glenwood Ave	Chico	Butte
Construction	5R04C364851	Lake Vista Subdivision Phase 3	12.39	Acres	101 Delaney Drive	Chico	Butte
Construction	5R04C366073	Innsbrook Subdivision	11.5	Acres	DeGarmo Drive	Chico	Butte
Construction	5R04C370999	Chrysler Residence	11.3	Acres	1405 Rim Rock Drive	Chico	Butte
Construction	5R04C368047	Wildwood Estates Phase 1 & 1A	11.2	Acres	Eaton Road	Chico	Butte
Construction	5R04C370218	Butte Regional Transit Operations Center	10	Acres	326 Huss Drive	Chico	Butte
Construction	5R04C372739	Chic Municipal Airport	9.8	Acres	150 Airpark Blvd	Chico	Butte
Construction	5R04C369498	Eaton Village Apartments Phase 2	7.24	Acres	121 Penzance Avenue	Chico	Butte
Construction	5R04C371938	Carriage Park Apartments	7.1	Acres	Bruce Road	Chico	Butte
Construction	5R04C329054	Brown Land Disturbance	5	Acres	4675 Kilkare Ln	Chico	Butte
Construction	5R04C370879	Farmers International	4.87	Acres	1260 Muir Avenue	Chico	Butte
Construction	5R04C365896	North Butte County Court House	4.6	Acres	East 20th Street	Chico	Butte
Construction	5R04C363811	Belvedere Heights Subdivision	4.2	Acres	Bancroft Drive	Chico	Butte
Construction	5R04C367910	Lots 39 40 42 and 43 of Rocky Bluff Subdivision	4.11	Acres	Lava Rock Drive	Chico	Butte
Construction	5R04C370049	Foothill Park East Unit No 6	3.8	Acres	Champlain Way	Chico	Butte
Construction	5R04C371459	North Valley Plaza Mall	2.99	Acres	801 East Avenue	Chico	Butte
Construction	5R04C372214	Estates At Hooker Oak Subdivision	2.8	Acres	1982 Hooker Oak Avenue	Chico	Butte
Construction	5R04C371208	Enloe Campus Storm Drain and Street Improvements	2.75	Acres	Enloe Hospital Area	Chico	Butte
Construction	5R04C365722	Mission Vista Hills Subdivision	2.56	Acres	1 Morning Rose Way	Chico	Butte
Construction	5R04C368846	CSU Taylor II	2.5	Acres	400 WEst 1st Street	Chico	Butte
Construction	5R04C371111	Humboldt Trail Estates	2.5	Acres	1962 Humboldt Road	Chico	Butte
Construction	5R04C370898	Mariposa Vista Subdivision Unit 2 Phase 6	1.93	Acres	Wanderer Lane	Chico	Butte
Construction	5R04C368840	The Inn at the Terraces	1.89	Acres	2950 Sierra Sunrise Terrace	Chico	Butte
Construction	5R04C371530	Belvedere Storm Drain Bypass	1.6	Acres	East 20th Street & Dawncrest Drive	Chico	Butte
Construction	5R04C366998	Bashir Parcel	1.28	Acres	1 Stoney Meadow Terrace	Chico	Butte
Construction	5R04C367162	1 Budlee Court	1.24	Acres	1 Budlee Court	Chico	Butte
Construction	5R04C372802	Rolling Hills Subdivision Lot 99	1	Acres	801 Whispering Winds Lane	Chico	Butte
Construction	5R04C370426	Cal Water Station 79 phase 2	1	Acres	2151 Springfield Drive	Chico	Butte

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5R04C365682	Sweeney Residence Project	0.64	Acres	3212 Summit Ridge Terrace	Chico	Butte
Construction	5R04C369918	McMurtry	0.47	Acres	3209 Shallow Springs Terrace	Chico	Butte
Construction	5R04C370654	Platanitis House	0.29	Acres	3459 Shallow Springs Terrace	Chico	Butte
Construction	5R04C369963	Mariposa Vista Lots 320 and 321	0.27	Acres	Birdwing Court	Chico	Butte
Construction	5R04C358710	Skyway Forest Hwy 171	42	Acres	Skyway from Humbug Summit Rd to Humboldt Rd	Butte Meadows	Butte
Construction	5R04C371204	Gray Lodge WAWSP Phase 1C	50	Acres	Farris Road and Colusa Highway	Biggs	Butte
Construction	5R04C367879	North Biggs Estates Subdivision	19.46	Acres	N end of 2nd Street	Biggs	Butte
Construction	5R04C371205	Gray Lodge WAWSP Phase 1A	18	Acres	Belding Lateral Canal	Biggs	Butte
Construction	5R04C370248	Nathan Clayton	19.65	Acres	91 Eder Canyon Road	Berry Creek	Butte
Construction	5R04C369544	Benitez Residence	3	Acres	Bell Ranch Road	Berry Creek	Butte
Construction	5S06C371406	Maxwell Transfer Station	3.67	Acres	3852 Old Highway 99W	Maxwell	Colusa
Construction	5S06C372705	Colusa Basin Mitigation Bank	215	Acres	Abel Rd	Colusa	Colusa
Construction	5S06C368444	Reddington Ranch	13.93	Acres	Almond Avenue and Hillgate Road	Arbuckle	Colusa
Construction	5S09C370082	Camp 2 Bridge Replacement Project	1.25	Acres	EID Camp 2 Near Riverton	Riverton	El Dorado
Construction	5S09C333865	Silver Springs Bass Lake Rd Rc Alignment Phase 2	23.24	Acres	S Of Green Valley Rd N Of Hill Rd	Rescue	El Dorado
Construction	5S09C372818	Ice House Road	42	Acres	From Wentworth Springs Road to	Pollock Pines	El Dorado
Construction	5S09C356378	US50 MO Flat Rd I C Reconstruction Proj Phase 1B	30	Acres	US 50 Missouri Flat Rd Interchange	Placerville	El Dorado
Construction	5S09C358240	Crossings at El Dorado	20	Acres	Headington Rd & Missouri Flat Rd	Placerville	El Dorado
Construction	5S09C371882	The Ridge	20	Acres	Winesap Circle	Placerville	El Dorado
Construction	5S09C372778	Western Slope Boys and Girls Club	3.79	Acres	2840 Mallard Lane	Placerville	El Dorado
Construction	5S09C372264	Green Valley Road at Weber Creek	2.92	Acres	Green Valley Road west of Placerville Drive	Placerville	El Dorado
Construction	5S09C371605	El Dorado Trails Project	1.2	Acres	Forni Road at Ray Lawyer Drive	Placerville	El Dorado
Construction	5S09C372055	Garden Valley	1.1	Acres	15061 Marshall Road	Garden Valley	El Dorado
Construction	5S09C368705	The Estates at Blackstone	64.9	Acres	Blackstone Pkwy and Royal Oaks Dr	El Dorado Hills	El Dorado
Construction	5S09C371696	Promontory Village Center Lot 8	63.2	Acres	Via Treviso	El Dorado Hills	El Dorado
Construction	5S09C370306	Serrano Village M2 Phase 1	62.75	Acres	Western Sierra Drive	El Dorado Hills	El Dorado
Construction	5S09C368482	Serrano Village K1&K2 Unit 5b	17.15	Acres	Da Vinci Drive	El Dorado Hills	El Dorado
Construction	5S09C367045	Sebring Residence	10	Acres	3305 Diablo Trail	El Dorado Hills	El Dorado
Construction	5S09C367858	Treviso II	6.98	Acres	Via Treviso	El Dorado Hills	El Dorado
Construction	5S09C369558	Schwam Residence	4	Acres	201 Klee Court	El Dorado Hills	El Dorado
Construction	5S09C366768	4845 Gresham Dr	1.3	Acres	4845 Gresham Dr	El Dorado Hills	El Dorado
Construction	5S09C372263	Francisco Drive Right Turn Pocket	1.2	Acres	Francisco Dr and El Dorado Hills Blvd	El Dorado Hills	El Dorado

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5S09C362601	Region 5S Multi County Broadband Project	22	Acres	9479 N Fort Washington Ste 105	El Dorado	El Dorado
Construction	5S09C364192	Bradley Road	15.5	Acres	Bradley Road and Throwita Way	Diamond Springs	El Dorado
Construction	5S09C369004	Marshal Gold State Historic Park	576	Acres	Back Street	Coloma	El Dorado
Construction	5S09C371071	SMUD Iowa Hill Drift Tunnel and Geotechnical Investigation	500	Acres	2009 Chute Camp Road	Camino	El Dorado
Construction	5R11C348111	Weststeyn Farms Dairy	172	Acres	West end of County Rd 65	Willows	Glenn
Construction	5R11C372327	WILLOWS TRACTOR SUPPLY	4	Acres	811 NORTH HUMBOLDT AVENUE	Willows	Glenn
Construction	5R11C370486	Walden Academy	3.1	Acres	1129 W Wood Street	Willows	Glenn
Construction	5R11C368812	Willows Senior Apartments	2.94	Acres	Sycamore Street	Willows	Glenn
Construction	5R25C368957	State Route 395 Left Turn Lane Construction	2.5	Acres	State Route 395 5 Miles N of Alturas	Alturas	Modoc
Construction	5S29C364454	Donner Summit WWTP Expansion	10	Acres	Sherrit Lane	Soda Springs	Nevada
Construction	5S29C364355	Harmony Ridge Phase 2	20	Acres	10364 Harmony Ridge Road	Nevada City	Nevada
Construction	5S29C355484	Town & Country Mini Storage	4	Acres	13270 Gracie Rd	Nevada City	Nevada
Construction	5S29C358560	Deer Creek Park 2 Unit A	3	Acres	Red Dog Rd	Nevada City	Nevada
Construction	5S29C368065	Riebes Nevada City Project	1.7	Acres	Intersection of Hollow Way and Hallwood Lane	Nevada City	Nevada
Construction	5S29C365137	Dorsey Drive Interchange Project	19	Acres	Dorsey Drive	Grass Valley	Nevada
Construction	5S29C369949	Best Trailer	11.63	Acres	500 Idaho Maryland Road	Grass Valley	Nevada
Construction	5S29C369036	Gold Country Village	5.39	Acres	465 Bennett Street	Grass Valley	Nevada
Construction	5S29C371011	Lot 10 Mountain English Park	2.06	Acres	12871 Loma Rica Drive	Grass Valley	Nevada
Construction	5S29C364552	Cascade Crossing	30.89	Acres	10400 Combie Road	Auburn	Nevada
Construction	5S31C370369	Western Regional Sanitary Landfill	291	Acres	3033 Fiddyment Road	Roseville	Placer
Construction	5S31C370833	Westbrook Phases 1 and 2	227	Acres	Pleasant Grove Blvd and Westbrook Blvd	Roseville	Placer
Construction	5S31C369875	Fiddyment Ranch	146	Acres	Hayden Rd and Fiddyment Ranch Rd	Roseville	Placer
Construction	5S31C365923	Sorrento Village 2 thru 10	87.66	Acres	Sorrento Pkwy and Ferrari Ranch Rd	Roseville	Placer
Construction	5S31C343746	Club by Del Webb	80.5	Acres	SWC of Fiddyment Rd and Village Green Dr	Roseville	Placer
Construction	5S31C367843	West Park 4 Major Roads and Swales	79.1	Acres	West of Westpark Drive and South of Phillip Road	Roseville	Placer
Construction	5S31C366586	WestPark Village 15	76	Acres	PleasantGroveBoulevard	Roseville	Placer
Construction	5S31C366914	West Park Phase 3 Village 13	69.3	Acres	Pleasant Grove Blvd and Westbrook Blvd	Roseville	Placer
Construction	5S31C356144	Morgan Creek II	55	Acres	S of Inter Vineyard Rd & Crowder Ln	Roseville	Placer
Construction	5S31C358831	Roseville 218	55	Acres	NW of Fiddyment Rd and Hayden Pkwy	Roseville	Placer
Construction	5S31C370700	Westpark Phase 4	50	Acres	Pleasant Grove Blvd and Westbrook Blvd	Roseville	Placer
Construction	5S31C370715	Blue Oaks Commerce Center	50	Acres	8950 Industrial Avenue	Roseville	Placer

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5S31C367839	West Park 4 Villages 19a 17c and17d	47.6	Acres	West of Westpark Drive and South of Phillip Road	Roseville	Placer
Construction	5S31C366614	Fiddyment Ranch Village 15 A B C	41.84	Acres	4821 Fiddyment Road Roseville CA 95747	Roseville	Placer
Construction	5S31C367840	West Park Villages 17 A and E and 18F	33.42	Acres	West of Westpark Drive and South of Phillip Road	Roseville	Placer
Construction	5S31C367785	Stone Point	32.32	Acres	East of intersection of Stone Point Drive and North Sunrise Avenue	Roseville	Placer
Construction	5S31C372537	Solmere Village 5A 5B	30.5	Acres	1950 Westbrook Drive	Roseville	Placer
Construction	5S31C366728	Hidden Crossing	29.7	Acres	Northeast of PFE Road and Walerga Road	Roseville	Placer
Construction	5S31C366786	Fiddyment Ranch Village F16	29.5	Acres	East of Fiddyment Rd Btwn N Hayden Pkwy and Blue Oaks Blvd	Roseville	Placer
Construction	5S31C369352	Whisper Creek Phase 1	26.4	Acres	PFE Road	Roseville	Placer
Construction	5S31C371478	MODULE 5 LINER SYSTEM AND MODULE 15 AND 16 PARTIAL FINAL COVER CONSTRUCTION	24	Acres	3195 Athens Ave	Roseville	Placer
Construction	5S31C369713	Campus Oaks PGE Grading	23.87	Acres	1485 Blue Oaks Boulevard	Roseville	Placer
Construction	5S31C357852	Crocker Ranch N Village 4	22.5	Acres	N of Sevilla Dr And E of Adrienne Dr	Roseville	Placer
Construction	5S31C371556	Stoneridge 10B	21	Acres	Demartini Dr	Roseville	Placer
Construction	5S31C365685	Stoneridge Parcel 58	20.8	Acres	3000 Miners Ravine	Roseville	Placer
Construction	5S31C357851	American Vineyard Village	19.2	Acres	1671 Vineyard Rd	Roseville	Placer
Construction	5S31C368557	Lifetime Athletic	17.4	Acres	1435 East Roseville Parkway	Roseville	Placer
Construction	5S31C365927	Fiddyment Ranch F14A2 and F14B2	16.6	Acres	North Hyden Pkwy and Fiddyment Road	Roseville	Placer
Construction	5S31C369500	Stoneridge Village 12	16	Acres	Miners Ravine and Sierra College	Roseville	Placer
Construction	5S31C372155	Roseville Costco Fueling Station	14.4	Acres	6720 Stanford Ranch Road	Roseville	Placer
Construction	5S31C372135	Carrington at West Park	14.37	Acres	W of West Park Dr and S of Phillip Rd	Roseville	Placer
Construction	5S31C369499	Stoneridge Village 11	13.76	Acres	Miners Ravine Road and Sierra College	Roseville	Placer
Construction	5S31C368074	Stoneridge East Village 13	12.5	Acres	Miners Ravine Drive	Roseville	Placer
Construction	5S31C372331	Avia	12	Acres	1900 Blue Oaks Blvd	Roseville	Placer
Construction	5S31C366853	Pearl Creek	11.6	Acres	1298 Antelope Creek Drive	Roseville	Placer
Construction	5S31C372401	Oakbriar F 23	11.5	Acres	1875 Orchard View Road	Roseville	Placer
Construction	5S31C366651	West Park Village 26	11.16	Acres	Bob Doyle Drive and Village Green Drive	Roseville	Placer
Construction	5S31C371795	GSA Office Building	11.15	Acres	8950 Industrial Avenue	Roseville	Placer
Construction	5S31C371010	Eskaton Village Roseville	10.35	Acres	northwest of the intersection of Blue Oaks Blvd and Diamond	Roseville	Placer
Construction	5S31C372830	Foothills Boulevard and Roseville Parkway	8.3	Acres	Foothills Boulevard	Roseville	Placer

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5S31C368085	Lot 5 Carlsberg Industrial Center	8.2	Acres	Duluth Avenue	Roseville	Placer
Construction	5S31C365284	WP Vill 22	7.82	Acres	1381 Village Center Drive	Roseville	Placer
Construction	5S31C369649	Rockwood Subdivision	7.7	Acres	9755 Sierra College	Roseville	Placer
Construction	5S31C363006	Diamond Creek DC 31	7.42	Acres	Intersection of Diamond Creek Blvd and Blue Oaks Blvd	Roseville	Placer
Construction	5S31C369324	Eureka Road Widening	6	Acres	NE Corner of Eureka Rd and Sierra College Blvd	Roseville	Placer
Construction	5S31C361109	Church in Roseville	4.3	Acres	9885 Sierra college Boulevard	Roseville	Placer
Construction	5S31C367935	Paseo Del Norte	4	Acres	SE Corner of Pleasant Grove Blvd and Fiddyment	Roseville	Placer
Construction	5S31C372536	Industrial Avenue Bridge Replacement	3.44	Acres	10576 Industrial Ave	Roseville	Placer
Construction	5S31W002052	Fire Station Improvement	2.79	Acres	Downtown Roseville along Dry Creek	Roseville	Placer
Construction	5S31C371395	Sutter Roseville MOB 6	2.2	Acres	8 Medical Plaza Drive	Roseville	Placer
Construction	5S31C371774	Douglas Substation	2.04	Acres	90 N Sunrise Ave	Roseville	Placer
Construction	5S31C369811	Walerga Road Tank and Booster Station	2.03	Acres	9235 Walerga Road	Roseville	Placer
Construction	5S31C371396	Sutter Roseville Parking Structure II	1.93	Acres	12 Medical Plaza	Roseville	Placer
Construction	5S31C372527	West Park Phase 4 North	149.1	Acres	West of Westpark Drive and South of Phillips Road	Rockville	Placer
Construction	5S31C369848	Whitney Ranch Phase 2C & 2D	120	Acres	Whitney Ranch Parkway	Rocklin	Placer
Construction	5S31C366797	Whitney Ranch Ph 2 Mass Grading 46 and 47	95	Acres	Old Ranch House Road	Rocklin	Placer
Construction	5S31C371828	WJU Dorm	83.95	Acres	333 Sunset Blvd	Rocklin	Placer
Construction	5S31C366654	Two Oaks	60	Acres	West Oaks Boulevard and West Stanford Ranch Road	Rocklin	Placer
Construction	5S31C368035	Rocklin 60	56.88	Acres	Sierra College Boulevard and I80	Rocklin	Placer
Construction	5S31C366254	Croftwood Ranch Units 1 & 2	47	Acres	Barton Road and Rocklin Road	Rocklin	Placer
Construction	5S31C370240	SR 65 at Whitney Ranch Parkway	31	Acres	SR 65 at Whitney Ranch Parkway	Rocklin	Placer
Construction	5S31C372710	Garnet Creek	26.42	Acres	4200 Granite Drive	Rocklin	Placer
Construction	5S31C365711	Stanford Ranch Parcel 69	24.69	Acres	Corner of Wildcat Blvd and Bridlewood Dr	Rocklin	Placer
Construction	5S31C372402	Spring Valley Phase 1	22.58	Acres	West of Bridlewood Drive	Rocklin	Placer
Construction	5S31C366269	Parkview	22.2	Acres	Blue Oaks Boulevard and Sonora Pass Way	Rocklin	Placer
Construction	5S31C363790	Whitney Ranch Parcel 17	19.25	Acres	Ranch View and Spring Creek Drive	Rocklin	Placer
Construction	5S31C372823	Croftwood 3B	17.5	Acres	Croftwood Drive and White Chapel Way	Rocklin	Placer
Construction	5S31C365325	Granite Lakes	16.5	Acres	Greenbrae Drive	Rocklin	Placer
Construction	5S31C369724	Bass Pro Shops Rocklin	16	Acres	5472 Crossings Drive	Rocklin	Placer

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5S31C370729	Parklands South	15	Acres	SW Intersection of Del Mar Ave and Del Rio Court	Rocklin	Placer
Construction	5S31C372687	Brighton	13.72	Acres	NWC Granite Drive and Dominguez Road	Rocklin	Placer
Construction	5S31C368138	Winding Lane Estates	12.72	Acres	Winding Lane	Rocklin	Placer
Construction	5S31C371029	BassPro	12.5	Acres	5472 Crossings Drive	Rocklin	Placer
Construction	5S31C370516	Whitney Ranch Unit 22	12	Acres	Wildcat Blvd	Rocklin	Placer
Construction	5S31C368160	Lot 2A Sunset West	10.8	Acres	West Oaks Blvd at Lonetree Blvd	Rocklin	Placer
Construction	5S31C369458	Avalon	10.1	Acres	Rocklin Road at S Grove Street	Rocklin	Placer
Construction	5S31C369672	University Avenue North	10	Acres	East of Hwy 65 and South of Whitney Ranch Parkway	Rocklin	Placer
Construction	5S31C370009	University Avenue South	9	Acres	Sunset Blvd at Atherton rd intersection	Rocklin	Placer
Construction	5S31C368559	Rocklin Senior Living	6.9	Acres	West Ranch View Drive	Rocklin	Placer
Construction	5S31C368111	Bella Vida	6.35	Acres	4141 Pacific Street	Rocklin	Placer
Construction	5S31C372606	Stanford Ranch Parcel 61	4.4	Acres	West Stanford Ranch Road	Rocklin	Placer
Construction	5S31C372038	The Center at Secret Ravine	3.7	Acres	SE corner of Sierra College Boulevard and Schriber Way	Rocklin	Placer
Construction	5S31C370683	Yankee Hill Unit 6	2.64	Acres	Northaven Drive at Mockingbird Lane	Rocklin	Placer
Construction	5S31C365239	Meyers Court Subdivision	2.01	Acres	Meyers Street	Rocklin	Placer
Construction	5S31C372178	Rocklin Crossings Pad 9	0.5	Acres	South East Corner of Sierra College Bl and Interstate 80	Rocklin	Placer
Construction	5S31C372669	UPRR Roseville Subdivision Bridge	4	Acres	Near Norden	Norden	Placer
Construction	5S31C365150	Vista Cielo	78	Acres	NW of intersection of Auburn Folsom Rd and Powerhouse Road	Newcastle	Placer
Construction	5S31C367057	Cherokee Trail Estates	18	Acres	Boyington Road	Loomis	Placer
Construction	5S31C370233	Geyer Residence	4.8	Acres	5511 Sable Ridge Court	Loomis	Placer
Construction	5S31C372627	Emerzian Residence	4.6	Acres	3220 Rustic Woods Court	Loomis	Placer
Construction	5S31C366477	SMD 3 Regional Sewer Project	4.5	Acres	Auburn Folsom Road	Loomis	Placer
Construction	5S31C370500	Randall Ow Residence Lot 17 Sierra de Montserrat	4	Acres	615 Blackhawk Court	Loomis	Placer
Construction	5S31C369999	Loveday Resdience Lot 28 Sierra de Montserrat	2.21	Acres	5520 Sable Ridge Court	Loomis	Placer
Construction	5S31C371593	Lincoln WWTP Remedial Grading	199	Acres	WAVERLY DRIVE	Lincoln	Placer
Construction	5S31C370491	Coon Creek LLC	85	Acres	5585 Garden Bar Road	Lincoln	Placer
Construction	5S31C365661	Lakeside 6 Village 1	79.3	Acres	NE of the Intersection of Venture Dr and Lakeside Dr	Lincoln	Placer

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5S31C369102	Midwestern Placer Regional Sewer Project	52	Acres	HWY 193	Lincoln	Placer
Construction	5S31C372790	Verdera Village 19	32.91	Acres	Camino Cielo	Lincoln	Placer
Construction	5S31C369096	Village 12 at Verdera	23	Acres	Via Diablo at Vista De Madera	Lincoln	Placer
Construction	5S31C364141	Twelve Bridges Village 9 Unit 3	22	Acres	Culpepper Lane	Lincoln	Placer
Construction	5S31C365466	Twelve Bridges V9U4P1	21.1	Acres	Gemstone Lane and Beamreach Court	Lincoln	Placer
Construction	5S31C368714	Twelve Bridges Village 9 Unit 1	13.6	Acres	Fantail Lane and Darter Lane	Lincoln	Placer
Construction	5S31C372343	Summer Place Lincoln	7.13	Acres	NWC Red Rock and Joiner Pkwy	Lincoln	Placer
Construction	5S31C367862	Sorrento	7	Acres	Sorrento Pkwy and Marina Grande Way	Lincoln	Placer
Construction	5S31C371955	Lincoln Stake Center	6.01	Acres	708 Virginiatown Road	Lincoln	Placer
Construction	5S31C369054	Lincoln WWTRF	4.3	Acres	1245 Fiddyment Road	Lincoln	Placer
Construction	5S31C368830	Lincoln Village	3.4	Acres	2nd 3rd and E Streets	Lincoln	Placer
Construction	5S31C370175	Clover Meadows	3.4	Acres	821 East Avenue	Lincoln	Placer
Construction	5S31C372152	North Dowd Road Bridge Replacement over Yankee Slough	3.33	Acres	North Dowd Road	Lincoln	Placer
Construction	5S31W002119	Lincoln Boulevard Improvement Project	1.6	Acres	Lincoln Blvd From 7th Street to McBean Park Drive	Lincoln	Placer
Construction	5S31C368484	The Groves at Granite Bay	31.8	Acres	Berg Road and Granite Grove Way	Granite Bay	Placer
Construction	5S31C367156	Auburn Folsom Road Widening North Phase	15.7	Acres	Auburn Folsom Road	Granite Bay	Placer
Construction	5S31C370216	Enclave	12.1	Acres	End of Pastor Drive	Granite Bay	Placer
Construction	5S31C368851	Greyhawk II	6.54	Acres	Greyhawk Dr at Woodgrove Way	Granite Bay	Placer
Construction	5S57C365511	River Landing	5	Acres	1895 Sierra Road	Granite Bay	Placer
Construction	5S31C368733	Johl Residence	5	Acres	4607 King Ranch Place	Granite Bay	Placer
Construction	5S31C371752	Folsom Dike 1	5	Acres	Granite Bay Recreation Area	Granite Bay	Placer
Construction	5S31C372418	The Enclave	1.93	Acres	West of Pastor Drive	Granite Bay	Placer
Construction	5S31C366975	Sierra College Blvd Douglas Blvd Sidewalk Improvements	1.5	Acres	Douglas Blvd and Sierra College Blvd	Granite Bay	Placer
Construction	5S31C372813	Dollar General Foresthill	1.2	Acres	5830 Sunset Drive	Foresthill	Placer
Construction	5S31C361290	Bear River Canal Project	3	Acres	Colfax Quad SE Quardrant	Colfax	Placer
Construction	5S31C372814	Dollar General Colfax	1.3	Acres	951 S Auburn Street	Colfax	Placer
Construction	5S31C371089	Bella Tuscany	57	Acres	Black Oak Road	Auburn	Placer
Construction	5S57C369587	SMD 1 SEWER PUMP STATION	30	Acres	Northwest Corner of Intersection of	Auburn	Placer
Construction	5S31C372819	Rock Creek Pad 6	22.88	Acres	2845 Bell Road	Auburn	Placer
Construction	5S31C370954	Auburn Bluffs Subdivision	9.6	Acres	Lantern View Drive	Auburn	Placer
Construction	5S31C371998	Willow Creek Shopping Center	7.07	Acres	NWC HWY 49 and Willow Creek Dr	Auburn	Placer

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Construction	5S31C370781	Quartz Ridge	6.5	Acres	200 Silver Bend Way	Auburn	Placer
Construction	5S31C357957	Canyon View Watershed Restoration	5	Acres	Section 35 Township 13 N	Auburn	Placer
Construction	5S31C372620	Placer County Animal Services Center	5	Acres	11232 B Avenue	Auburn	Placer
Construction	5S31C371960	Plaza II	3.3	Acres	1760 Grass Valley Highway	Auburn	Placer
Construction	5R32C369025	Mooney Road 5R CR A21	21	Acres	Begin south of Lassen County Line on A25 and	Susanville	Plumas
Construction	5R32C371253	Irrigation Pond	44	Acres	500 N Mill Creek	Quincy	Plumas
Construction	5R32C341771	Sierra Park	15.43	Acres	APN 116 050 034	Quincy	Plumas
Construction	5R32C368175	Bucks Lake Road	5.9	Acres	Half Mile E of Snake Lake Rd	Quincy	Plumas
Construction	5R32C368636	Peppard Flat Grading	1.7	Acres	1506 Peppard Flat Rd	Quincy	Plumas
Construction	5R32C367749	Chester Warner Valley Road	25	Acres	Between Juniper Lake road and	Chester	Plumas
Construction	5R32C360351	Old Red Bluff Road Warner Creek Bridge	18.11	Acres	MP 12 Chester Warner Valley Road	Chester	Plumas
Construction	5R32C356679	820 Lorraine Dr	5	Acres	820 Lorraine Dr	Chester	Plumas
Construction	5R32C371113	Dock Storage Yard	2.54	Acres	407 408 411 Peninsula Drive	Chester	Plumas
Construction	5R32C370710	Gansner Bar Fish Barrier	2.75	Acres	Caribou Rd and Hwy 70	Belden	Plumas
Construction	5R32C371415	Beckwourth Genessee Road 111	80	Acres	Beginning at the town of Beckwourth and proceeding 10 miles north and west	Beckwourth	Plumas
Construction	5S34C368173	West Sac Truckstop	2.41	Acres	4790 West Capital Avenue	West Sacramento	Sacramento
Construction	5S34C355120	Natomas Levee Improvement Prog Phase 2	1224.5	Acres	Natomas Basin	Sacramento	Sacramento
Construction	5S34C359132	Natomas Levee Improvement Program-Phase 4a	915.56	Acres	Natomas Basin	Sacramento	Sacramento
Construction	5S34C357072	Notamas Levee Improvement Program Phase 3	793.51	Acres	Natomas Basin	Sacramento	Sacramento
Construction	5S34C366044	Former SPTCo Railyard	180	Acres	501 Jibboom Street	Sacramento	Sacramento
Construction	5S34C370956	North Natomas Regional Park Ph 5	171	Acres	2501 New Market Drive	Sacramento	Sacramento
Construction	5S34C368039	Los Rios American River College Culinary Arts	128	Acres	4700 College Oak Drive	Sacramento	Sacramento
Construction	5S34C321214	Curtis Park Village Soil Remed	72	Acres	3675 Western Pacific Avenue	Sacramento	Sacramento
Construction	5S34C353064	Township 9	60	Acres	424 N 7th St	Sacramento	Sacramento
Construction	5S34C372640	Hanson Florin Zero Discharge	55	Acres	7020 Tokay Avenue	Sacramento	Sacramento
Construction	5S34C369971	McKinley Village	48.8	Acres	Business 80 and A Street	Sacramento	Sacramento
Construction	5S34C363975	Siemens	34	Acres	7340 French Road	Sacramento	Sacramento
Construction	5S34C371526	HBA Retail Center	33.3	Acres	2030 Arden Way	Sacramento	Sacramento
Construction	5S34C372174	Parkebridge Village 1	29.93	Acres	Fong Ranch Rd	Sacramento	Sacramento

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Construction	5S34C362793	BUS MAINTENANCE FACILITY 2	19.9	Acres	3701 Dudley Blvd	Sacramento	Sacramento
Construction	5S34C372432	Natomas Westshore Parcel A	18.42	Acres	Del Paso Blvd and El Centro Road	Sacramento	Sacramento
Construction	5S34C371550	McKinley Village Offsite Project	17	Acres	Alhambra Blvd and 28th Street and Future 40th Street	Sacramento	Sacramento
Construction	5S34C369671	4750 Manzanita Way	16.7	Acres	Sacramento CA 95833	Sacramento	Sacramento
Construction	5S34C366807	Sacramento Water Treatment Plants	16	Acres	301 Water St	Sacramento	Sacramento
Construction	5S34C371402	100 Bicentennial Circle	15.5	Acres	100 Bicentennial Circle	Sacramento	Sacramento
Construction	5S34C368990	The Grove by Campus Crest	13.6	Acres	3075 Redding Avenue	Sacramento	Sacramento
Construction	5S34C368250	4393 0 Sacramento Walmart	11.72	Acres	4675 Watt Avenue	Sacramento	Sacramento
Construction	5S34C365389	Thatcher Company New Facility Phase 1	11.38	Acres	8625 Unsworth Avenue	Sacramento	Sacramento
Construction	5S34C351224	Coppertstone Villages II & III	10.3	Acres	7640 W Stockton Blvd	Sacramento	Sacramento
Construction	5S34C369778	Sacramento ESC	9	Acres	547 L St	Sacramento	Sacramento
Construction	5S34C372556	WINCO Foods	8.67	Acres	2300 Watt Ave	Sacramento	Sacramento
Construction	5S34C372072	Riverfront Reconnection	8.21	Acres	Capitol Mall O St and 2nd St	Sacramento	Sacramento
Construction	5S34C365733	Raley & Vinci	7.9	Acres	Raley Blvd	Sacramento	Sacramento
Construction	5S34C369889	Patterson Subdivision	7.9	Acres	4439 Dry Creek Road	Sacramento	Sacramento
Construction	5S34C369158	29 41 & 45 Morrison Ave	7.8	Acres	4600 Northgate Blvd Ste 100	Sacramento	Sacramento
Construction	5S34C370000	Evan Estates	7.5	Acres	Stevenson Avenue	Sacramento	Sacramento
Construction	5S34C367379	Kuni Chevrolet	7.47	Acres	2449 Fulton Avenue	Sacramento	Sacramento
Construction	5S34C360326	Del Paso Nuevo 4	6.4	Acres	South Ave and Taylor St	Sacramento	Sacramento
Construction	5S34C370245	Language Academy of Sacramento	6.06	Acres	2850 49th Street	Sacramento	Sacramento
Construction	5S34C370110	John F Kennedy High School	6	Acres	6715 Gloria Drive	Sacramento	Sacramento
Construction	5S34C370316	Unitarian Universalist Society of Sacramento	5.8	Acres	2425 Sierra Boulevard	Sacramento	Sacramento
Construction	5S34C369781	FLC Rancho Cordova Center	5.7	Acres	10259 Folsom Blvd	Sacramento	Sacramento
Construction	5S34W002025	Egret Park	5.66	Acres	5145 Westlake Parkway	Sacramento	Sacramento
Construction	5S34W002018	Regency Lot K	5.6	Acres	5561 Celebration St	Sacramento	Sacramento
Construction	5S34C371961	Anton Arcade	5.16	Acres	2134 Butano Drive	Sacramento	Sacramento
Construction	5S34C370288	ARCF WRDA 1996 Remaining Sites R7 and L7	5.1	Acres	H Street Bridge Crossing American River	Sacramento	Sacramento
Construction	5S34C361270	Natomas Field Stockpile Off Haul	5	Acres	Amelia Earhart Avenue at Samuelson Way	Sacramento	Sacramento
Construction	5S34C368778	CA3	5	Acres	1625 National Drive	Sacramento	Sacramento
Construction	5S34W002026	El Camino Ave Phase 2	4.46	Acres	9560 El Camino Ave	Sacramento	Sacramento
Construction	5S34C366826	Fairbairn Water Treatment Plant	4	Acres	7501 College Town	Sacramento	Sacramento

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Construction	5S34C372832	Roseville Road Arcade Creek Bridge Replacement	4	Acres	Roseville Road at Arcade Creek	Sacramento	Sacramento
Construction	5S34C370158	Milargo	3.7	Acres	6241 Fair Oaks Boulevard	Sacramento	Sacramento
Construction	5S34C371548	Evergreen Phase 1	3.7	Acres	2470 Boxwood Street	Sacramento	Sacramento
Construction	5S34C368307	Arden Oaks Phase 1 Water Main Replacement	3.6	Acres	4231 Arden Way	Sacramento	Sacramento
Construction	5S34C369872	ARCF WRDA 1996 Remaining Sites R3A and L10	3.5	Acres	Business 80 at Tribute and Howe Ave at La Riviera	Sacramento	Sacramento
Construction	5S34C372006	Annette Street and Eastern Avenue	3.2	Acres	2405 Laredo Road	Sacramento	Sacramento
Construction	5S34C362852	VA Mather Medical Center	3	Acres	10535 Hospital Way	Sacramento	Sacramento
Construction	5S34C371199	Saint Marys Cemetery New Administration Center & Chapel Columbarium	2.87	Acres	6700 21st Avenue	Sacramento	Sacramento
Construction	5S34C367369	The Welsh Property	2.83	Acres	Pocket Road	Sacramento	Sacramento
Construction	5S34C370298	The Bridge at Jonas	2.5	Acres	1020 Jonas Ave	Sacramento	Sacramento
Construction	5S34C370973	Fair Oaks Hills Unit 3	2.4	Acres	7883 Fair Oaks Boulevard	Sacramento	Sacramento
Construction	5S34C372026	south sacramento islamic center	2.07	Acres	7285 25th st	Sacramento	Sacramento
Construction	5S34C370391	Huntington at Sierra Oaks	1.93	Acres	361 Munroe Street	Sacramento	Sacramento
Construction	5S34C369117	Guy West Bridge	1.8	Acres	Guy West Bridge	Sacramento	Sacramento
Construction	5S34C368524	McDonald	1.33	Acres	2858FultonAve	Sacramento	Sacramento
Construction	5S34C368837	Park Riviera Place	1.3	Acres	6655 Park Riviera Way	Sacramento	Sacramento
Construction	5S34C362936	Indian Lane Subdivision	1.1	Acres	7114 Indian Lane	Sacramento	Sacramento
Construction	5S34C372163	Carls Jr Sacramento	1.1	Acres	2280 Arden Way	Sacramento	Sacramento
Construction	5S34C369502	2014 Belcot Road El Camino Avenue and Fulton Avenue ROW Improvement Project	1	Acres	2100 Fulton Avenue	Sacramento	Sacramento
Construction	5S34C370652	Pritchard Lake Pumping Plant	1	Acres	8935 Garden Highway	Sacramento	Sacramento
Construction	5S34C371019	North Country Club Estates Phase 4	1	Acres	2701 Lerwick Road	Sacramento	Sacramento
Construction	5S34C366602	American River Common Features Site L5	0.5	Acres	Teichert Avenue	Sacramento	Sacramento
Construction	5S34C369541	Palisades Sierra Oaks	4.97	Acres	Fairgate Road	Saco	Sacramento
Construction	5S34C365042	Watt Ave at US 50 Interchange	93.3	Acres	Watt Ave at US 50 Interchange	Rosemont	Sacramento
Construction	5S34C372786	Sherman Island Whales Mouth Wetland and Scour Pond Project	877	Acres	Sherman Island	Rio Vista	Sacramento
Construction	5S34C369803	Capital Village Phase 3 and 4	32	Acres	SE Corner International Drive at Prospect Park Drive	Rancho Cordova	Sacramento

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Construction	5S34C367831	Kavala Ranch	25.9	Acres	1234 Azalea Park Way	Rancho Cordova	Sacramento
Construction	5S34C366295	Sunridge Park Phase 2	17.88	Acres	Pingree Lake Way at Timberland Drive	Rancho Cordova	Sacramento
Construction	5S34C369627	Rancho Cordova Entertainment LLC	13.02	Acres	2920 Kilgore Road	Rancho Cordova	Sacramento
Construction	5S34C368768	Cordova High School Performing Arts Building	8	Acres	2239 Chase Drive	Rancho Cordova	Sacramento
Construction	5S34C366842	Femoyer St	6.37	Acres	Femoyer St	Rancho Cordova	Sacramento
Construction	5S34C371157	Tributary Point Drive	6.3	Acres	12100 Tributary Point Drive	Rancho Cordova	Sacramento
Construction	5S34C371196	Mather Veterans Village	3.7	Acres	10621 Schirra Avenue	Rancho Cordova	Sacramento
Construction	5S34C367370	Sunridge Park Village 2B	1.52	Acres	Timberland Drive	Rancho Cordova	Sacramento
Construction	5S34C370457	AT&T Parking Lot	1.3	Acres	12700 Folsom Boulevard	Rancho Cordova	Sacramento
Construction	5S34C372066	Rivergate Cordova	1.07	Acres	2354 Sunrise Boulevard	Rancho Cordova	Sacramento
Construction	5S34C371146	Rivergate Plaza Pad 2 and Frontage	0.86	Acres	2350 Sunrise Boulevard	Rancho Cordova	Sacramento
Construction	5S34C340086	Cresleigh Almondwood	10.01	Acres	5843 Almond Ave	Orangevale	Sacramento
Construction	5S34C367619	Sprow Ranch	7.1	Acres	6714 Santa Juanita Ave	Orangevale	Sacramento
Construction	5S34C358565	Pringle Estates	4	Acres	5938 Illinois Ave	Orangevale	Sacramento
Construction	5S34C368849	Santa Juanita Estates	3.5	Acres	6840 Santa Juanita Avenue	Orangevale	Sacramento
Construction	5S34C371423	Assisted Living Village	3.33	Acres	6709 Walnut Avenue	Orangevale	Sacramento
Construction	5S34C367442	Greenback Assisted Living	3.1	Acres	8685 Greenback Lane	Orangevale	Sacramento
Construction	5S34C371584	Oakdale Park	6	Acres	3708 Myrtle Avenue	North Highlands	Sacramento
Construction	5S34C366920	Folsom Dam Auxiliary Spillway Phase IV	129	Acres	855 Folsom Lake Crossing	Folsom	Sacramento
Construction	5S34C365784	The Island	34	Acres	Parkshore Drive	Folsom	Sacramento
Construction	5S34C370132	Parkshore	34	Acres	South of Parkshore Dr between Folsom Blvd and Plaza Dr	Folsom	Sacramento
Construction	5S34C359873	MIAD KeyBlock	25	Acres	7794 Folsom Dam Road	Folsom	Sacramento
Construction	5S34C370146	Empire Ranch Village 40C	22.5	Acres	Orenco Circle	Folsom	Sacramento
Construction	5S34C369315	Empire Ranch Village 31	19.56	Acres	Oliver Court	Folsom	Sacramento
Construction	5S34C370084	Empire Ranch Village 32	17	Acres	West of Empire Ranch Road	Folsom	Sacramento
Construction	5S34C363466	The Parkway Lot J The Meadows	16.85	Acres	Parkway Drive North	Folsom	Sacramento
Construction	5S34C361816	Johnny Cash Trail Pedestrian Overcrossing	15.63	Acres	900 Folsom Lake Crossing	Folsom	Sacramento
Construction	5S34C364209	Turnstone	15.61	Acres	Iron Point Road and McAdoo Road	Folsom	Sacramento
Construction	5S34C366077	The Knolls	14.4	Acres	Northeasterly corner of E Natoma Street and Green Valley Road	Folsom	Sacramento
Construction	5S34C356599	72 Raw Water Bypass Project	14	Acres	7785 Folsom Auburn Road	Folsom	Sacramento
Construction	5S34C365242	Empire Ranch Village 62	13.6	Acres	Carpenter Hill Road and Hidden Falls Road	Folsom	Sacramento
Construction	5S34C370877	Empire Ranch Village 60	5.5	Acres	Fenceline Drive	Folsom	Sacramento

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Construction	5S34C370758	Commons at Prairie City	4.2	Acres	Prairie City Rd an Willard Dr	Folsom	Sacramento
Construction	5S34C368473	Estacio Estates	4	Acres	Alayna Way	Folsom	Sacramento
Construction	5S34C368309	Addison Place	3.9	Acres	SE Corner Sibley and Glenn	Folsom	Sacramento
Construction	5S34C362815	Folsom Bridge Access Road to Piers 2 & 3 & Rock Wall Removal	3.7	Acres	Folsom Lake Crossing	Folsom	Sacramento
Construction	5S34C370966	Residences at American River Canyon	2.5	Acres	Marietta Court & Folsom Auburn Rd	Folsom	Sacramento
Construction	5S34C369967	Sheba Office Park	1.8	Acres	6609 Folsom Auburn Road	Folsom	Sacramento
Construction	5S34C369790	Goddard Day School	1.49	Acres	Outcropping Way	Folsom	Sacramento
Construction	5S34C369325	Talmont	16.64	Acres	Northwest corner of Madison Ave and Kenneth Ave	Fair Oaks	Sacramento
Construction	5S34C369955	Fair Oaks Presbyterian Church	11.34	Acres	11427 Fair Oaks Boulevard	Fair Oaks	Sacramento
Construction	5S34C370448	Davis Ranch	7.4	Acres	10850 Fair Oaks Blvd	Fair Oaks	Sacramento
Construction	5S34C368972	The Village at Fair Oaks	5.43	Acres	6800 Madison Avenue	Fair Oaks	Sacramento
Construction	5S34C364814	Marquee	4	Acres	Brando Loop	Fair Oaks	Sacramento
Construction	5S34C372229	Taylor Oak Estates	2.5	Acres	5232 Buena Vista Ave	Fair Oaks	Sacramento
Construction	5S34C365357	Village at Old Fair Oaks	2.3	Acres	Orange Ave at Surnrise Blvd	Fair Oaks	Sacramento
Construction	5S34C368359	MORMON ISLAND AUXILIARY DAM	131	Acres	281 Green Valley Road	El Dorado Hills	Sacramento
Construction	5S34C341243	Bella Terra Estates	10	Acres	N Cherry Ave & Excelsior Ave	Citrus Heights	Sacramento
Construction	5S34C368986	Watt Communities at Autumnwood	9.2	Acres	7108 Antelope Road	Citrus Heights	Sacramento
Construction	5S34C372651	Sunrise Blvd Complete Street Phase 3	8	Acres	Sunrise Blvd	Citrus Heights	Sacramento
Construction	5S34C370661	Northridge Grove	7.9	Acres	5555 Mariposa Avenue	Citrus Heights	Sacramento
Construction	5S34C372100	Capital Nursery Plaza	5.97	Acres	5410 Sunrise Boulevard	Citrus Heights	Sacramento
Construction	5S34C371646	Bubbas Car Wash	1.3	Acres	7411 Greenback Lane	Citrus Heights	Sacramento
Construction	5S34C370737	Winston Churchill Middle School	17.1	Acres	4900 Whitney Avenue	Carmichael	Sacramento
Construction	5S34C372406	Jesuit High School Track and Field Improvements	7.75	Acres	1200 Jacob Lane	Carmichael	Sacramento
Construction	5S34C367410	Jesuit High School Chapel	6	Acres	1200 Jacob Lane	Carmichael	Sacramento
Construction	5S34C371874	The Oaks at Carmichael	4.3	Acres	5741 Winding Way	Carmichael	Sacramento
Construction	5S34C367967	Fair Oaks Lotus	3.8	Acres	Fair Oaks Blvd	Carmichael	Sacramento
Construction	5S34C365673	Weatherstone	2.19	Acres	8015 Fair Oaks Boulevard	Carmichael	Sacramento
Construction	5S34C370602	Barrett Ranch Multi Family Apartments	8.2	Acres	4850 Antelope Road	Antelope	Sacramento
Construction	5S34C369926	Riolo Manor	3.87	Acres	8312 Cook Riolo Road	Antelope	Sacramento
Construction	5R45C371614	Brandy Creek WDS	203520	SF	14412 JF Kennedy Memorial Drive	Whiskeytown	Shasta
Construction	5R45C367159	Sierra Pacific Industires Inc	122	Acres	3735 El Cajon Ave	Shasta Lake	Shasta
Construction	5R45C367112	Windsor Estates Subdivision Phase II Unit 5	13.2	Acres	APN 075 030 034 West of Windsor Estates	Shasta Lake	Shasta

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5R45C356276	Vicotria Dr Fire Access	227.56	Acres	Vicotria Dr S	Redding	Shasta
Construction	5R45C372738	Shastina Ranch Subdivision	223.8	Acres	5650 Airport Road	Redding	Shasta
Construction	5R45C367077	Highland Park Units 4 5 6 7	40	Acres	Reddington Drive Mill Valley Parkway Mission De Oro Drive Road C Road I Road B and Road J	Redding	Shasta
Construction	5R45C361677	Turtle Bay Hotel	17	Acres	840 Auditorium Drive	Redding	Shasta
Construction	5R45C342108	Brooks Valley Subdivision	16.99	Acres	Valley Brook Dr N of Valley Ridge Dr	Redding	Shasta
Construction	5R45C335402	S 10 04	14.25	Acres	4090 Eureka Way	Redding	Shasta
Construction	5R45C370556	Moores Flour Mill	11.7	Acres	6150 Shasta View Drive	Redding	Shasta
Construction	5R45C365416	Palomar at Clover Creek	10	Acres	Incline Way	Redding	Shasta
Construction	5R45C371411	CCWWTP Biosolids Facility	7.4	Acres	2200 Metz Road	Redding	Shasta
Construction	5R45C370317	Prestige Storage	5.2	Acres	1120 Prestige Way	Redding	Shasta
Construction	5R45C372607	Premier Oil Change & Wash	4.61	Acres	100 North Boulder Creek	Redding	Shasta
Construction	5R45C369787	RPD Patrol Building	4.6	Acres	777 Cypress Ave	Redding	Shasta
Construction	5R45C372274	Bel Air Estates	4.5	Acres	907 Fantenell Ct	Redding	Shasta
Construction	5R45C369014	Lithia Toyota of Redding	4.5	Acres	250 East Cypress Avenue	Redding	Shasta
Construction	5R45C369736	Browning Pointe	4	Acres	4255 Alta Campo Drive	Redding	Shasta
Construction	5R45C370404	Dry Creek Road Widening	3.76	Acres	Dry Creek Road	Redding	Shasta
Construction	5R45C368355	Hope Lane Subdivision Unit 1	3.63	Acres	19402 Carnegie Drive	Redding	Shasta
Construction	5R45C370230	City Lights Development	2.7	Acres	650 Hilltop Drive	Redding	Shasta
Construction	5R45C368535	Tuscany Villas	2.5	Acres	1800 Gold Hills Drive	Redding	Shasta
Construction	5R45C372586	Hollow Lane Estates by Palomar	2.46	Acres	11573 Ridgewood Road	Redding	Shasta
Construction	5R45C370814	North Valley Distributing	2.46	Acres	3081 Crossroads Drvie	Redding	Shasta
Construction	5R45C363027	Buenaventura Park	1.93	Acres	Lear Way	Redding	Shasta
Construction	5R45W002147	Dollar General Store No 15959	2.02	Acres	21973 Old 44 Drive	Palo Cedro	Shasta
Construction	5R45C370903	Shasta Wine Village	10.85	Acres	Old Oregon Trail	Mountain Gate	Shasta
Construction	5R45C370665	44215 Walnut	22.4	Acres	44215 Walnut Street	Mc Arthur	Shasta
Construction	5R45C370675	Tamarack	5.92	Acres	20375 Tamarack Ave	Burney	Shasta
Construction	5R45C367167	Pit 3 Dam Rock Creek Crossing Seismic Upgrade	1.22	Acres	FR37NO6	Burney	Shasta
Construction	5R45C372661	Dollar General Burney	1.1	Acres	37288 State Hwy 299	Burney	Shasta
Construction	5R45C370632	Hawthorne Ave Widening	11.7	Acres	Hawthorne Avenue	Anderson	Shasta
Construction	5R45C368107	Homewood 3A	7.4	Acres	None	Anderson	Shasta
Construction	5R45C371363	Tractor Supply Company Anderson	3.1	Acres	Marx Way	Anderson	Shasta
Construction	5R45C367769	Anderson Middle School	1.86	Acres	1646 Ferry Street	Anderson	Shasta
Construction	5S46C359376	Dickey Driveway	520	Acres	25555 Highway 49	Sierra City	Sierra

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5R47C370667	Mountain View	24.2	Acres	37571 Mountain View Road	Burney	Siskiyou
Construction	5S51C365902	Feather River West Levee Project Contract C	245.5	Acres	Along West Feather River Levee	Yuba City	Sutter
Construction	5S51C326321	Riverside Meadows	206	Acres	Highway 80 & Feather River Blvd	Yuba City	Sutter
Construction	5S51C369726	Feather River West Levee Project Contract B	205.37	Acres	Along west Feather River levee	Yuba City	Sutter
Construction	5S51C336413	Tres Picos Estates West	25	Acres	West Of Stabler Lane & South Of Pease Road	Yuba City	Sutter
Construction	5S51C370174	Yuba City Raw Water Security Improvements	25	Acres	701 Northgate Drive	Yuba City	Sutter
Construction	5S51C333840	Tres Picos Estates	19	Acres	E Of Stabler Lane And South Of Pease Rd	Yuba City	Sutter
Construction	5S51C368715	Prop 84 Waterline Extension Project	15.86	Acres	Franklin Road	Yuba City	Sutter
Construction	5S51C370267	Richland Neighborhood Center	14.9	Acres	488 Garden Highway	Yuba City	Sutter
Construction	5S51C371148	Twin River Charter School Site	10	Acres	2510 Live Oak Boulevard	Yuba City	Sutter
Construction	5S51C370607	2154 Foote	9.8	Acres	3961 Larkin Road	Yuba City	Sutter
Construction	5S51C358161	New Earth Market River Valley Family Fitness	9.5	Acres	1475 1415 Tharp Rd	Yuba City	Sutter
Construction	5S51C368234	Sierra Central Credit Union1351	8.15	Acres	1321 Harter Parkway	Yuba City	Sutter
Construction	5S51C366161	Yuba City Dodge Chrysler	6.12	Acres	950 Harter Parkway	Yuba City	Sutter
Construction	5S51C367626	Yuba City Courthouse	5	Acres	1500 Veterans Memorial Circle	Yuba City	Sutter
Construction	5S51C368718	Kingsbury Inc	2	Acres	209 Burns Drive	Yuba City	Sutter
Construction	5S51C366057	Knights Road Facility	1.16	Acres	10982 Knights Road	Robbins	Sutter
Construction	5S51C370643	Micro Paradox	19.98	Acres	3556 Sankey Road	Pleasant Grove	Sutter
Construction	5S51C372553	Live Oak Soccer Park	13.8	Acres	9150 Linda Street	Live Oak	Sutter
Construction	5S51C367649	Sikh Temple Live Oak	5.26	Acres	10461 Larkin Road	Live Oak	Sutter
Construction	5S51C371963	Maple Park phase II	0.46	Acres	Maple Park	Live Oak	Sutter
Construction	5S51C367958	East Nicolaus Substation Reliability Project	3.3	Acres	El Centro Blvd and East Nicolaus Ave	East Nicolaus	Sutter
Construction	5R52C370411	San Benito Curve Realignment	8.4	Acres	8181 San Benito Ave	San Benito	Tehama
Construction	5R52C355690	Nine Mile Hill Ranch	3320	Acres	156 Diablo Rd.	Red Bluff	Tehama
Construction	5R52C369530	1608 2 Red Bluff Walmart	30	Acres	608 Luther Road	Red Bluff	Tehama
Construction	5R52C365339	Walnut Subdivision	10	Acres	2000 Walnut Street	Red Bluff	Tehama
Construction	5R52C371421	New Red Bluff Courthouse County of Tehama	6.81	Acres	1740 Walnut Street	Red Bluff	Tehama
Construction	5R52C369990	Wastewater treatment plant and constructed wetlands	99	Acres	Dinghy Place and Ventana Drive	Cottonwood	Tehama

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5R52C369828	Polniaszek Trails	12.02	Acres	18880 Bay Meadows Ln	Cottonwood	Tehama
Construction	5R52C364574	Bowman Road SF Cottonwood	7.76	Acres	15929 Bowman Road	Cottonwood	Tehama
Construction	5R52W002089	Bowman Road Safe Routes To School	3.4	Acres	Bowman Road	Cottonwood	Tehama
Construction	5R52C368551	Cottonwood Roseville Transmission Line Replacement	1.91	Acres	Shasta Butte and Tehama Counties	Cottonwood	Tehama
Construction	5R52C366122	Corning Community Park Project	10	Acres	Houghton Ave	Corning	Tehama
Construction	5R52C370228	Stonefox Ranch Subdivision Phase 1	8.8	Acres	Solano Street	Corning	Tehama
Construction	5R52C372287	2192 Max Ramirez	8.1	Acres	22189 Samson Ave	Corning	Tehama
Construction	5R52C372012	Golden West Homes Models	3	Acres	Highway 99W	Corning	Tehama
Construction	5R52C371538	Dollar General Store No 15653	1.89	Acres	530 Solano Street	Corning	Tehama
Construction	5R52C372465	99W at Thomes Creek	3	Acres	6159 99w	Conejo	Tehama
Construction	5S58C368337	Heartlands at Plumas Lakes	4	Acres	4282 Fortuna Road	Yuba City	Yuba
Construction	5S58C369343	Sunset Valley Duplexes	7.5	Acres	Evergreen Drive	Wheatland	Yuba
Construction	5S58W002100	Hammonton Bluffs	185	Acres	Hammonton Smartsville Road	Smartville	Yuba
Construction	5S58C368891	Feather River Blvd Interchange Project	47.6	Acres	Feather River Blvd	Olivehurst	Yuba
Construction	5S58C371320	2586 Rosser Road	24.7	Acres	2586 Rosser Road	Olivehurst	Yuba
Construction	5S58C370089	Cobblestone Phase 3	8.5	Acres	Ivy Hatch Way	Olivehurst	Yuba
Construction	5S58C370734	Shoei Foods	8.44	Acres	1900 Feather River Blvd	Olivehurst	Yuba
Construction	5S58C371152	Powerline Road Bike Ped Improvements from 15th Ave to 9th Ave	5	Acres	Powerline Rd from 15th Ave to 9th Ave	Olivehurst	Yuba
Construction	5S58C370721	Olivehurst Avenue Rule 20A Project	2.26	Acres	Olivehurst Avenue	Olivehurst	Yuba
Construction	5S58C371195	Lots 46 & 47	0.36	Acres	Long Horn Trail Drive	Olivehurst	Yuba
Construction	5S58C361240	Rideout Memorial Hospital	4	Acres	726 Fourth Street	Marysville	Yuba
Construction	5S58C351252	South Congregation Kingdom Hall Project	3	Acres	2422 Hammonton Smartville Rd	Marysville	Yuba
Construction	5S58C372520	Yuba County Sheriff Facility Tenant Improvements	3	Acres	720 Yuba Street	Marysville	Yuba
Construction	5S58W002122	Loma Rica Shoulder Widening	1.4	Acres	Loma Rica Road	Marysville	Yuba
Construction	5S58C329596	Montrose at Edgewater	74	Acres	Nw Of Int Of Erle Rd And Griffith Ave	Linda	Yuba
Construction	5S58C330434	The Orchards	64	Acres	W Of Int Of Erle Rd and Griffith Ave N Of Erle Rd	Linda	Yuba
Construction	5S58C370280	Sierra Vista Subdivision	5	Acres	Jordan Drive	Linda	Yuba
Construction	5S58C371457	Greenfields at Edgewater	3	Acres	River Bank and Gold River Way	Linda	Yuba
Construction	5S58C370810	Log Cabin Diversion Dam	5.4	Acres	N/A	Camptonville	Yuba

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Construction	5S58C371993	Distributed Common Ground Station Operations Facility	8.87	Acres	10763 B Street Building 2142	Beale Afb	Yuba
Construction	5S58C372602	Beale AFB Civil Engineer Administration Operation Facility	7	Acres	6451 B Street	Beale Afb	Yuba
Construction	5S58C370464	Wheeler Ranch Ponds	170	Acres	Ella Road	Arboga	Yuba
Construction	5S58C370684	Plumas Lakes	26.4	Acres	1141 Thunder Ranch Way	Arboga	Yuba
Construction	5S58C365692	River Oaks Commercial Site	10	Acres	River Oaks Blvd at Feather River Blvd	Arboga	Yuba

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5R04I023254	Carr Mine	46.6	Acres	Carr Mine	Butte Meadows	Butte
Industrial	5R04I003206	Chico Municipal Airport	925	Acres	150 Airpark Blvd	Chico	Butte
Industrial	5R04I000249	Neal Road Class III Landfill	101	Acres	1023 NEAL RD	Chico	Butte
Industrial	5R04I015720	Sierra Nevada Brewing Co	52	Acres	1075 20th St	Chico	Butte
Industrial	5R04I014405	Baldwin Contracting Co Chico Y	48	Acres	1764 Skyway	Chico	Butte
Industrial	5R04I010509	A A Concrete Supply	31	Acres	3578 Esplanade	Chico	Butte
Industrial	5R04I003099	Smuckers Juice Processing WW Ponds	29	Acres	37 Speedway	Chico	Butte
Industrial	5R04I024976	Western Woods Inc	28.5	Acres	275 Sikorsky Ave	Chico	Butte
Industrial	5R04I020287	Chico Terminal	25	Acres	2570 Hegan Lane	Chico	Butte
Industrial	5R04I003207	Chico City Municipal Ser Ctr	11	Acres	901 Fir St	Chico	Butte
Industrial	5R04I022043	Pick N Pull Dismantlers	10	Acres	397 E Park Ave	Chico	Butte
Industrial	5R04I021270	Little Chico Creek	4.9	Acres	Canyon Shadows Rd	Chico	Butte
Industrial	5R04I016186	North Valley Disposal	4	Acres	2569 Scott Ave	Chico	Butte
Industrial	5R04I012784	Chico Scrap Metals Inc	2	Acres	878 E 20th St	Chico	Butte
Industrial	5R04I023372	Butte Cnty Yard Chico	0.68	Acres	20th and Locust	Chico	Butte
Industrial	5R04I002075	United Parcel Ser Cachc	326488	SqFt	401 Otterson Dr	Chico	Butte
Industrial	5R04I002466	Wrex Prod Inc	175500	SqFt	25 Wrex Ct	Chico	Butte
Industrial	5R04I022971	Asbury Environmental Services Chico II LLC	60000	SqFt	1618 W 5th St	Chico	Butte
Industrial	5R04I011075	Transdev Services Inc	55000	SqFt	326 Huss Dr	Chico	Butte
Industrial	5R04I024533	Fair Street Recycling	19000	SqFt	2300 Fair Street	Chico	Butte
Industrial	5R04I024730	California Family Recycling	7200	SqFt	2565 S Whitman Place	Chico	Butte
Industrial	5R04I022009	Asbury Environmental Services Chico	1495	SqFt	2549 Scott Ave	Chico	Butte
Industrial	5R04I022926	Propacific Fresh	18	Acres	70 Pepsi Wy	Durham	Butte
Industrial	5R04I021331	Chico Scrap Metal South	7	Acres	766 Oro Chico Hwy	Durham	Butte
Industrial	5R04I005864	FedEx Freight Durham	5	Acres	700 Keenan Ct	Durham	Butte
Industrial	5R04I022815	Steel Mill Recyclers	3	Acres	786 Oro Chico Hwy	Durham	Butte
Industrial	5R04I021313	Chico Frito Lay	22000	SqFt	740 Oro & Chico Hwy	Durham	Butte
Industrial	5R04I019732	DJW Truck Dismantlers Hwy 99	6	Acres	1267 State Highway 99	Gridley	Butte
Industrial	5R04I024678	Nelson Terminal	10	Acres	1566 Nelson Road	Nelson	Butte
Industrial	5R04I009678	Butte College WWTP	926	Acres	3536 Butte Campus	Oroville	Butte
Industrial	5R04I002938	Oroville City Airport	567	Acres	225 Chuck Yeager Way	Oroville	Butte
Industrial	5R04I023335	Highway 70 Recycling	133.37	Acres	4801 Feather River Blvd #18	Oroville	Butte
Industrial	5R04I021606	Triangle Rock Products Table Mountain	114	Acres	2216 Table Mountain Blvd	Oroville	Butte
Industrial	5R04I022689	BCJ Sand & Rock Co Chico Pit	94	Acres	4970 Slickens Rd off Wheelock	Oroville	Butte
Industrial	5R04I022477	Oroville Pacific Heights	70	Acres	4714 Pacific Heights	Oroville	Butte

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5R04I016040	Morris Ravine Mine (Quarry)	45	Acres	1324 Cherokee	Oroville	Butte
Industrial	5R04I004410	North State Rendering Tallow Plant	28	Acres	15 Shippee	Oroville	Butte
Industrial	5R04I001810	Pacific Coast Producers Inc Oroville Processing Facility	27	Acres	1601 Mitchell Ave	Oroville	Butte
Industrial	5R04I005004	Oroville Yard	21	Acres	2985 South Fifth Avenue	Oroville	Butte
Industrial	5R04I002694	Setzer Forest Prod	15	Acres	1980 Kusel Rd	Oroville	Butte
Industrial	5R04I001553	Recology Butte Colusa Counties	12	Acres	2720 S 5th Ave	Oroville	Butte
Industrial	5R04I021330	Chico Scrap Metal Inc dba NorCal Recyclers	9	Acres	1855 Kusel	Oroville	Butte
Industrial	5R04I004909	Roplast Industries	9	Acres	3155 S 5th Ave	Oroville	Butte
Industrial	5R04I020964	Oroville Self Serve	7	Acres	2815 Feather River Blvd	Oroville	Butte
Industrial	5R04I024884	Sierra Silica Resources	7	Acres	650 Georgia Pacific Way	Oroville	Butte
Industrial	5R04I009782	Lake Oroville Marina LLC dba Bidwell Canyon Marina	4	Acres	801 Bidwell Canyon Road	Oroville	Butte
Industrial	5R04I023195	Empire Steel	1.25	Acres	1508 Parker Rd	Oroville	Butte
Industrial	5R04I017991	Thermalito Union School District Transportation	1	Acres	1123 Sierra	Oroville	Butte
Industrial	5R04I023930	Mathews Readymix Oroville Plant	652548	SqFt	4290 Pacific Heights Rd	Oroville	Butte
Industrial	5R04I024529	Nicks Auto Dismantling	98600	SqFt	4280 Lincoln Blvd	Oroville	Butte
Industrial	5R04I025403	Crown Metals LLC	20000	SqFt	4801 Feather River Blvd Suite 18	Oroville	Butte
Industrial	5R04I024186	Savior Earth Recycling	4000	SqFt	2680 5th Ave	Oroville	Butte
Industrial	5R04I023371	Butte County Yard Orville	6.8		9 County Center Dr	Oroville	Butte
Industrial	5R04I023332	Graphic Packaging	6.5		525 Airport Pkwy	Oroville	Butte
Industrial	5R04I019233	Oroville Landfill Properties Industrial Stormwater			Ophin	Oroville	Butte
Industrial	5R04I017915	Oroville Uion High School Transportation			2139 Washington Ave	Oroville	Butte
Industrial	5R04I010256	Paradise Skypark	35	Acres	4405 Airport Rd	Paradise	Butte
Industrial	5R04I019075	Lake Oroville Marina LLC	7	Acres	3428 Pentz	Paradise	Butte
Industrial	5R04I022379	Northern Recycling & Waste Ser	5.1	Acres	920 American Way	Paradise	Butte
Industrial	5R04I017896	Paradise USD Bus Maintenance Yard	5	Acres	610 Pearson	Paradise	Butte
Industrial	5R04I025136	Viking Used Auto Parts	5168	SqFt	699 B Pearson Road	Paradise	Butte
Industrial	5R04I023373	Butte Cnty Yard Paradice	0.51		5912 Almond St	Paradise	Butte
Industrial	5R04I003052	Wehah Farm Inc	15	Acres	5370 Church St	Richvale	Butte
Industrial	5S06I018393	Conrad Forest Products	16	Acres	7085 Eddy Rd C	Arbuckle	Colusa
Industrial	5S06I020359	ADM Rice Inc	7	Acres	1603 Old Hwy 99 W	Arbuckle	Colusa

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Industrial	5S06I023975	ThermaSource Cementing Yard	3	Acres	7085 Eddy Road Area G	Arbuckle	Colusa
Industrial	5S06I005371	Colusa Cnty Evans Landfill Tra	122	Acres	Evans Rd 1 2 Mile S Of Meyers	Colusa	Colusa
Industrial	5S06I001560	Colusa Cnty Airport	81	Acres	2915 Highway 20	Colusa	Colusa
Industrial	5S06I020441	Premier Mushrooms Inc	22.02	Acres	2847 Niagara Ave	Colusa	Colusa
Industrial	5S06I021432	Western Ready Mix Concrete Co Inc	2	Acres	2820 Hwy 20	Colusa	Colusa
Industrial	5S06I025202	NorCal Recycling & Demolition	1.5	Acres	541 14th St	Colusa	Colusa
Industrial	5S06I003903	Colusa Transportation Department	1	Acres	901 Colus Ave	Colusa	Colusa
Industrial	5S06I025081	Maxwell Transfer Station	3.67	Acres	3852 Old Highway 99W	Maxwell	Colusa
Industrial	5S06I022929	Colusa Generating Station	19		4780 Dirks Rd	Maxwell	Colusa
Industrial	5S06I022307	West Coast Products	0.85	Acres	717 Tehama St	Orland	Colusa
Industrial	5S06I005372	Colusa Cnty Stonyford Landfill	48	Acres	2 Miles S O Stonyford	Stonyford	Colusa
Industrial	5S06I000534	Wadham Energy Ltd Part	63	Acres	6247 Myers Rd	Williams	Colusa
Industrial	5S06I020372	Viking Pools	21	Acres	121 Crawford Rd	Williams	Colusa
Industrial	5S06I021456	Williams Redi Mix	5	Acres	1310 Husted Rd	Williams	Colusa
Industrial	5S06I023045	Big M Automative	4.5	Acres	271 N 7th St	Williams	Colusa
Industrial	5S06I021474	Coach Maintenance Co	2	Acres	2300 Husted Rd	Williams	Colusa
Industrial	5S06I024811	Ramos Oil Company	1.25	Acres	1802 Old Hwy 99W	Williams	Colusa
Industrial	5S06I016280	Williams Unified Sch Dis Bus Y	16900	SqFt	Eleventh And B Streets	Williams	Colusa
Industrial	5S09I006522	Camino Sch Dist	18	Acres	3060 Snows Rd	Camino	El Dorado
Industrial	5S09I015039	El Dorado Cnty Transit Auth	3	Acres	6565 Commerce Way	Diamond Springs	El Dorado
Industrial	5S09I020631	Truck Maintenance Facility	1.98	Acres	3940 Hwy 49	Diamond Springs	El Dorado
Industrial	5S09I014844	Lilyama Historical Mine	6	Acres	Lilyama Road	El Dorado	El Dorado
Industrial	5S09I016774	Bob S Salvage Scrap Metal	1100	SqFt	4468 Forni Rd	El Dorado	El Dorado
Industrial	5S09I020466	ITW Rippey Corp	2	Acres	5000 Hillsdale Circle	El Dorado Hills	El Dorado
Industrial	5S09I001185	El Dorado Cnty Georgetown Airp	154	Acres	Dry Diggins Road	Georgetown	El Dorado
Industrial	5S09I002883	Black Oak Mine Sch Dist Trans	2	Acres	6540 Wentworth Springs Rd	Georgetown	El Dorado
Industrial	5S09I020109	Sliger Mine	4	Acres	1500 Feet S of Sliger Mine Rd & Fox Grove Ln	Greenwood	El Dorado
Industrial	5S09I001215	El Dorado Cnty Placerville Air	253	Acres	3501 Airport Rd	Placerville	El Dorado
Industrial	5S09I022964	Big Cut Mine	131.34	Acres	2261 Donovan Ranch Rd	Placerville	El Dorado
Industrial	5S09I014115	Lava Cap Winery	80	Acres	2221 Fruitridge Rd	Placerville	El Dorado
Industrial	5S09I023728	Chili Bar Slate Mine	40	Acres	11380 State Highway 193	Placerville	El Dorado
Industrial	5S09I020632	Western El Dorado Recovery Systems	10.14	Acres	4100 Throwita Way	Placerville	El Dorado
Industrial	5S09I008022	Hangtown Creek WRF	5.5	Acres	2300 Coolwater Creek Rd	Placerville	El Dorado
Industrial	5S09I017872	Mother Lode Usd	1.5	Acres	3783 Forni Rd	Placerville	El Dorado

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Industrial	5S09I001157	El Dorado Cnty CDA Transportation Division	83400	SqFt	2441 Headington Rd	Placerville	El Dorado
Industrial	5S09I018174	Placerville Union School District Transportation Dept	62000	SqFt	2877 Schnell School Rd	Placerville	El Dorado
Industrial	5S09I014311	Boeger Winery	12000	SqFt	1709 Carson	Placerville	El Dorado
Industrial	5S09I021560	Placerville Bin	5500	SqFt	4003 Stage Court	Placerville	El Dorado
Industrial	5S09I017873	Pollock Pines Sch Trans	55000	SqFt	2701 Amber Trl	Pollock Pines	El Dorado
Industrial	5S09I000233	Rescue Usd Transporation Facil	21000	SqFt	3880 Green Valley Rd	Rescue	El Dorado
Industrial	5S09I016274	Mountain Aggregates LLC Marin	10	Acres	Ice House Rd	Riverton	El Dorado
Industrial	5R11I010466	McCorkle Farms Inc	119000	SqFt	2470 Road WW	Glenn	Glenn
Industrial	5R11I001573	Orland Haigh Field	390	Acres	Road P At Rd 200	Orland	Glenn
Industrial	5R11I021574	Wilbur Ellis Orland Haigh Field Airport	78	Acres	4115 County Rd P	Orland	Glenn
Industrial	5R11I019928	Jensen Precast Inc	40	Acres	7210 Highway 32	Orland	Glenn
Industrial	5R11I019861	Greenwood Dairy	30	Acres	6569 County Road 27	Orland	Glenn
Industrial	5R11I003468	Valley Rock Orland Plant	25.37	Acres	HWY 32 7266	Orland	Glenn
Industrial	5R11I022650	Parts R Us	13.5	Acres	3948 Hwy 99W	Orland	Glenn
Industrial	5R11I024609	Waste Tire Products	4	Acres	3820 Hwy 99 West	Orland	Glenn
Industrial	5R11I025261	Haigh Field Airport	3.9	Acres	County Road P and County Road 200	Orland	Glenn
Industrial	5R11I010513	Jack L Spence Inc	3	Acres	821 Papst Ave	Orland	Glenn
Industrial	5R11I022803	Orland Auto Wreckers	137500	SqFt	3825 County Road 99 W	Orland	Glenn
Industrial	5R11I022273	Nor Cal Enviro Solutions LLC	77972	SqFt	4383 Co Rd HH	Orland	Glenn
Industrial	5R11I021812	Dye Creek Quarry	60	Acres	99999 Hwy 36 E of Tuscan Springs Rd	Red Bluff	Glenn
Industrial	5R11I016650	CalPlant 1 LLC	275	Acres	6101 State Hwy 162	Willows	Glenn
Industrial	5R11I001601	Willows Glen Co Airport	254	Acres	State Route 162 at Interstate 5	Willows	Glenn
Industrial	5R11I001568	Glenn County Class III Landfill Storm Water	193	Acres	5700 County Rd 33	Willows	Glenn
Industrial	5R11I000338	Willows City	25	Acres	1600 S Tehama	Willows	Glenn
Industrial	5R11I021268	Swift Transportation	5	Acres	1475 Hwy 99 W	Willows	Glenn
Industrial	5R11I004040	Western Ready Mix Concrete Co	2	Acres	E End Of Cedar St	Willows	Glenn
Industrial	5R11I001938	Johns Manville Willows Facility			5616 County 49	Willows	Glenn
Industrial	5R18I016206	Hayden Hill Mine			Hwy 139	Adin	Lassen
Industrial	5R18I010347	Mt Lassen Power	60	Acres	Mooney	Westwood	Lassen
Industrial	5R18I015832	Westwood Class III Landfill	40	Acres	HWY 36	Westwood	Lassen
Industrial	5R25I025342	Sage Country Recycling	0.5	Acres	504 W 12th St	Alturas	Modoc
Industrial	5S29I005634	Grass Valley Ready Mix	308	Acres	Railroad Ave	Grass Valley	Nevada
Industrial	5S29I024812	McCourtney Road Landfill	244	Acres	APN 25 120 12 et al	Grass Valley	Nevada

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5S29I001722	Nevada County Airport	117	Acres	13083 John Bauer Ave	Grass Valley	Nevada
Industrial	5S29I002778	Hansen Bros Ent Greenhorn Cree	35	Acres	12865 Mule Canyon Rd	Grass Valley	Nevada
Industrial	5S29I006044	Grass Valley City WWTP	30	Acres	556C Freeman	Grass Valley	Nevada
Industrial	5S29I002931	Hansen Bros Ent Barr Meadows Y	26	Acres	11727 La Barr Meadows Rd	Grass Valley	Nevada
Industrial	5S29I001610	Nevada Cnty Grass Valley Maint	11	Acres	12548 Loma Rica Dr	Grass Valley	Nevada
Industrial	5S29I002779	Hansen Bros Ent	5	Acres	14789 Taylors Crosing Rd	Grass Valley	Nevada
Industrial	5S29I004364	Durham School Services	4.1	Acres	10701 E Bennett Rd	Grass Valley	Nevada
Industrial	5S29I001343	Grass Valley	3	Acres	11825 La Barr Meadows Rd	Grass Valley	Nevada
Industrial	5S29I013071	Kilroys	3	Acres	12077 State Hwy 49	Grass Valley	Nevada
Industrial	5S29I012647	RDJJB Inc dba Grass Valley Auto & Truck Dis	2	Acres	647 E Main St	Grass Valley	Nevada
Industrial	5S29I014708	Waste Mgt Inc	2	Acres	13083 Grass Valley Ave	Grass Valley	Nevada
Industrial	5S29I025186	Advanced Towing & Recycling	0.46	Acres	319 Railroad Ave	Grass Valley	Nevada
Industrial	5S29I009479	UPS Grass Valley CAGVA	82038	SqFt	12025 Charles Dr	Grass Valley	Nevada
Industrial	5S29I016986	Waste Mgt Inc Nev Cnty	39321	SqFt	12301 Loma Rica Dr	Grass Valley	Nevada
Industrial	5S29I001179	Grass Valley Steelcast	37290	SqFt	145 E Main St	Grass Valley	Nevada
Industrial	5S29I024037	Marks Cycle Store	8073	SqFt	144 Idaho Maryland Road	Grass Valley	Nevada
Industrial	5S29I021949	Grass Valley Bin	4922	SqFt	1020 Whispering Pines Ln Ste B	Grass Valley	Nevada
Industrial	5S29I019611	Empire Mine State Historic Park			10556 E Empire St	Grass Valley	Nevada
Industrial	5S29I025353	Grass Valley Scrap Iron and Metal Inc	3.9	Acres	875 Idaho Maryland Rd	Green Valley	Nevada
Industrial	5S29I010822	Robinson Timber	5	Acres	293 Lower Grass Valley Rd	Nevada City	Nevada
Industrial	5S29I019386	Whittlesey Recycling	3	Acres	13895 Whittlesey Ln	Nevada City	Nevada
Industrial	5S29I023628	French Corral Mine	65	Acres	21235 Pleasant Valley Road	North San Juan	Nevada
Industrial	5S29I004057	Douglas Tarr Bonelli Ridgerock	5	Acres	22800 Pleasant Valley Rd	North San Juan	Nevada
Industrial	5S31I002840	Auburn City Airport	125	Acres	New Airport Rd	Auburn	Placer
Industrial	5S31I002989	Auburn WWTP	88	Acres	10441 Ophir	Auburn	Placer
Industrial	5S31I016582	Auburn City Landfill	40	Acres	12305 Shale Ridge Ln	Auburn	Placer
Industrial	5S31I009013	SMD One WWTP	10	Acres	11755 Joeger Rd	Auburn	Placer
Industrial	5S31I023693	Bear River Ready Mix	10	Acres	890 Highway 49	Auburn	Placer
Industrial	5S31I001657	Auburn Placer Disposal Ser Tra	5	Acres	12305 Shale Ridge Ln	Auburn	Placer
Industrial	5S31I017901	Mid Placer Pub Schools Tran	5	Acres	13121 Bill Francis Dr	Auburn	Placer
Industrial	5S31I002988	Auburn City Coorporation Yard	2.45	Acres	11500 Blocker Dr	Auburn	Placer
Industrial	5S31I002506	Morgan Advanced Ceramcis Inc	1	Acres	13079 Earhart Ave	Auburn	Placer
Industrial	5S31I024920	Aubrurn Recycling and Scrap Metals Inc	0.33	Acres	350 Sacramento St	Auburn	Placer
Industrial	5S31I009763	Don Robinson Sand Gravel	40280	SqFt	2145 Grass Valley Hwy	Auburn	Placer

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5S31I021140	HBE Colfax	8	Acres	44 Central St	Colfax	Placer
Industrial	5S31I020395	Red Ink Maid & Big Seam Claims	2.3	Acres	6 Mi Down USFS Hwy 96	Foresthill	Placer
Industrial	5S31I017899	Foresthill Union School District Elementary School	1	Acres	24750 Main St	Foresthill	Placer
Industrial	5S31I009012	Foresthill Transfer Station	0.95	Acres	6699 Patent Road	Foresthill	Placer
Industrial	5S31I017903	Eureka Union SD Transportation	1.5	Acres	5455 Eureka Rd	Granite Bay	Placer
Industrial	5S31I006497	Lincoln City Airport	659	Acres	1480 Flightline Dr	Lincoln	Placer
Industrial	5S31I016850	Lincoln City Wastewater Treatm	470	Acres	1245 Fiddyment Rd	Lincoln	Placer
Industrial	5S31I009014	Western Placer Waste Management Authority WRSL Athens Ave	320	Acres	3195 Athens Ave	Lincoln	Placer
Industrial	5S31I001741	Sierra Pac Ind	234	Acres	1445 Highway 65	Lincoln	Placer
Industrial	5S31I011352	Gladding Mcbean	64	Acres	601 7th St	Lincoln	Placer
Industrial	5S31I002525	Rio Bravo Rocklin	50	Acres	3100 Thunder Valley Court	Lincoln	Placer
Industrial	5S31I021336	Newman Trucking	50	Acres	1500 Gladding Rd	Lincoln	Placer
Industrial	5S31I000725	Alpha Explosives	22	Acres	3400 Nader Road	Lincoln	Placer
Industrial	5S31I024868	Ramos Oil Co	8.8	Acres	1185 Lincoln Blvd	Lincoln	Placer
Industrial	5S31I006495	Closed Lincoln Landfill	6	Acres	Virginiatown Rd	Lincoln	Placer
Industrial	5S31I012602	Cemex	5	Acres	2680 Athens Ave	Lincoln	Placer
Industrial	5S31I025293	Pallets Unlimited LLC	5	Acres	2390 Athens Avenue	Lincoln	Placer
Industrial	5S31I023993	Lincoln Facility	3.1	Acres	960 Gladding Road	Lincoln	Placer
Industrial	5S31I024749	Green Solutions and More Inc	2.3	Acres	2915 Lesvos Court	Lincoln	Placer
Industrial	5S31I014258	A A Concrete Supply	2	Acres	2930 Lesvos Ct	Lincoln	Placer
Industrial	5S31I017902	Western Placer Unified Sch Dis	85528	SqFt	2701 Nicolaus Rd	Lincoln	Placer
Industrial	5S31I003601	Sierra Auto Dismantlers	3	Acres	3363 Swetzer Rd	Loomis	Placer
Industrial	5S31I023694	Bear River Aggregates	40	Acres	2701 Combie Rd	Meadow Vista	Placer
Industrial	5S31I005173	Meadow Vista Transfer Station	2	Acres	2950 Combie	Meadow Vista	Placer
Industrial	5S31I017900	Placer Hills Union Sch Dist	0.5	Acres	16801 Placer Hills Rd	Meadow Vista	Placer
Industrial	5S31I010449	Jim Dobbas Inc	28	Acres	280 Taylor Rd	Newcastle	Placer
Industrial	5S31I012912	Don Robinson Sand Gravel	8	Acres	9691 Ophir Rd	Newcastle	Placer
Industrial	5S31I024627	Gold River Recycling	1	Acres	9390 Old State Highway	Newcastle	Placer
Industrial	5S31I013581	A & A Stepping Stone Manufacturing Inc	50000	SqFt	10291 Ophir Rd	Newcastle	Placer
Industrial	5S31I000782	Sierrapine Rocklin Division	36	Acres	4300 DOMINGUEZ RD	Rocklin	Placer
Industrial	5S31I009124	JELDWEN Rocklin	10	Acres	3901 Cincinnati Ave	Rocklin	Placer
Industrial	5S31I012876	Mallard Creek Inc	10	Acres	4095 Duluth Ave	Rocklin	Placer
Industrial	5S31I004286	Pick N Pull Auto Dismantlers	6	Acres	6355 Pacific St	Rocklin	Placer

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Industrial	5S31I015746	Progress Vanguard Corporation	4	Acres	3909 Cincinnati Ave	Rocklin	Placer
Industrial	5S31I018372	Rocklin Unified SD Trans	2	Acres	2225 Corporation Yard Rd	Rocklin	Placer
Industrial	5S31I012363	Pac Mdf Prod Inc	315000	SqFt	4315 Dominguez Rd	Rocklin	Placer
Industrial	5S31I002072	United Parcel Ser Caroc	250906	SqFt	2275 Sierra Meadows Dr	Rocklin	Placer
Industrial	5S31I013627	Fed Ex	156500	SqFt	1500 Nichols Dr	Rocklin	Placer
Industrial	5S31I015322	Roseville Yard	915	Acres	1600 VERNON	Roseville	Placer
Industrial	5S31I003707	Hewlett Packard	492	Acres	8000 Foothills Blvd	Roseville	Placer
Industrial	5S31I019659	Pleasant Grove WWTP	107	Acres	5051 Phillip Rd	Roseville	Placer
Industrial	5S31I005740	Dry Creek Wwtp	105	Acres	1800 Booth Rd	Roseville	Placer
Industrial	5S31I023169	TSI Semiconductors America LLC	102	Acres	7501 Foothills Blvd	Roseville	Placer
Industrial	5S31I010820	Roseville City Corp Yard	59	Acres	2005 Hilltop Cir	Roseville	Placer
Industrial	5S31I020737	Save Mart Supermarkets	42	Acres	9999 Niblick Dr	Roseville	Placer
Industrial	5S31I006286	H B Fuller	40	Acres	10500 Industrial Ave	Roseville	Placer
Industrial	5S31I011144	Western Placer Waste Management Authority WRSL Fiddyment Rd	25	Acres	3033 Fiddyment Rd	Roseville	Placer
Industrial	5S31I001342	Roseville	13.1	Acres	9800 Del Rd	Roseville	Placer
Industrial	5S31I024903	Industrial Container Services CA North LLC	12.5	Acres	749 Galleria Blvd	Roseville	Placer
Industrial	5S31I020747	Sims Recycling Solutions INC	9.4	Acres	8855 Washington Blvd	Roseville	Placer
Industrial	5S31I021340	Roseville Energy Park	8.9	Acres	5120 Phillip Rd	Roseville	Placer
Industrial	5S31I001766	AutoGator Roseville	7	Acres	1961 Pfe Rd	Roseville	Placer
Industrial	5S31I004589	Teichert Readymix Roseville Re	5	Acres	721 Berry St	Roseville	Placer
Industrial	5S31I021529	Folsom Ready Mix Inc Plant 4	5	Acres	9700 Del Rd	Roseville	Placer
Industrial	5S31I004971	Bw Auto Dismantlers	2	Acres	2031 Pfe Rd	Roseville	Placer
Industrial	5S31I017852	Roseville Joint Union High School District Transportation Dept	2	Acres	129 Berry St	Roseville	Placer
Industrial	5S31I022492	Hanford Sand and Gravel Inc	2	Acres	97 Berry St	Roseville	Placer
Industrial	5S31I021475	Neff Rental	1.37	Acres	8455 Sierra College Blvd	Roseville	Placer
Industrial	5S31I004029	Patterson Sand & Gravel	326	Acres	8705 Camp Far West Rd	Sheridan	Placer
Industrial	5S31I023103	Weimar Auto Wreckers	5	Acres	21300 Canyon Way	Weimar	Placer
Industrial	5R32I022134	Sierra Cascade Aggregate & Asphalt Products Inc	28	Acres	6600 Old Ski Rd	Chester	Plumas
Industrial	5R32I021794	White Cap Ready Mix Chester Plant	1.89	Acres	400 Black Oak	Chester	Plumas
Industrial	5R32I022172	Collins Pine Chester Sawmill			HWY 36	Chester	Plumas
Industrial	5R32I024250	Willow Creek Borrow Site	3.65		1737 Clio State 40a road	Clio	Plumas
Industrial	5R32I023298	IMD Recycling Center	1.91	Acres	73980 Industrial Way	Delleker	Plumas

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Industrial	5R32I002177	CA Engels Mining Co Engels & S	35	Acres	Diamond Mountain Rd	Greenville	Plumas
Industrial	5R32I020305	LCS Boneyard	7.86	Acres	318 Ann St	Greenville	Plumas
Industrial	5R32I017056	White Cap Ready Mix Portola Plant	10	Acres	73880 Hwy 70	Portola	Plumas
Industrial	5R32I011933	Union Pac Railroad Tobin Quarr	6	Acres	24 T24n R6e Se1 Mdb&m At Uprr	Portola	Plumas
Industrial	5R32I024622	Rocky Point Borrow Site	3.7	Acres	Rocky Point Road	Portola	Plumas
Industrial	5R32I023300	IMD Recycling Center Shop	3.3	Acres	73836 S Delleker Rd 73980 Industrial Way	Portola	Plumas
Industrial	5R32I023589	Crescent Tow	29900	SqFt	73830 Delleker Rd	Portola	Plumas
Industrial	5R32I015203	Portola Class III Landfill			Meadow	Portola	Plumas
Industrial	5R32I025036	Sierra Pacific Industries	94	Acres	1538 Lee Road	Quincy	Plumas
Industrial	5R32I024475	American Valley Aviation Inc	15	Acres	550 Orion Wy	Quincy	Plumas
Industrial	5R32I023858	Soper Pit	14	Acres	Spanish Ranch Rd	Quincy	Plumas
Industrial	5R32I024819	Wilburn Construction Inc	13.4	Acres	747 Lee Rd	Quincy	Plumas
Industrial	5R32I023891	Sierra Concrete	2.37	Acres	901 Lee Road	Quincy	Plumas
Industrial	5R32I014732	Feather River Disposal	2	Acres	1166 Industrial Way	Quincy	Plumas
Industrial	5R32I021495	Sloat Quarry	37	Acres	Sloat McRae Rd 23N08	Sloat	Plumas
Industrial	5R32I023571	Bar One Ranch Aggregate Mine	10	Acres	St Rte 49 near Cty Rd A 24	Vinton	Plumas
Industrial	5S34I010450	Jim Dobbas Inc	15	Acres	7920 Antelope Rd	Antelope	Sacramento
Industrial	5S34I001480	J W Auto Wreckers	11	Acres	8626 Antelope North Rd	Antelope	Sacramento
Industrial	5S34I022042	Pick N Pull Auto Dismantlers A General Partnership	10	Acres	8640 Antelope N Rd	Antelope	Sacramento
Industrial	5S34I017907	Center Unified School District	5	Acres	8408 Watt Ave	Antelope	Sacramento
Industrial	5S34I018806	Aba Daba Rents Inc	1	Acres	7448 Auburn Blvd	Citrus Heights	Sacramento
Industrial	5S34I017576	Air Blown Concrete	35	Acres	601 W Delano St	Elverta	Sacramento
Industrial	5S34I000185	Intel Corp Fm4 124	234	Acres	1900 Prairie City Rd	Folsom	Sacramento
Industrial	5S34I017520	Folsom Auto Mall Dealers Assoc	45	Acres	Auto Mall Drive	Folsom	Sacramento
Industrial	5S34I016266	Folsom City Corp Yard	18	Acres	Western End Of Leidesdorff St	Folsom	Sacramento
Industrial	5S34I004925	Gekkeikan Sake	9	Acres	1136 Sibley St	Folsom	Sacramento
Industrial	5S34I004590	Teichert Folsom Readymix Plant	9	Acres	1209 Levy Rd	Folsom	Sacramento
Industrial	5S34I019404	USCG Air Station Sacramento	58	Acres	6037 Price Ave Bldg 1106	North Highlands	Sacramento
Industrial	5S34I007295	Sacramento County North Area Recovery Station	14	Acres	4450 Roseville Rd	North Highlands	Sacramento
Industrial	5S34I018204	Trans	10	Acres	3050 Orange Grove Ave	North Highlands	Sacramento
Industrial	5S34I001138	Livingstons Concrete Svc	6	Acres	5416 Roseville Rd	North Highlands	Sacramento
Industrial	5S34I018621	Security Contractor Services	6	Acres	5339 Jackson St	North Highlands	Sacramento
Industrial	5S34I017705	Northrop Grumman ESL Operation	3.9	Acres	5441 Luce Ave	North Highlands	Sacramento

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Industrial	5S34I013755	Dc Metals Recycling	3	Acres	6849 28th St	North Highlands	Sacramento
Industrial	5S34I019428	Sacramento Rental LP	2	Acres	7001 Watt Ave	North Highlands	Sacramento
Industrial	5S34I021305	Southwestern Wire Inc	48650	SqFt	4318 Dudley Blvd 475E	North Highlands	Sacramento
Industrial	5S34I019705	US Powder Coating Inc	28000	SqFt	4423 Dudley Blvd	North Highlands	Sacramento
Industrial	5S34I019079	Greenback Equipment Rentals	73656	SqFt	9325 Greenback Ln	Orangevale	Sacramento
Industrial	5S34I021265	GR Trucking LLC	23	Acres	12584 White Rock Rd	Rancho Cordova	Sacramento
Industrial	5S34I023475	LKQ Specialized Parts of Northern CA	15.9	Acres	11337 Dismantle Ct	Rancho Cordova	Sacramento
Industrial	5S34I010230	Bavarian Auto Recycling Inc	8	Acres	3688 Omec Cir	Rancho Cordova	Sacramento
Industrial	5S34I003368	Schnitzer Steel Prod	6	Acres	12000 Folsom Blvd	Rancho Cordova	Sacramento
Industrial	5S34I005106	SMM Rancho Cordova	5.3	Acres	11320 Dismantle Ct	Rancho Cordova	Sacramento
Industrial	5S34I016269	GEM of Rancho Cordova LLC	5	Acres	11855 White Rock Rd	Rancho Cordova	Sacramento
Industrial	5S34I023483	Luxury Auto Dismantling	5	Acres	3551 Recycle Rd 1	Rancho Cordova	Sacramento
Industrial	5S34I004059	Bfi Waste Services	4	Acres	3326 Fitzgerald Rd	Rancho Cordova	Sacramento
Industrial	5S34I023477	LKQ Specialized Parts	3.8	Acres	3486 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I023523	Truck Time Auto Wrecking	3.5	Acres	3618 Omec Circle	Rancho Cordova	Sacramento
Industrial	5S34I001139	Livingston S Concrete	3	Acres	3458 Fitzgerald Rd	Rancho Cordova	Sacramento
Industrial	5S34I023360	LKQ Specialized Parts	2.7	Acres	3590 Sunrise Blvd 1 and 5	Rancho Cordova	Sacramento
Industrial	5S34I023914	ACM Machining	2.2	Acres	11390 Gold Dredge Wy	Rancho Cordova	Sacramento
Industrial	5S34I004980	Fair Oaks Wrecking Inc	2	Acres	11350 S Bridge St	Rancho Cordova	Sacramento
Industrial	5S34I023493	LKQ Specialized Parts	2	Acres	3379 Sunrise Blvd	Rancho Cordova	Sacramento
Industrial	5S34I024989	DBA TLS Auto Recycling	2	Acres	3811 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I025020	GS Auto Dismantler Inc	2	Acres	3554 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I024898	ToyAutoMart	1.5	Acres	3410 Sunrise Blvd	Rancho Cordova	Sacramento
Industrial	5S34I016150	All Hyundai & Izuzu Auto Rec	1	Acres	3750 Recycle Rd #2	Rancho Cordova	Sacramento
Industrial	5S34I020011	Redline Performance Auto Dismantling & Sales Inc	1	Acres	3664 Omec Cir No 2	Rancho Cordova	Sacramento
Industrial	5S34I023456	Auto Imports USA	1	Acres	3701 Omec Circle	Rancho Cordova	Sacramento
Industrial	5S34I023777	European Recycling Inc	1	Acres	3697 Recycle Rd #2	Rancho Cordova	Sacramento
Industrial	5S34I023953	Jaguar and Porsche Parts	1	Acres	3636 Omec Circle	Rancho Cordova	Sacramento
Industrial	5S34I023976	Economy Auto Dismantling	1	Acres	3791 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I024437	TSL Parts	1	Acres	11426 Elks Circle	Rancho Cordova	Sacramento
Industrial	5S34I023304	TKO Recycling	0.75	Acres	11493 Folsom Blvd	Rancho Cordova	Sacramento
Industrial	5S34I023424	Happy Auto Parts	0.5	Acres	3430 Sunrise Blvd	Rancho Cordova	Sacramento
Industrial	5S34I024293	ACM West	0.5	Acres	3218 Luyung Drive	Rancho Cordova	Sacramento
Industrial	5S34I024298	Acura Honda Dismantling Inc	0.5	Acres	3664 Omec Circle 1	Rancho Cordova	Sacramento

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5S34I019797	Tokyo Auto Recycling	0	Acres	3565 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I025263	Jakes Auto Sales & Repair Inc	75794	SqFt	3632 Omec Circle	Rancho Cordova	Sacramento
Industrial	5S34I017975	Omega Prducts Int In	70000	SqFt	3362 Fitzgerald Rd	Rancho Cordova	Sacramento
Industrial	5S34I019766	Quality & Quick Auto Wreckers Inc	70000	SqFt	3513 Recycle Rd Ste A	Rancho Cordova	Sacramento
Industrial	5S34I022989	LTS Auto Dismantling Inc	65000	SqFt	3527 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I019731	Haley Metal Fabrication Inc	50700	SqFt	3343 Luyung Dr	Rancho Cordova	Sacramento
Industrial	5S34I009649	Foremost Interiors Inc	21780	SqFt	2318 Gold River Rd	Rancho Cordova	Sacramento
Industrial	5S34I024759	Cordova Auto Parts Inc	16000	SqFt	3784 Omec Circle Ste 5	Rancho Cordova	Sacramento
Industrial	5S34I009983	Volvo & Saab Auto Dismantlers	12000	SqFt	3539 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I023150	All Trucks	9000	SqFt	11407 Elks Circle	Rancho Cordova	Sacramento
Industrial	5S34I024507	DBA Specialized Subaru Parts	6000	SqFt	11428 Elks Circle Unit C	Rancho Cordova	Sacramento
Industrial	5S34I025415	BAP Dismantling LLC	5000	SqFt	3689 Recycle Road	Rancho Cordova	Sacramento
Industrial	5S34I022440	BM Tech Auto Dismantling	4200	SqFt	3460 Sunrise Blvd	Rancho Cordova	Sacramento
Industrial	5S34I023337	MGM Auto Dismantler	4200	SqFt	3440 Sunrise Blvd	Rancho Cordova	Sacramento
Industrial	5S34I025198	West Coast American Auto Dismantling	4000	SqFt	11450 Elks Circle Suite #A	Rancho Cordova	Sacramento
Industrial	5S34I023273	MLH Auto Dismantling	3600	SqFt	3391 Fitzgerald Rd #B	Rancho Cordova	Sacramento
Industrial	5S34I023279	United Auto Dismantling	3600	SqFt	3391 Fitzgirald Rd E	Rancho Cordova	Sacramento
Industrial	5S34I023060	In N Out Honda	3500	SqFt	3383 Fitzgerald Rd Ste F	Rancho Cordova	Sacramento
Industrial	5S34I023425	Arm Auto Dismantler	3200	SqFt	3391 Fitzgerald Rd Unit C	Rancho Cordova	Sacramento
Industrial	5S34I005978	Fed Ex	2000	SqFt	11140 Sun Center Dr	Rancho Cordova	Sacramento
Industrial	5S34I022903	Import Auto Parts	1200	SqFt	3697 Recycle Rd	Rancho Cordova	Sacramento
Industrial	5S34I023104	MG Auto Dismantler	5000		3513 Recycle Rd #B	Rancho Cordova	Sacramento
Industrial	5S34I018052	Woodmack Prod Inc			11430 White Rock Rd	Rancho Cordova	Sacramento
Industrial	5S34I025329	Green Earth Auto Dismantling			11450 Elk Circle Suite E	Rancho Cordova	Sacramento
Industrial	5S34I001227	CA Dept Corrections Folsom	1200	Acres	300 Prison Rd	Represa	Sacramento
Industrial	5S34I001111	Mauser Aviation Inc	34	Acres	931 E St	Rio Linda	Sacramento
Industrial	5S34I015377	Elkhorn Hot Plant	9	Acres	900 W Elkhorn Blvd	Rio Linda	Sacramento
Industrial	5S34I022392	Rio Linda Facility	5.29	Acres	831 W Elkhorn Blvd	Rio Linda	Sacramento
Industrial	5S34I000967	Rio Linda Sch Dist	62550	SqFt	6619 6th Ave	Rio Linda	Sacramento
Industrial	5S34I013829	A1 Metals Company	53000	SqFt	2655 Elkhorn Blvd	Rio Linda	Sacramento
Industrial	5S34I007301	Sacramento International Airport	2479	Acres	Sacramento International Airport	Sacramento	Sacramento
Industrial	5S34I004477	Sac City Landfill	113	Acres	20 28th St	Sacramento	Sacramento
Industrial	5S34I014640	Hanson Pipe & Precast	53	Acres	7020 Tokay Ave	Sacramento	Sacramento
Industrial	5S34I020961	HP Hood LLC	35	Acres	8340 Belvedere Ave	Sacramento	Sacramento
Industrial	5S34I018864	Raleys Distribution Ctr	30	Acres	4061 Gateway Park Blvd	Sacramento	Sacramento

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5S34I021689	North Country Corporation Yard	28.6	Acres	5026 Don Julio Blvd	Sacramento	Sacramento
Industrial	5S34I020226	Cal Exposition Racing Stables	28	Acres	1600 Exposition Blvd	Sacramento	Sacramento
Industrial	5S34I002873	Reg Transit Dist Light Rail Ma	24	Acres	2700 Academy Way	Sacramento	Sacramento
Industrial	5S57I023133	Estes West	22	Acres	4200 W Capitol Ave	Sacramento	Sacramento
Industrial	5S34I025052	BCI Coca Cola Bottling Company of LA	21	Acres	4101 Gateway Park Boulevard	Sacramento	Sacramento
Industrial	5S34I002852	CA Cascade Industries	20	Acres	7512 14th Ave	Sacramento	Sacramento
Industrial	5S34I025230	Bar None Auction	18.75	Acres	4751 Power Inn Road	Sacramento	Sacramento
Industrial	5S34I021386	Roundtree Rock & Gardening	14.5	Acres	5300 Excelsior Rd	Sacramento	Sacramento
Industrial	5S34I021994	UPS Rancho Cordova	14	Acres	3930 Kristi Ct	Sacramento	Sacramento
Industrial	5S34I009681	Seven Up Bottling Co	13	Acres	2670 Land Ave	Sacramento	Sacramento
Industrial	5S34I017825	Jensen Precast	12	Acres	5400 Raley Blvd	Sacramento	Sacramento
Industrial	5S34I018652	Milgard Windows	12	Acres	6050 88th St	Sacramento	Sacramento
Industrial	5S34I019869	CMH Manufacturing West Inc dba Karsten Homes	11	Acres	9998 Old Placerville Rd	Sacramento	Sacramento
Industrial	5S34I020501	Quikrete Northern California	10.32	Acres	7705 Wilber Way	Sacramento	Sacramento
Industrial	5S34I023436	Sun Gro Horticulture Processing	10	Acres	2263 Dean St	Sacramento	Sacramento
Industrial	5S34I006443	Con Way Freight USA	9	Acres	3516 Kiessing Ave	Sacramento	Sacramento
Industrial	5S34I025268	MDI Forest Products McClellan	8.7	Acres	Lot 17 McClellan Park	Sacramento	Sacramento
Industrial	5S34I024398	Penske Logistics	8.6	Acres	4040 Vista Park Court	Sacramento	Sacramento
Industrial	5S34I005108	SMM Sacramento	8.5	Acres	130 N 12th St	Sacramento	Sacramento
Industrial	5S34I024897	Composite Engineering Inc	8	Acres	5381 Raley Blvd	Sacramento	Sacramento
Industrial	5S34I025279	Sierra Waste Recycling Transfer Station Inc	7.65	Acres	8260 Berry Ave	Sacramento	Sacramento
Industrial	5S34I022676	YRC Inc 809	7.15	Acres	3210 52nd Ave	Sacramento	Sacramento
Industrial	5S34I004106	Sac City Usd Trans	7	Acres	3101 Redding Ave	Sacramento	Sacramento
Industrial	5S34I021719	Trench Plate Rental Co	7	Acres	2924 47th Ave	Sacramento	Sacramento
Industrial	5S34I021867	Golden State Crushing	7	Acres	5980 Outfall Cir	Sacramento	Sacramento
Industrial	5S34I004009	Cordova Truck Dismantlers	6	Acres	4075 Happy Ln	Sacramento	Sacramento
Industrial	5S34I016140	Central Freight Lines Inc	6	Acres	1621 Main Ave	Sacramento	Sacramento
Industrial	5S34I002407	Abf Freight Sys Inc	5	Acres	3250 47th Ave	Sacramento	Sacramento
Industrial	5S34I009995	American Auto Wreckers	5	Acres	6128 Stockton Blvd	Sacramento	Sacramento
Industrial	5S34I020274	Atlas Disposal Industries LLC	4.55	Acres	3000 Power Inn Road	Sacramento	Sacramento
Industrial	5S34I001044	Dan Dukes Trucking Inc	4	Acres	1350 Vinci Ave	Sacramento	Sacramento
Industrial	5S34I016969	Natomas Unified Sch Dist Trans	4	Acres	1931 Arena Blvd	Sacramento	Sacramento
Industrial	5S34I013314	Subway Truck Parts Inc	3.26	Acres	903 Del Paso Blvd	Sacramento	Sacramento

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5S34I005087	Twin Rivers USD Grant	3	Acres	1400 Grand Ave	Sacramento	Sacramento
Industrial	5S34I005912	Matheson Postal Servies Inc	3	Acres	455 Bannon St	Sacramento	Sacramento
Industrial	5S34I022883	NMI Industrial Holdings Inc	3	Acres	8503 Weyand Ave	Sacramento	Sacramento
Industrial	5S34I023067	ABHS Auto Recycling	2.95	Acres	7006 McComber St	Sacramento	Sacramento
Industrial	5S34I021556	B&G Delivery System Inc	2.25	Acres	2549 Harris Ave	Sacramento	Sacramento
Industrial	5S34I003851	Freeway Auto Wrecking	2	Acres	1961 Auburn Blvd	Sacramento	Sacramento
Industrial	5S34I004043	A&M Auto Wreckers LLC	2	Acres	716 Bell Ave	Sacramento	Sacramento
Industrial	5S34I013756	Mings Metal Recycling	2	Acres	3316 47th Ave	Sacramento	Sacramento
Industrial	5S34I024404	Toledo Auto Dismantling	1.3	Acres		Sacramento	Sacramento
Industrial	5S34I021141	M&M Salvage Inc	1.25	Acres	4071 Happy Ln	Sacramento	Sacramento
Industrial	5S34I023620	J & M Recycling Inc	1.1	Acres	2205 Rice Ave	Sacramento	Sacramento
Industrial	5S34I018100	Raynguard Protective Materials	1	Acres	8280 14th Ave	Sacramento	Sacramento
Industrial	5S34I022750	Fars and Mersal Auto Dismantiling	1	Acres	5325 Dry Creek Rd	Sacramento	Sacramento
Industrial	5S34I025371	RockTenn CP LLC	1	Acres	8454 24th Ave	Sacramento	Sacramento
Industrial	5S34I023756	Yellow Cab Co of Sacramento	0.9	Acres	900 Richards Blvd	Sacramento	Sacramento
Industrial	5S34I023681	Sacramento 1 Service Center	0.8	Acres	8100 Signal Ct	Sacramento	Sacramento
Industrial	5S34I021787	Chatfields Auto Dismantlers	0.75	Acres	1101 Del Paso Blvd	Sacramento	Sacramento
Industrial	5S34I023676	Sacramento 2 Sercive Center	0.3	Acres	777 Arden Way	Sacramento	Sacramento
Industrial	5S34I024821	Rudys Metals	0.25	Acres	325 N 7th Street	Sacramento	Sacramento
Industrial	5S34I001826	Sun Shine Steel Ent Corp		Acres	8265 Belvedere Ave	Sacramento	Sacramento
Industrial	5S34I023074	Office of State Publishing	510594	SqFt	344 N 7th St	Sacramento	Sacramento
Industrial	5S34I004438	Martin Sprocket & Gear	303610	SqFt	1199 Vine St	Sacramento	Sacramento
Industrial	5S34I022447	NWNA Sacramento	263169	SqFt	8670 Younger Creek Rd	Sacramento	Sacramento
Industrial	5S34I022889	Ozark Trucking Inc	156995	SqFt	4916 Dudley Blvd	Sacramento	Sacramento
Industrial	5S34I025207	Blomberg Window Systems	142000	SqFt	1453 Blair Avenue	Sacramento	Sacramento
Industrial	5S34I014772	Pac Adhesives Comany Inc	111300	SqFt	8670 23rd Ave	Sacramento	Sacramento
Industrial	5S34I020493	Recycling Industries	85000	SqFt	3300 Power Inn Rd	Sacramento	Sacramento
Industrial	5S34I023256	Capital City Recycling Inc	59160	SqFt	3185 Longview Dr Unit C	Sacramento	Sacramento
Industrial	5S34I019459	AMR Sacramento	50000	SqFt	1101 Fee Dr	Sacramento	Sacramento
Industrial	5S34I021405	California Mantel Inc	45840	SqFt	4141 N Freeway Blvd	Sacramento	Sacramento
Industrial	5S34I021286	Universe Auto Dismantler	43000	SqFt	8590 Unsworth Ave	Sacramento	Sacramento
Industrial	5S34I020688	DHL Express SMF	40000	SqFt	10300 Truemper Wy	Sacramento	Sacramento
Industrial	5S34I023798	Tex Chen Co dba KDS Nail Products	32791	SqFt	858 Younger Creek Dr	Sacramento	Sacramento
Industrial	5S34I025110	Intex Forms Inc	25000	SqFt	9293 Beatty Drive	Sacramento	Sacramento
Industrial	5S34I004305	US Postal Ser Vehicle Maint Fa	22032	SqFt	2000 Royal Oaks Dr	Sacramento	Sacramento

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5S34I021564	INX International Ink Co Inc	11400	SqFt	2930 Ramona Ave	Sacramento	Sacramento
Industrial	5S34I012656	D T Fiberglass	11000	SqFt	8900 Osage Ave	Sacramento	Sacramento
Industrial	5S34I023768	MV Transportation Div 04	6000	SqFt	10170 Croydon Wy A	Sacramento	Sacramento
Industrial	5S34I025223	Full Faith Cores	4000	SqFt	3457 La Grande Blvd	Sacramento	Sacramento
Industrial	5S34I023216	Capital Jac	3000	SqFt	4265 Power Inn Rd	Sacramento	Sacramento
Industrial	5S34I005979	Fed Ex	2000	SqFt	3950 Development Dr	Sacramento	Sacramento
Industrial	5S34I024515	K&M Recycling	15		3562 Ramona Ave	Sacramento	Sacramento
Industrial	5S34I023749	All West Coachlines Inc	4		7701 Wilbur Wy	Sacramento	Sacramento
Industrial	5S34I023656	Test Industrial Facility	1		1001 I Street	Sacramento	Sacramento
Industrial	5R45I005373	Anderson Landfill	1200	Acres	18703 Cambridge	Anderson	Shasta
Industrial	5R45I020225	Shasta Ranch Aggregate	289.81	Acres	End of Jensen	Anderson	Shasta
Industrial	5R45I022199	Stillwater Wastewater Treatment Plant	233	Acres	6475 Airport Rd	Anderson	Shasta
Industrial	5R45I019734	Clear Creek WWTP	200	Acres	2220 Metz	Anderson	Shasta
Industrial	5R45I018137	Sound Stud	51	Acres	2457 Latona	Anderson	Shasta
Industrial	5R45I011906	Bettendorf Ent Inc	5	Acres	20943 Bettendorf Way	Anderson	Shasta
Industrial	5R45I003419	All Car & Truck Recycling	4	Acres	19555 Olinda Rd	Anderson	Shasta
Industrial	5R45I022909	Redding Oil Fuel Transfer Facility	0.5	Acres	19631 N Hirsch Ct	Anderson	Shasta
Industrial	5R45I002073	UPS-CARED	125625	SqFt	6845 Eastside	Anderson	Shasta
Industrial	5R45I023534	Shasta Renewable Resources	31.5		6309 Hwy 273	Anderson	Shasta
Industrial	5R45I019416	Wilson Industrial Park			Latona Rd Parcel 050 080 052	Anderson	Shasta
Industrial	5R45I016806	Siskiyou Forest Products			6199 Hwy 273	Anderson	Shasta
Industrial	5R45I020119	Folsom Ready Mix Anderson LLC			19291 Latona	Anderson	Shasta
Industrial	5R45I025042	Dicalite Minerals Corporation	125	Acres	36994 Summit Lake Road	Burney	Shasta
Industrial	5R45I021356	Sierra Pacific Industries Burney Division	60	Acres	36336 HWY 299E	Burney	Shasta
Industrial	5R45I005567	Burney Mountain Power	30	Acres	37800 Energy	Burney	Shasta
Industrial	5R45I002912	Fall River Mills Airport	83	Acres	HWY 299E	Fall River Mills	Shasta
Industrial	5R45I019985	Washington Mine			Scorpion Creek	French Gulch	Shasta
Industrial	5R45I002913	West Central Landfill	100	Acres	14095 Clear Creek Rd	Igo	Shasta
Industrial	5R45I013432	Antlers Resort & Marina	50	Acres	20679 Antlers	Lakehead	Shasta
Industrial	5R45I010883	Packers Bay Marina	7	Acres	16814 PACKERS BAY	Lakehead	Shasta
Industrial	5R45I015577	Shasta Marina Resort	5	Acres	18390 OBRIEN INLET RD	Lakehead	Shasta
Industrial	5R45I020677	Twin Mine	91.5	Acres	8103 Millville Plains Rd	Millville	Shasta
Industrial	5R45I010771	Holiday Harbor Inc	8	Acres	20061 Shasta Caverns	O'brien	Shasta
Industrial	5R45I002363	Redding Municipal Airport	1279	Acres	6751 Woodrum Cir Ste 200	Redding	Shasta
Industrial	5R45I024887	Lehigh Southwest Cement Co	867	Acres	15390 Wonderland Boulevard	Redding	Shasta

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Industrial	5R45I025446	Aggregate Products	487.87	Acres	17400 Clear Creek Rd	Redding	Shasta
Industrial	5R45I002152	Shasta College	365	Acres	11555 Old Oregon	Redding	Shasta
Industrial	5R45I020192	West Valley Sand & Gravel	190.33	Acres	16722 Gas Point Rd	Redding	Shasta
Industrial	5R45I025001	Crystal Creek Aggregate Inc	108.87	Acres	10936 Iron Mountain Road	Redding	Shasta
Industrial	5R45I010881	Bridge Bay Resort & Marina	72	Acres	10300 Bridge Bay Rd	Redding	Shasta
Industrial	5R45I002365	Redding City Benton Airport	67	Acres	Airpark Drive	Redding	Shasta
Industrial	5R45I024919	SWA at Mountain Gate Quarry	53	Acres	20285 Radcliff Rd	Redding	Shasta
Industrial	5R45I020194	Redding Auto Center Inc dba LKQ Corp	42.1	Acres	2850 Viking Way	Redding	Shasta
Industrial	5R45I024882	Fawndale Rock and Asphalt	41.45	Acres	15380 Fawndale Road	Redding	Shasta
Industrial	5R45I002236	Contech Engineered Solutions LLC	33	Acres	2245 Canyon Creek Rd	Redding	Shasta
Industrial	5R45I021081	Corporation Yard	32	Acres	20055 Viking Wy	Redding	Shasta
Industrial	5R45I010979	Silverthorn Marina Resort	25	Acres	16250 Silvertorn	Redding	Shasta
Industrial	5R45I012357	Valley Slurry Seal Emultech	23	Acres	7200 Pit Rd	Redding	Shasta
Industrial	5R45I011829	Redding Lumber Trans Inc	21	Acres	4301 Eastside Rd	Redding	Shasta
Industrial	5R45I006298	BCI Coca Cola Bottling Company of LA	19	Acres	1580 Beltline Rd	Redding	Shasta
Industrial	5R45I010033	Northstate Truck Equipment	18	Acres	17011 Clear Creek Rd	Redding	Shasta
Industrial	5R45I017961	Northstate Asphalt	14	Acres	15939 Clear Creek Rd	Redding	Shasta
Industrial	5R45I016539	Northstate Recycling (formerly Shorts Scrap)	12	Acres	2041 Girvan	Redding	Shasta
Industrial	5R04I011624	Roy E Ladd Inc Bangor Quarry	10	Acres	1304 East St	Redding	Shasta
Industrial	5R45I015067	Pick N Pull Auto Dismantlers	10	Acres	19919 Viking Way	Redding	Shasta
Industrial	5R45I024352	Select Auto and Truck Recyclers	7.25	Acres	19895 Viking Way	Redding	Shasta
Industrial	5R45I011121	Anderson Cottonwood Disposal	5	Acres	8595 Commercial Way	Redding	Shasta
Industrial	5R45I009117	Cook Concrete Prod Inc	5	Acres	5461 Eastside Rd	Redding	Shasta
Industrial	5R45I004453	Shasta Cnty Schools	3	Acres	3169 S Market St	Redding	Shasta
Industrial	5R45I023881	Bulldog Scrap Metal Recycling	2.5	Acres	20010 B Viking Way	Redding	Shasta
Industrial	5R45I015948	SST Shop	2	Acres	2370 WYNDHAM LN	Redding	Shasta
Industrial	5R45I013682	Smf Inc	2	Acres	4311 Caterpillar Rd	Redding	Shasta
Industrial	5R45I020605	Abernathy Transfer Station & Compost Facility	1	Acres	2255 Abernathy	Redding	Shasta
Industrial	5R45I012712	Clayton Ward Recycling		Acres	2500 Ellis St	Redding	Shasta
Industrial	5R45I021842	First Transit Inc 55868	34550	SqFt	4554 Caterpillar Rd Ste B	Redding	Shasta
Industrial	5R45I010782	Jones Valley Resort	18000	SqFt	22300 Jones Valley Marina	Redding	Shasta
Industrial	5R45I023361	Auto Parts	3.75		20134 Accidents Ln	Redding	Shasta
Industrial	5R45I022860	RABA Maintenance Facility	3.71		3333 S Market St	Redding	Shasta

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Industrial	5R45I004306	Redding VMF			2440 Larkspur Ln	Redding	Shasta
Industrial	5R45I013334	Bear Gulch Limestone Quarry	220	Acres	Hwy 299 E	Round Mountain	Shasta
Industrial	5R45I016734	Knauf Insulation Gmbh	89	Acres	3100 District Dr P O Box 819	Shasta Lake	Shasta
Industrial	5R45I022232	Sierra Pacific Industries	56	Acres	3735 El Cajon Ave	Shasta Lake	Shasta
Industrial	5S46I005328	Dickey Exploration Co	10	Acres	1 1 2 Miles Sw Of Alleghany	Alleghany	Sierra
Industrial	5S46I018735	North Fork Mine	1	Acres	North Fork Mine Site	Alleghany	Sierra
Industrial	5S46I021436	Telegraph & Dutch Mines	60	Acres	Sec 9 T2ON RKE MDB and M	Downieville	Sierra
Industrial	5S46I000246	Sierra Pac Industries	232	Acres	Railroad Avenue	Loyalton	Sierra
Industrial	5S46I020705	Loyalton Landfill	27.58	Acres	150 Garbage Pit Rd	Loyalton	Sierra
Industrial	5R47I019330	Upper Dunsmuir Yard	12	Acres	5750 Sacramento Ave	Dunsmuir	Siskiyou
Industrial	5S51I017176	Sysco Food Services	50	Acres	7062 Pacific Ave	Pleasant Grove	Sutter
Industrial	5S51I011150	3163 LLC	20	Acres	3131 Sankey Rd	Pleasant Grove	Sutter
Industrial	5S51I014718	Teichert Ready Mix	10	Acres	7466 Pacific Ave	Pleasant Grove	Sutter
Industrial	5S51I024591	Elite Ready Mix LLC Plant 2	5.38	Acres	3163 Sankey Road	Pleasant Grove	Sutter
Industrial	5S51I023188	Reclamation District 1001	190	Acres	1959 Cornelius Ave	Rio Oso	Sutter
Industrial	5S51I001968	Butte Sand & Gravel	280	Acres	10373 S Butte Rd	Sutter	Sutter
Industrial	5S51I023986	Jack L Spence Inc Composting	19.5	Acres	1601 Southridge Blvd	Sutter	Sutter
Industrial	5S51I014470	Calpine Greenleaf Unit One Cog	77	Acres	5087 S Township Rd	Yuba City	Sutter
Industrial	5S51I022547	Sacramento Packing	25	Acres	833 Tudor Rd	Yuba City	Sutter
Industrial	5S51I019859	Empire Steel	16	Acres	3094 N Township Rd	Yuba City	Sutter
Industrial	5S51I024605	Sutter Energy Center	16	Acres	5029 South Township Road	Yuba City	Sutter
Industrial	5S51I000257	Unity Forest Prod	10	Acres	1162 Putman Ave	Yuba City	Sutter
Industrial	5S51I019044	Orchard Machinery Corp	8	Acres	2700 Colusa Hwy	Yuba City	Sutter
Industrial	5S51I017354	Calpine Greenleaf Inc Unit Two	6	Acres	875 N Walton Ave	Yuba City	Sutter
Industrial	5S51I017894	Ycusd Trans	5	Acres	1512 Stewart Rd	Yuba City	Sutter
Industrial	5S51I018617	Antonini Enterprises LLC	5	Acres	1258 Obanion Rd	Yuba City	Sutter
Industrial	5S51I010756	D H Transportation Inc	4	Acres	586 Franklin Ave	Yuba City	Sutter
Industrial	5S51I023885	Dispatch Transportation	4	Acres	753 N George Washington Blvd	Yuba City	Sutter
Industrial	5S51I024147	RECYCLING INDUSTRIES	3	Acres	140 EPLEY DRIVE	Yuba City	Sutter
Industrial	5S51I003508	Mathews Readymix Inc	2	Acres	249 Lamon Wy	Yuba City	Sutter
Industrial	5S51I003193	A C Auto Dismantlers	2	Acres	800 Garden Hwy	Yuba City	Sutter
Industrial	5S51I024413	Sanchez Truck Repair Inc	1.72	Acres	20 Wilbur Ave	Yuba City	Sutter
Industrial	5S51I007216	A A Concrete Supply	1	Acres	1201 Market St	Yuba City	Sutter
Industrial	5S51I006374	First Student Inc 20310	0.9	Acres	1305 Hassett Ave	Yuba City	Sutter
Industrial	5S51I021314	Yuba City Bin	20000	SqFt	401 C Burns Dr	Yuba City	Sutter

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Industrial	5S51I004478	Bill Amarel Trucking Inc	1		2260 Oswald Rd	Yuba City	Sutter
Industrial	5S51I018940	Valley Fine Foods Inc			300 Epley Dr	Yuba City	Sutter
Industrial	5R52I021255	7 11 Materials Inc Pine Creek Facility	488	Acres	517 Roney Trail	Chico	Tehama
Industrial	5R52I021798	Thomes Creek Rock	125.55	Acres	6069 Hwy 99 W	Corning	Tehama
Industrial	5R52I009913	Corning City Corning Airport	76	Acres	930 N Marguerite Ave	Corning	Tehama
Industrial	5R52I020858	Bell Carter Plant 1	40.7	Acres	1012 Second	Corning	Tehama
Industrial	5R52I019158	Corning Wastewater Treatment Plant	26	Acres	25010 Gardiner Ferry Rd	Corning	Tehama
Industrial	5R52I016256	Corning Travel Center	24	Acres	3524 S HWY 99W	Corning	Tehama
Industrial	5R52I022066	Petro Shopping Center	18.35	Acres	2151 South Ave	Corning	Tehama
Industrial	5R52I019512	All Star Auto Recycling	10	Acres	22521 Capay Rd	Corning	Tehama
Industrial	5R52I011979	Bell Carter Plant 2	6	Acres	HWY 99W	Corning	Tehama
Industrial	5R52I011120	Corning Disposal Service	5	Acres	3281 Highway 99 West	Corning	Tehama
Industrial	5R52I025060	Richfield Recycling Inc	1	Acres	23052 Sonoma Ave	Corning	Tehama
Industrial	5R52I024259	Corning Olive Oil Company	36195	SqFt	721 Fig Lane	Corning	Tehama
Industrial	5R52I023113	Cottonwood Creek Sand and Gravel	62	Acres	19840 Draper Rd	Cottonwood	Tehama
Industrial	5R52I001897	Tehama Co Rd Dept Gerber Shop	7	Acres	9380 San Benito	Gerber	Tehama
Industrial	5R52I019749	Truck World Auto & Truck Dismantlers	7	Acres	7980 Hwy 99W	Gerber	Tehama
Industrial	5R52I011594	Paskenta Sawmill Landfill	36	Acres	Paskenta	Paskenta	Tehama
Industrial	5R52I000539	Red Bluff City Municipal Airport	505	Acres	1800 Airport Blvd	Red Bluff	Tehama
Industrial	5R52I005490	Louisiana Pacific Corp I Joist Plant	216	Acres	11500 Reading	Red Bluff	Tehama
Industrial	5R52I017116	Sierra Pacific Industries Red Bluff	168	Acres	11400 Reading Road	Red Bluff	Tehama
Industrial	5R52I019120	Pactiv LLC	100	Acres	1000 Diamond Ave	Red Bluff	Tehama
Industrial	5R52I000290	Tehama Cnty Red Bluff Landfill - Storm Water	80	Acres	19995 Plymire Rd	Red Bluff	Tehama
Industrial	5R52I005495	Red Bluff Class III Landfill	80	Acres	WILLIAMS RD	Red Bluff	Tehama
Industrial	5R52I012189	Sierra Pacific Industries Red Bluff Windows	40	Acres	11605 Reading Rd	Red Bluff	Tehama
Industrial	5R52I018114	Lassen Forest Prod	40	Acres	22829 Casale Rd	Red Bluff	Tehama
Industrial	5R52I024433	Evoqua Water Technologies LLC	22	Acres	11711 Reading Road	Red Bluff	Tehama
Industrial	5R52I020136	Tehama Asphalt Processing Inc	12.4	Acres	22645 Fisher Rd	Red Bluff	Tehama
Industrial	5R52I022901	Waste Water Reclamation Plant	11.5	Acres	700 Messer Dr	Red Bluff	Tehama
Industrial	5R52I021754	G R Auto Parts LLC	9	Acres	11095 Hwy 99 W	Red Bluff	Tehama
Industrial	5R52I022854	Red Bluff Corp Yard	5.55	Acres	1055 Kimball Rd	Red Bluff	Tehama
Industrial	5R52I016917	John Wheeler Logging Inc	5	Acres	13570 Hwy 365	Red Bluff	Tehama
Industrial	5R52I020377	Steve Hill Towing	4	Acres	20795 Dalby Ln	Red Bluff	Tehama

Type	WDID	Facility Name	Size	Units	Facility Address	Facility City	Facility County
Industrial	5R52I022054	Red Bluff Auto Dismantling	3.5	Acres	20722 Walnut St	Red Bluff	Tehama
Industrial	5R52I017763	Paratransit Services	3	Acres	1509 Schwab St	Red Bluff	Tehama
Industrial	5R52I020892	Greenwaste of Tehama	2.3	Acres	1805 Airport Blvd	Red Bluff	Tehama
Industrial	5R52I019763	Wal Mart Distribution Ctr 26			10815 HWY 99W	Red Bluff	Tehama
Industrial	5R52I003581	Sierra Pacific Industries Richfield	50	Acres	No End Of Alameda Rd	Richfield	Tehama
Industrial	5R52I020337	Thomas Creek Rock TCR Doyle Site	194.31	Acres	Hall Rd @ Thomes Creek	Tehama	Tehama
Industrial	5R52I021264	Deer Creek	4.7	Acres	6300 Acorn Hollow Rd	Vina	Tehama
Industrial	5S57I016940	Best Overnite Express	4	Acres	850 F St	West Sacramento	Yolo
Industrial	5S57I013618	UPS Ground Freight	1	Acres	900 E Street	West Sacramento	Yolo
Industrial	5S57I023314	Dependable Highway Express	10532	SqFt	820 830 E St	West Sacramento	Yolo
Industrial	5S58I009991	US Air Force Beale	22944	Acres	9 Ces Cev 6451 B Street	Beale Afb	Yuba
Industrial	5S58I021883	Western Aggregates LLC	1200	Acres	4711 Hammonton Rd	Marysville	Yuba
Industrial	5S58I010755	Naumes Inc Juice Concentrate P	945	Acres	3792 Feather River Blvd	Marysville	Yuba
Industrial	5S58I001682	Yuba Cnty Airport	933	Acres	1364 Sky Harbor Dr	Marysville	Yuba
Industrial	5S58I001223	Recology Yuba Sutter	180	Acres	3001 N Levee Rd	Marysville	Yuba
Industrial	5S58I021701	Cal Sierra Development Inc	40	Acres	4738 Hammonton Rd	Marysville	Yuba
Industrial	5S58I009621	Water Works Manufacturing LLC	25	Acres	3387 Plumas Arboga Rd	Marysville	Yuba
Industrial	5S58I014033	Livingstons Concrete	12	Acres	2572 Rosser Rd	Marysville	Yuba
Industrial	5S58I021576	Silica Resources Inc	12	Acres	4553 Hammonton Rd	Marysville	Yuba
Industrial	5S58I002442	United Truck Dismantlers	8.32	Acres	2488 Mcgowan Pkwy	Marysville	Yuba
Industrial	5S58I018473	Cemex	6	Acres	Avondale Ave APN 020 030 049	Marysville	Yuba
Industrial	5S58I021001	Dantoni Pit	5.5	Acres	7229 Dantoni Rd	Marysville	Yuba
Industrial	5S58I017718	Oldcastle Enclosure Solutions	5	Acres	5236 Arboga Rd	Marysville	Yuba
Industrial	5S58I013130	Yuba Sutter Transit Auth	2	Acres	2100 B St	Marysville	Yuba
Industrial	5S58I002069	United Parcel Ser Cayub	69122	SqFt	1470 Furneaux Rd	Marysville	Yuba
Industrial	5S58I023826	Shoei Foods USA Inc	50	Acres	1900 Feather River Blvd	Olivehurst	Yuba
Industrial	5S58I023983	CTU Precast	12	Acres	1260 Furneaux Rd	Olivehurst	Yuba
Industrial	5S58I006972	Nordic Industries Inc	10	Acres	1437 Furneaux Rd	Olivehurst	Yuba
Industrial	5S58I025103	Andersons Pull N Save	6	Acres	4199 Feather River Blvd	Olivehurst	Yuba
Industrial	5S58I006459	BCI Coca Cola Bottling Company of LA	4	Acres	1430 Melody Rd	Olivehurst	Yuba
Industrial	5S58I023614	Century Nationwide Inc	2.2	Acres	1401 Melody Rd	Olivehurst	Yuba
Industrial	5S58I016156	Tollcrest Dairy	304	Acres	3355 Virginia	Wheatland	Yuba
Industrial	5S58I010551	Recology Ostrom Rd	261	Acres	5900 Ostrom Rd	Wheatland	Yuba
Industrial	5S58I017853	Wheatland Sch Dist	22800	SqFt	711 Olive St	Wheatland	Yuba

Industrial NPDES Permits in Sacramento River Watershed

Discharger	Facility Name	Facility Address	County	NPDES #	Effluent Type	Flow	Receiving Water	Facility Type	Location	Latitude N	Longitude W
State of California Dept. of Fish and Game & Department of Water Resources	Feather River Fish Hatchery - Thermalito Annex Facility	4700 Hwy 99E, Oroville Assessor's Parcel No. 030-320-017 adjacent to western shorline of the Thermalito Annex Facility	Butte	Order No. R5-2010-0018-001	Wastewater	11.3 mgd is max through facility, each of the 4 raceways uses a max of 19.5 mgd	Thermalito Afterbay, Lower Feather River	Fish Hatchery	See Map		
North Yuba Water District	Forbestown Water Treatment Plant	118 Buckeye Dr. Forbestown, CA 95941	Butte	Order No. R5-2013-0108 NPDES CA0084824	Filter Backwash	0.070 mgd	Unnamed tributary of New York Creek, tributary to Dry Creek, and the Yuba River	Water Treatment Plant	39,30,54 121,16,9	39.515	121.2691667
USBR	Sliger Mine	Sliger Mine Rd/Fox Glove Lane	El Dorado	Order No. R5-2008-0168	Mine Drainage	0.194 mgd	Middle Fork American River	Inactive Mine	38,56,26.22 120,56,13.1	38.94061667	120.9369722
Modoc Joint Unified School District	Geothermal Project	906 W 4th Street, Alturas	Modoc	Order R5-2011-0044	Waste Geothermal Fluid	0.166mgd	North Fork Pit River	Geothermal Heating Facility	41,28,53.29 120,32,33.31	41.48146944	120.5425861
State of California Dept. of Parks and Recreation	Empire Mine State Historic Park	10791 East Empire St. Grass Valley, CA 95945	Nevada	Order No. R5-2012-0050 NPDES. CA0085171	Mine Drainage	2.3 mgd	Magenta Drain Channel to South Fork of Wolf Creek	Gold Mine	39,12,41.8 121,3,10.6	39.21161111	121.0529444
Soper Company	Spanish Mine	Spanish Mine Road Washington, CA 94986	Nevada	Order No. R5-2008-0104 NPDES. CA0085286	Mine Adit	0.065 mgd	Poorman Creek and Devils Canyon (tributary to South Fork of Yuba River)	Inactive Mine	39,22,56 120,47,10	39.38222222	120.7861111
Collins Pine Company	Chester Sawmill	500 Main St, Chester	Plumas	Order No. R5-2009-0015	Treated process wastewater	0.36 mgd	Stover Ditch/Lake Almanor	Log storage and handling;saw mill and planing mill	40,18,30 121,14,31	40.30833333	121.2419444
Sierra Pacific Industries	Quincy Division	1538 Lee Rd, Quincy	Plumas	Order No. R5-2015-0070	Stormwater Runoff and Power Plant Discharge	Unspecified	Mill Creek	Log storage and handling;saw mill and planing mill	39,56,43.89 120,54,46.13	39.945525	120.9128139
Indian Valley Health Care District	Geothermal Space Heating System	184 Hot Springs Rd, Greenville	Plumas	Order R5-2005-0012	Waste Geothermal Fluid	80 gpm	Wolf Creek to Indian Creek to North Fork Feather River	Geothermal Heating Facility	40,8,22 120,55,50	40.13944444	120.9305556
Sterling Caviar LLC	Sterling Caviar LLC, Elverta	9149 E. Levee Road Elverta, CA 95626	Sacramento	Order No. R5-2007-0012 NPDES CA 0085197	Aquaculture Wastewater	3.67 mgd	BKS preserve wetlands, Reclamation District, Natomas East Main Drain	Concentrated Aquatic Animal Production Facility	38,44,6 121,29,26	38.735	121.4905556
State of California Dept. of Fish and Game	Nimbus Salmon and Steelhead Hatchery and American River Trout Hatchery	So. Bank of American River, downstream of Hazel Avenue and Lake Natoma in Rancho Cordova	Sacramento	Order No. R5-2005-0057 NPDES CA0004774	Treated flow-through process wastewater	Outfall 001 - 19 mgd Outfall 002 - 3 mgd Outfall 003 - 18 mgd Outfall 004 - nothing for last 6 years	Lower American River	Concentrated Aquatic Animal Production Facility	38,38,4 121,13,40	38.63444444	121.2277778
U.S. Dept. of the Air Force, Air Force Real Property Agency	Former McClellan Air Force Base, Groundwater Extraction and Treatment System	4934 Patrol Road, Building 740 McClellan, CA 95652	Sacramento	Order No. R5-2014-0055 NPDES No. CA0081850	Treated Groundwater	Discharge 001 - 2.88 mgd Discharge 002 - 0.144 mgd	Magpie Creek and Beaver Pond, tributary to Natomas East Main Drainage	Groundwater Extraction and Treatment System	38,39,30 121,24,54.6	38.65833333	121.4151667
Aerojet-General Corp.	Interim Groundwater Extraction and Treatment System ARGET, GET E/F, GET H, Interim GET H, GET K, Interim GET K, GET L, GET L1, etc..	Aerojet Rd. Sacramento, CA 95813	Sacramento	Order R5-2014-0126 NPDES CA0083861	Treated Groundwater	12 outfalls - 48 mgd	Various to American River	Groundwater Extraction and Treatment System	38,38,0 121,16,7	39.63333333	121.2686111
Aerojet-General Corp.	Sacramento Facility	Aerojet Rd. Rancho Cordova, CA 95670	Sacramento	Order R5-2013-0156 NPDES CA0004111	Stormwater	NA	Buffalo Creek, Alder Creek, tributary to American River	Rocket Manufacturing and Testing	38,37,12 121,13,30	38.62	121.225
Mt. Lassen Trout Farms and PG&E	Mt. Lassen Trout Farms MillSeat Facility	Assessor's Parcel 096-070-05 and 703-160-01, approximately 2 miles east of Shingletown	Shasta	Order No. R5-2010-0018-004	Wastewater from Settling ponds	19.0 mgd maximum	Millseat Creek, tributary to North Fork of Battle Creek	Concentrated Aquatic Animal Production Facility	See Map		
Mt. Lassen Trout Farms and PG&E	Mt. Lassen Trout Farms Volta Facility	Assessor's Parcel 999-019-41, approximately 2 miles north of Manton	Shasta	Order No. R5-2010-0018-005	Wastewater from Settling ponds	6.0 mgd maximum	PG&E Cross Country Canal, tributary to South Fork of Battle Creek	Concentrated Aquatic Animal Production Facility	See Map		

Discharger	Facility Name	Facility Address	County	NPDES #	Effluent Type	Flow	Receiving Water	Facility Type	Location	Latitude N	Longitude W
State of California Dept. of Fish and Game	Darrah Springs Fish Hatchery	Assessor's Parcel 704-240-03, west of Manton	Shasta	Order No. R5-2010-0018-012	Wastewater	18.7 mgd (average) and 26.7 mgd max	Darrah Creek and Pacific Power Ditch, both tributary to Coleman Canal, a tributary to Battle Creek	Concentrated Aquatic Animal Production Facility	See Map		
U.S. Dept. of Interior Fish and Wildlife Service	Livingston Stone National Fish Hatchery	16349 Shasta Dam Blvd. Shasta Lake, CA, 1/2 mile downstream of Shasta Dam powerhouse	Shasta	Order No. R5-2010-0018-003	Wastewater	1 mgd (average), 2.45 mgd (max)	Sacramento River	Concentrated Aquatic Animal Production Facility	40,43,00 N 122,25,26 W	40.71666667	122.4238889
U.S. Dept. of Interior Fish and Wildlife Service	Coleman Fish Hatchery	Assessor's Parcel 057-540-03, along North Bank of Battle Creek	Shasta	Order No. R5-2004-0123 NPDES CA0004201	Wastewater	Depends on discharge location	Battle Creek, tributary to Sacramento River	Concentrated Aquatic Animal Production Facility	See Map		
State of California, Department of Fish and Game and PG&E	Crystal Lake Fish Hatchery	40156 Baum Lake Rd. Cassel, CA	Shasta	Order No. R5-2010-0018-011	Wastewater	DP001-12.4 mgd DP002-4 mgd	Baum Lake	Concentrated Aquatic Animal Production Facility	See Map		
Sierra Pacific Industries	Anderson Division	19758 Riverside Ave, Anderson Assessor's Parcel 050-100-15 is located approx. one mile northwest of Anderson	Shasta	Order No. R5-2011-0090 NPDES CA 0082066	Process Wastewater and Storm Water	Unspecified	Storm water runoff and roof drainage from planer mill, stacker, cooling shed and drying kilns enters Sacramento River upstream of confluence with Spring Gulch.	Log storage and handling;saw mill and planing mill	40,28,23 122,19,5	40.47305556	122.3180556
Sierra Pacific Industries	Shasta Lake Division	3735 El Cajon Ave, Redding Assesor's Parcel 006-030-34 in the city of Shasta Lake	Shasta	Order No. R5-2010-0034 NPDES CA 0081400	Storm Water Runoff from Retention Pond	Not applicable	Churn Creek, tributary to Sacramento River	Log storage and handling;saw mill and planing mill	40,40,30 122,23,5	40.675	122.3847222
Sierra Pacific Industries	Burney Division	36336 Hwy 299E, Burney	Shasta	Order No. R5-2015-0071	Stormwater	Unspecified	Canyon Creek	Log storage and handling;saw mill and planing mill	40,52,31.82 121,42,17.95	40.87550556	121.7049861
Burney Forest Products	Burney Forest Power	35586 B Hwy 299E, Burney	Shasta	Order No. R5-2014-0035	Stormwater	Unspecified	Canyon Creek	Log storage and handling;saw mill and planing mill	40,52,35 121,43,00	40.87638889	121.7166667
Stimpel-Wiebelhaus Associates, Inc.	SWA at Mountain Gate Quarry	20285 Radcliff Rd. Redding, CA 96003	Shasta	Order No. R5-2008-0120 NPDES CA 0084140	Storm Water	Unspecified	West Fork of Stillwater Creek, trubutary to Stillwatercreek and the Sacramento River	Crushed and Broken Limestone	40,43,34 122,17,51	40.72611111	122.2975
Lehigh Southwest Cement Co.	Lehigh Southwest Cement Co.	15390 Wonderland Blvd. Redding, CA 96003	Shasta	Order No. R5-2007-0168 NPDES CA0081191	Storm Water	Unspecified	West Fork of Stillwater Creek	Hydraulic cement, crushed and broken limestone, minerals and earth	40,44,9 122,19,5	40.73583333	122.3180556
J.F. Shea Construction	Fawndale Rock and Asphalt	15380 Fawndale Road Redding, CA 96002	Shasta	Order No. R5-2007-0137 NPDES CA0083097	Storm Water	Unspecified	West Fork of Stillwater Creek	Sand/Gravel-Mining/Quarry	40,44,6 122,18,26	40.735	122.3072222
Mining Remedial Recovery Co.	Stowell Mine	Stowell Mine Section 14, T33N, R6W, MDB&M	Shasta	Order No. R5-2002-0153 NPDES CA0081876	Acid mine drainge	Not applicable	Spring Creek, approximately 5 miles upstream from Keswick reservoir	Inactive Mine	Spring Creek, approximately 5 miles upstream from Keswick reservoir		
Shasta Gold Corp and French Gulch Mining Corp	Washington Mine		Shasta	Order No. R5-2011-0026	Stormwater	Unspecified	French Gulch to Scorpion Gulch to Clear Creek	Gold Mine	See Map		
Wheelabrator Shasta Energy Co. and Wheelabrator Lassen, Inc.	Wheelabrator Shasta Energy Co. and Wheelabrator Lassen, Inc.	20811 Industry Road Anderson, CA 96007	Shasta	Order No. R5-2015-0078 NPDES CA0081957	Process water, groundwater and Storm Water	Not applicable	Anderson Cottonwood Irrigation District Canal, tributary to Cottonwood Creek	Electrical Generation	40,25,49 122,16,32	40.43027779	122.2755556
Lazarus Mining LLC and US Forest Service, Tahoe National Forest	Klondike, Dutch, and Telegraph Tunnel Mines	Section 9, T20N, R10E, MDB&M	Sierra	Order No. R5-2015-0075 NPDES CA0084387	Tunnel Drainage Water	0.30 mgd (average dry flow)	Goodyears Creek, tributary to Yuba River	Industrial Abandoned Mine Operation	39,36,49.7 120,51,58.5	39.61380556	120.86625
Original Sixteen to One Mine, Inc.	Sixteen to One Mine	506 Miners St, Alleghany Section 34, T19N, R10E, MDB&M	Sierra	Order No. R5-2015-0002 NPDES CA 0081809	Treated wastewater and mine drainage	0.28 mgd (average dry flow)	Kanaka Creek, tributary to Middle Yuba River, Yuba River, Feather River, Sacramento River	Gold Mine	39,27,45 120,50,15	39.4625	120.8375
California Cedar Products Co.		1/2 Mile Northeast of McCloud	Siskiyou	Order No. R5-2003-0014	Stormwater and Process Water	Unspecified	Squaw Valley Creek	Log storage and handling;saw mill and planing mill	No Map		

Industrial NPDES Permits in Sacramento River Watershed

Discharger	Facility Name	Facility Address	County	NPDES #	Effluent Type	Flow	Receiving Water	Facility Type	Location	Latitude N	Longitude W
Mt. Lassen Trout Farms and Marion Jones	Mt. Lassen Trout Farms' Willow Springs Facility	Wildcat Rd/Road A6, Manton Assessor's Parcel 011-010-191, approx. 7 miles southwest of Manton	Tehama	Order No. R5-2010-0018-008	Wastewater	5.8 mgd (max daily)	Coleman Canal, tributary to Battle Creek	Concentrated Aquatic Animal Production Facility	See Map		
Mt. Lassen Trout Farms and Leland and Shirley Davis	Mt. Lassen Trout Farms' Jeffcoat West Facility	Assessor's Parcel 11-020-10 approx. 4 miles southwest of Manton	Tehama	Order No. R5-2010-0018-007	Wastewater	4.9 mgd (max)	North Fork of Battle Creek	Concentrated Aquatic Animal Production Facility	See Map		
Mt. Lassen Trout Farms and Leland and Shirley Davis	Mt. Lassen Trout Farms' Jeffcoat East Facility	Assessor's Parcel 11-020-101 approx. 4 miles southwest of Manton	Tehama	Order No. R5-2010-0018-006	Wastewater	5.0 mgd (max)	PG&E Eagle Canyon Ditch, trib to South Fork of Battle Creek, Trib to Battle Creek	Concentrated Aquatic Animal Production Facility	See Map		
Mt. Lassen Trout Farms and Dale Family Partnership	Mt. Lassen Trout Farms' Dales Facility	Assessor's Parcel 9-14-11 and 9-19-21, 14 miles east of Red Bluff	Tehama	Order No. R5-2010-0018-009	Wastewater	6.0 mgd (max)	Paynes Creek, Tributary to Sacramento River	Concentrated Aquatic Animal Production Facility	See Map		
Mt. Lassen Trout Farms and Fred and Nancy Cline	Mt. Lassen Trout Farms Meadowbrook Facility	28125 Hwy 36E, Red Bluff Assessor's Parcel 11-250-21, 15 miles east of Red Bluff	Tehama	Order No. R5-2004-0150 NPDES CA 0080373	Wastewater	9.0 mgd (max)	Paynes Creek, Tributary to Sacramento River	Concentrated Aquatic Animal Production Facility	See Map		
Pactiv Corporation	Molded Pulp Mill	1000 Diamond Ave, Red Bluff Assessor's Parcel 35-08-02 in Section 33, T27N, R3W, MDB&M, approx. 1/2 mile upstream of Red Bluff Diversion Dam	Tehama	Order No. R5-2011-0036 NDPES CA 0004821	Treated wastewater	1.6 to 2.2 mgd (average)	Sacramento River	Converted Paper and Paperboard products	40,9,10 122,12,20	40.15277778	122.2055556
Bell-Carter Olive Co. and City of Corning	Bell Carter Industrial Wastewater Treatment Plant	Gardiner Ferry Road Corning, CA 96021	Tehama	Order No. R5-2015-0030 NPDES CA0083721	Treated process wastewater	1.4 mgd (daily max);0.75 mgd (annual average)	Treated wastewater goes to City of Corning outfall line, then to Sacramento River	Industrial	39,54,24 122,5,13	39.90666667	122.0869444

The Sacramento River Source Water Protection Program (SRSWPP) conducts numerous activities, as described in the subsections of Section 4. Included in this appendix is a selection of various examples of stakeholder input, education and outreach, or technical evaluations. The samples include:

- 2010 AWWA CA/NV Section's Exemplary Source Water Protection Program Award
- 2012 AWWA Exemplary Source Water Protection Program Award for Metropolitan Sized Water System
- Comment Letter to USEPA Regarding Pesticide Registration Application for Flupyradifurone
- Comments Letter to USEPA on Public Availability of Identities of Inert Ingredients in Pesticides
- Comment Letter to Regional Board on Tentative WDRs General Order for Sacramento Valley Rice Growers
- Comment Letter to Regional Board on Administrative Draft WDRs General Order for Sacramento River Watershed
- Comments and Recommendations for the Expert Panel on the Draft Conclusions of the Agricultural Expert Panel: Recommendations to the State Water Resources Control Board Pertaining to the Irrigated Lands Regulatory Program
- Pesticide Fact Sheet for Sodium Chlorate
- September 2013 Rice Pesticide Prioritization Memo
- October 2013 Sacramento River Watershed Pesticide Prioritization Memo
- "Keep Our Waters Clean" Campaign Materials – Sample Sheet
- OES Spill Event Summary Tables for Sacramento River Watershed, 2010 – 2014
- Comment Letter to Regional Board on the CEQA Scoping for Evaluation of the Municipal and Domestic Supply Beneficial Use in Agriculturally Dominated Water Bodies
- Comment Letter to Regional Board on the CEQA Scoping for Development of Central Valley Wide Salt and Nitrate Management Plans for Incorporation into the Sacramento-San Joaquin and Tulare Lake Basin Plans

RECEIVED
AUG 25 2010
CITY OF SACRAMENTO
DEPARTMENT OF UTILITIES

CALIFORNIA-NEVADA SECTION
American Water Works Association

LEADING. EDUCATING. SERVING.

August 23, 2010

Ms. Elissa Callman
Department of Utilities
City of Sacramento
1395 35th Ave
Sacramento, CA 95822

Dear Ms. Callman:

On behalf of the California-Nevada Section, American Water Works Association, it is my pleasure to inform you that the Lower American River and Sacramento River Source Water Protection Program Partners have been selected to receive the **Exemplary Source Water Protection Award** for 2010. Congratulations! This award recognizes a utility or utility group with the commitment to make protection of their water resources paramount. The criteria for this award are stringent, so very few utilities are so honored.

Please join us at the CA-NV Section's fall 2010 conference on Wednesday, October 6th, to receive your award plaque. The conference will be held at the Hyatt Regency Hotel in Sacramento, located at 12091 L Street. The opening session begins at 9:00 am and our awards ceremony starts about 10:30 am.

If you are not otherwise planning on attending the conference, we would appreciate you informing us, so we can have a luncheon ticket for you. If you are planning on attending the conference, and haven't already registered, a registration form has been included for your convenience.

We would also appreciate it if you could send us a suitable photo representative of the water district by September 22d. We'll use it in the presentation and in the exhibit hall. You can e-mail your photo to me at macler.bruce@epa.gov. If you have any questions, please do not hesitate to contact me. Again, congratulations!

Sincerely,

Bruce Macler
Section Awards Chair
415 972-3569

office 909.481.7200 • fax 909.481.4688
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March 7, 2012

Elissa Callman
City of Sacramento
Dept. of Utilities
1395 35th Avenue
Sacramento, CA 95822

Dear Ms. Callman:

I am pleased to inform you that your utility has been selected as the recipient of the Exemplary Source Water Protection Award for metropolitan-sized systems. This award recognizes organizations in North America who have developed and are implementing exemplary source water protection programs.

In recognition of this honor, an award will be presented to you during the AWWA Annual Conference & Exposition scheduled for June 10-14, 2012 in Dallas, Texas. Details regarding the presentation will be sent to you later by Linda Moody, staff secretary for the Water Resource Sustainability Division.

The Association's Officers and Directors join me in congratulating you on this honor.

Sincerely,

David LaFrance
Executive Director

DL/lm
cc: Linda Moody, Staff Secretary

City of
SACRAMENTO
Department of Utilities

June 25, 2013
130146:KDM:EC

Jessica Rogala
US EPA Office of Pesticides Programs
OPP Docket, Environmental Protection Agency
Docket Center (EPA/DC), (28221T),
1200 Pennsylvania Ave. NW.,
Washington, DC 20460-0001

Subject: Pesticide Products; Registration Applications for New Active Ingredients – Flupyradifurone (Docket Number: EPA–HQ–OPP–2013–0026-0001)

Dear Ms. Rogala:

On behalf of the Sacramento River Source Water Protection Program, thank you for the opportunity to provide input on EPA's review of the application to register the pesticide flupyradifurone for use on rice. The City of Sacramento and Sacramento County Department of Water Resources sponsor the Sacramento River Source Water Protection Program; this program is coordinated with other agencies that draw their drinking water from the River (or that have future plans to do so), including the City of West Sacramento, East Bay Municipal Utility District (EBMUD), and the Woodland-Davis Clean Water Agency.

The Source Water Protection Program seeks to maintain the high quality of the Sacramento River drinking water supply. It is our responsibility as water utilities to ensure that our water is both healthful and aesthetically pleasing. Because our water supply intakes are downstream of California's primary rice growing area, our source water protection efforts include tracking the application and registration of rice pesticide used in our watershed and coordination with rice growers and pesticide regulators on actions to facilitate protection of our surface water.

City of Sacramento Department of Utilities
916-808-1400
1395 35th Avenue
Sacramento, CA 95822

City of
SACRAMENTO
Department of Utilities

Over the last two decades, the City of Sacramento and City of West Sacramento have detected the rice pesticides molinate and thiobencarb at our Sacramento River water treatment plant intakes on many occasions. The frequency and detected levels of these rice pesticides have significantly reduced in recent years, and molinate is now phased out. However, the historic presence of these rice pesticides indicates that there are pathways for these and other rice pesticides to enter our water supply.

Each time EPA evaluates an application to register a new rice pesticide, it is important for EPA to directly evaluate the potential for the pesticide to affect drinking water quality. Our concerns include potential human health effects to our customers and adverse taste and odor from rice pesticides and their breakdown products (through degradation and transformation), and cumulative and potential synergistic effects of exposure to multiple rice pesticides. We believe it is important for EPA to include the following considerations when evaluating human health risk from rice pesticides:

- Effects of the parent chemicals, metabolites, degradates, and transformation products formed during and subsequent to water treatment processes.
- Effects of water treatment processes on residue removal and on the creation of transformation products from the parent chemical.
- Cumulative and possible synergistic effects of rice pesticides and their breakdown products in drinking water.
- Estimation of the concentrations that might occur in downstream surface water, based on all pathways for release to surface waters (e.g., drift, planned and unplanned rice field discharges, and seepage).
- Require monitoring and data collection by pesticide registrants to support EPA's evaluation of the above.

We request that EPA thoroughly review the application to register flupyradifurone for use on rice with regard to its potential to affect drinking water quality. Please carefully consider each item listed above.

City of Sacramento Department of Utilities
916-808-1400
1395 35th Avenue
Sacramento, CA 95822

City of
SACRAMENTO
Department of Utilities

If you have any questions on the above, please do not hesitate to contact Elissa Callman at (916) 808-1424. Thank you for the opportunity to provide our input on EPA's review of the application to register the pesticide flupyradifurone for use on rice.

Sincerely,

Sherill Huun
Supervising Engineer

Cc: Daniel McClure, Central Valley Water Board
Susan Fregien, Central Valley Water Board
Richard Breuer, California State Water Resources Control Board
David Duncan, CDPR
Nan Singhasemanon, CDPR
Richard Hinrichs, CA Dept. of Public Health
Patti TenBrook, U.S. EPA Region 9
Debra Denton, U.S. EPA Region 9
Dave Brent, City of Sacramento
Bill Busath, City of Sacramento
Dave Phillips, City of Sacramento
Pravani Vandeyar, City of Sacramento
Dan Mount, City of West Sacramento
Eileen White, EBMUD
Hubert Lai, EBMUD
Forrest Williams, Sacramento County Department of Water Resources
Vicki Butler, Sacramento County Department of Water Resources
Dan Gwaltney, Sacramento County Department of Water Resources
Jacques DeBra, Woodland-Davis Clean Water Agency
Bonny Starr, Starr Consulting
Kelly Moran, TDC Environmental

City of Sacramento Department of Utilities
916-808-1400
1395 35th Avenue
Sacramento, CA 95822

DEPARTMENT
OF UTILITIES

ENGINEERING
SERVICES DIVISION

CITY OF SACRAMENTO
CALIFORNIA

1395 35th AVENUE
SACRAMENTO, CA
95822-2911

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April 22, 2010
100752:EC

Kerry B. Leifer, Registration Division
Office of Pesticide Programs
c/o Regulatory Public Docket (7502P)
U.S. Environmental Protection Agency (EPA)
1200 Pennsylvania Ave., N.W.
Washington DC 20460-0001

Subject: Public Availability of Identities of Inert Ingredients in Pesticides (Docket No. EPA-HQ-OPP-2009-0635)

Dear Mr. Leifer:

On behalf of the City of Sacramento (City), thank you for the opportunity to provide input on EPA's planned rulemaking to disclose the identities of inert ingredient in pesticides. The City provides drinking water to more than 141,000 customer accounts serving approximately 481,000 people. The City of Sacramento also coordinates the Sacramento River Source Water Protection Program, which includes the Cities of Roseville, Sacramento, West Sacramento, East Bay Municipal Utility District (EBMUD), Sacramento County Department of Water Resources, and Placer County Water Agency.

The Source Water Protection Program seeks to maintain the high quality of the Sacramento River drinking water supply. Because our water supply intakes are downstream of agricultural and urban areas, our source water protection efforts include monitoring of pesticide use in our watershed and coordination with agricultural groups, urban runoff managers, and pesticide regulators on actions to facilitate protection of our source water.

Some pesticide product ingredients are water pollutants that degrade drinking water quality. Since California requires reporting of pesticide applications, we are able to track the use of pesticide "active ingredients" in our watershed. Pesticide product ingredients other than the active ingredient— commonly termed "inert ingredients"— may also be water pollutants such as solvents, heavy metals, and toxic organic compounds; however, we are unable to track these chemicals because their presence in pesticide products is not public information. We support EPA's announced intention to make all pesticide ingredients public because it would enhance our ability to take proactive steps to protect our source water quality.

Of the two disclosure options under consideration by EPA, we prefer the option that would disclose all pesticide ingredients. Because new scientific information about chemicals in drinking water is growing quickly, our source water protection program examines chemicals other than those currently on regulatory agency lists of "hazardous" chemicals. The full disclosure option ensures that we would be able to follow the usage of all substances that our source water protection program may wish to track.

If EPA elects to require disclosure only of "potentially hazardous" ingredients, drinking water contaminants should be included among the substances requiring disclosure. We have attached descriptions of and Internet links to Federal and California regulatory agency lists of drinking water contaminants. Copies of the most important lists are enclosed. Whether EPA elects to use a list-based approach or an objective criteria approach for identifying "potentially hazardous" pesticide ingredients, we recommend that EPA require disclosure of all chemicals on the enclosed lists.

If you have any questions on the above or attached, please do not hesitate to contact Elissa Callman at (916) 808-1424. Thank you for the opportunity to provide our input on EPA's planned rulemaking to disclose the identities of inert ingredient in pesticides.

Sincerely,

Sherill Huun

Sherill Huun
Supervising Engineer

Enclosures:

1. Lists of Chemicals that are Potential Drinking Water Hazards
2. U.S. EPA, National Primary Drinking Water Regulations and National Secondary Drinking Water Regulations (summary list of contaminants), EPA 816-F-09-004, May 2009.
3. U.S. EPA, 2009 Edition of the Drinking Water Standards and Health Advisories (tables), EPA 822-R-09-011, October 2009.

4. California Department of Public Health Maximum Contaminant Levels and Regulatory Dates for Drinking Water (table), November 2008.
5. California Code of Regulation, Title 22, Division 4, Environmental Health. Chapter 15. Domestic Water Quality and Monitoring Regulations. Article 16. Secondary Water Standards. Section 64449.
6. California Department of Public Health, Drinking Water Program, Drinking Water Notification Levels and Response Levels: An Overview, December 14, 2007.
7. California Department of Public Health, Drinking Water Program, CDHS' Archived Advisory Levels for Drinking Water, March 7, 2007.

Cc: Daniel McClure, Central Valley Water Board
Syed Ali, California State Water Resources Control Board
John Sanders, CDPR
Nan Singhasemanon, CDPR
Dave Lancaster, CA Dept. of Public Health
Patti TenBrook, U.S. EPA Region 9
Debra Denton, U.S. EPA Region 9
Kelly Moran, UP3 Project
Dave Brent, City of Sacramento
Mike Yee, City of Sacramento
Roland Pang, City of Sacramento
Dave Phillips, City of Sacramento
Pravani Pillay, City of Sacramento
Elissa Callman, City of Sacramento
Delia McGrath, City of Sacramento
Ed Kriz, City of Roseville
Cathy Lee, City of Roseville
Dan Mount, City of West Sacramento
Belinda Arthurs, City of West Sacramento
Hubert Lai, EBMUD
Dave Kephart, Placer County Water Agency
Brad Wilkins, Placer County Water Agency
Forrest Williams, Sacramento County Dept of Water Resources
Vicki Butler, Sacramento County Dept of Water Resources
Amy de la Salle, Sacramento County Dept of Water Resources
Dave Tamayo, Sacramento County Dept of Water Resources
Bonny Starr, Starr consulting

Lists of Chemicals that are Potential Drinking Water Hazards

United States Environmental Protection Agency (EPA) Federal Drinking Water Standards

The EPA Office of Groundwater and Drinking Water has set Primary Drinking Water Standards (PDWS) for a variety of constituents, including microorganisms, disinfectants, disinfection by-products, inorganic chemicals, organic chemicals, and radionuclides. These PDWS have either Maximum Contaminant Levels (MCLs) or Treatment Technique (TT) requirements to limit the amount of a constituent in treated drinking water to protect public health. These are constituents with both acute and chronic human health impacts. These standards apply to public water supplies throughout the country and are enforceable. In addition, the EPA lists constituents for Secondary Drinking Water Standards (SDWS) for a variety of constituents based on potential cosmetic or aesthetic concerns. These secondary standards are not enforceable by the EPA but can be adopted and enforced by States, as most do.

The EPA website has the current list of PDWS and SDWS. A current list is attached.
http://www.epa.gov/safewater/contaminants/index.html

In addition to the list of PDWS and SDWS there is a TT that is required to be implemented for surface water supplies providing conventional filtration if the source water concentration of Total Organic Carbon (TOC) is greater than 2.0 milligrams per liter (mg/L). TOC is a precursor for disinfection by-products (DBPs) so implementation of the TT will reduce production of DBPs in the treated water and allow compliance with their associated MCLs.

EPA Health Advisories

There are many constituents which have the potential to impact human health but are not currently regulated in drinking water. The EPA develops Health Advisories (HAs) to provide information on contaminants that can cause human health effects and are known or anticipated to occur in drinking water. Health Advisories are guidance values based on non-cancer health effects for different durations of exposure (e.g., one-day, ten-day, and lifetime).

The most recent tables are from Summer 2009 and are attached. The EPA website has these posted as well.
http://www.epa.gov/waterscience/criteria/drinking/dwstandards2009.pdf

California Department of Public Health (DPH) State Drinking Water Regulations

The DPH enforces drinking water regulations in California. They are required to implement all federal regulations and in many cases have developed more stringent requirements, as well as regulated additional constituents. DPH has regulated constituents for Secondary Drinking Water

Standards (SDWS) based on potential cosmetic or aesthetic concerns. These secondary standards are enforceable by DPH. These standards apply to public water supplies throughout the state and are enforceable.

The current list of primary and secondary drinking water standards are attached and can be found on their website.
http://www.cdph.ca.gov/certlic/drinkingwater/Documents/DWdocuments/EPAandCDPH-11-28-2008.pdf
http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recentlyadoptedregulations/R-21-03-finalregtext.pdf

DPH Notification Levels

In addition to constituents with MCLs and TT, DPH has developed Notification Levels for unregulated constituents that are likely to impact public health. These are health-based advisory levels established by DPH. When chemicals are found at concentrations greater than their notification levels, certain public notification requirements and recommendations apply. The level at which DPH recommends removal of a drinking water source from service is called the "response level." For chemicals with a non-cancer toxicological endpoint, this recommendation occurs at 10 times the notification level. For chemicals with a cancer toxicological endpoint, the response level is variable from 10 to 100 times the notification level.

The list of current and archived notification levels are attached and can be found on their website.
http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Notificationlevels/NotificationLevels.pdf
http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Notificationlevels/Archivedadvisorylevels.pdf

City of SACRAMENTO
Department of Utilities

February 18, 2014
140055:EC

Ms. Margaret Wong
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Sent via e-mail to MAWong@waterboards.ca.gov

Subject: Sacramento River Source Water Protection Program Comments on ILRP Tentative WDRs General Order for Sacramento Valley Rice Growers

Dear Ms. Margaret Wong:

On behalf of the Sacramento River Source Water Protection Program (SRSWPP), thank you for the opportunity to provide comments on the Irrigated Lands Regulatory Program (ILRP) Tentative Waste Discharge Requirements General Order for Sacramento Valley Rice Growers (Rice Order). The SRSWPP is sponsored by the City of Sacramento and the Sacramento County Department of Water Resources; this program is coordinated with other agencies that draw their drinking water from the Sacramento River (or have plans to do so), including the City of West Sacramento, East Bay Municipal Utility District, and the Woodland-Davis Clean Water Agency. We serve drinking water to more than 600,000 people in Northern California.

Watershed management programs are essential for preserving the high quality of the Sacramento River watershed. The Central Valley Regional Board and other regulatory agencies, regulated communities, and educational organizations have made significant strides. We appreciate the substantial efforts of the ILRP and the California Rice Commission (CRC) to protect water quality. The SRSWPP supports the overall framework of the tentative Rice Order. We support adoption of the Tentative Rice Order with minor - but important - modifications to the Monitoring and Reporting Program, which are specified below.

The SRSWPP seeks to maintain the high quality of the Sacramento River drinking water supply for the current and future generations. It is our responsibility as water utilities to ensure that our water is both healthful and free of any unpleasant taste, odor, or other aesthetic effects. We have been actively providing stakeholder input during the development of the Long-Term Irrigated Lands Regulatory Program (ILRP) orders, because they have the potential to impact source water quality for current and future water quality constituents of interest.

Source water protection is part of a "multi-barrier" approach to providing safe drinking water. Drinking water treatment alone cannot always be successful in removing contaminants. Even in cases where treatment is an option, treatment can be substantially more costly than source water protection. We rely on management programs, including the Long-Term ILRP, as part of the source water protection in the Sacramento Valley.

Over the last two decades, on many occasions the City of Sacramento and City of West Sacramento have detected pesticides at our water treatment plant intakes on the Sacramento River that are used only on rice. The presence of rice pesticides at our intakes demonstrates that there are pathways for water pollutants in rice discharges to reach downstream water supplies. In addition, our ongoing drinking water source assessments continue to identify agriculture as a significant potential contaminating activity in our watershed. We appreciate the efforts of the rice industry and regulatory agencies through the Rice Pesticide Program, which have resulted in significant reductions in frequency and detected levels of thiobencarb in the Sacramento River. We support the continued management of thiobencarb through the existing Rice Pesticides Program, as noted in the tentative Rice Order.

Agriculture, including rice cultivation, has the potential to contribute numerous constituents of interest to our source water. Our key interests for the Sacramento River drinking water supply, in addition to pesticides, include turbidity, organic carbon, and pathogens. Historical data collected as part of the ILRP indicates that these constituents are contributed by agriculture, so we support their inclusion in this long-term Order by monitoring and implementing control measures, as appropriate.

Our comments on the Tentative Rice Order include the following three remaining issues on the Attachment B Monitoring and Reporting Program (MRP), with corresponding suggested modifications. We recognize that there may be other solutions to address the issues, and we welcome those ideas and further discussion.

1. Limited Representative Monitoring during Non-Irrigation Season

   Limited monitoring for field measurements and general physical parameters is requested during the non-irrigation season at the four primary monitoring sites. We request that the assessment and modified assessment monitoring be modified to add the winter drainage of a significant acreage of rice, which typically occurs in mid-February or March. This information will fill an important data gap for organic carbon and related constituents.

   Total organic carbon (TOC) in the water column is a surrogate measure of disinfection by-products (DBP) precursor material in water. TOC levels in either source or treated water are used to determine treatment requirements in the Stage 1 Disinfectant/Disinfection By-Product Rule (D/DBP Rule). Disinfectants used in drinking water treatment can react with the naturally-occurring portion of organic carbon in the water to form byproducts, such as trihalomethanes and haloacetic acids, which are both defined by EPA as carcinogens, and may pose health risks. Organic carbon is recognized in the chemical constituents narrative of the Basin Plan, as per the Delta Drinking Water Policy, and therefore must be evaluated as part of the Long-Term ILRP. Protection of the municipal and domestic beneficial use should include looking at the cumulative effects of watershed activities and ensuring that reasonable efforts are made to prevent degradation in the long-term.

   Please see **Attachment 1** for suggested modifications to the MRP and additional supporting information for this request.

2. Annual Monitoring Report (AMR) to include discussion of trends of degradation that may be occurring.

   It is important that the AMR requirements include review for trends of degradation and discussion, to help ensure protection of beneficial uses and to protect the high quality of the Sacramento River water supply. We request that the AMR include a similar review as in Report Component No. 18 – Evaluation of Monitoring Data, in the Sacramento River Watershed Tentative Order.[1] We believe that a frequency of two years out of the five year monitoring cycle should be sufficient evaluation to identify trends, unless there have been any water quality objective or trigger limit exceedences in any given year.

   We refer to page 3 of our September 13, 2013 comments on the Administrative Draft Order for discussion of the importance of the monitoring program design to detect degradation and provide response mechanisms. We believe that review of trends of degradation in the AMR support this important need.

3. Clarification of discussion of Table 7 to provide for future adaptability

   We understand that Table 7, Basin Plan Numeric Water Quality Objectives for the Sacramento River Watershed, provides the current numeric water quality objectives which Board staff have evaluated and determined may be applicable to this order. We request clarification of the discussion of Table 7 to ensure adaptability to address the potential for future additional constituents of interest.

   The text on page 35 currently states that "Table 7 of this MRP lists Basin Plan numeric water quality objectives and NTR/CTR criteria for constituents of concern that may be discharged by Growers. We request that a sentence be added immediately after this sentence, stating that there may be other constituents with numeric water quality objectives that could be present in the discharge and those objectives apply as well.

We appreciate the efforts of Regional Board staff and the CRC to meet with us and discuss our comments and interest. We also would like to take this opportunity to provide our recognition and support of some of the key changes that are included in the Tentative Rice Order.

---

[1] See the Sacramento River Watershed Tentative Order Attachment B – MRP, page 31:

> **Report Component No. 18 — Evaluation of Monitoring Data**
> The third-party must evaluate its monitoring data in the Monitoring Report in order to identify potential trends and patterns in surface and groundwater quality that may be associated with waste discharge from irrigated lands. The third-party must specifically determine whether there are any trends in degradation that may threaten applicable beneficial uses. As part of this evaluation, the third-party must analyze all readily available monitoring data that meet program quality assurance requirements to determine deficiencies in monitoring for discharges from irrigated agricultural lands and whether additional sampling locations or sampling events are needed or if additional constituents should be monitored. If deficiencies are identified, the third-party must propose a schedule for additional monitoring or source studies. Upon notification from the Executive Officer, the third-party must monitor any parameter in an area that lacks sufficient monitoring data (i.e., a data gap should be filled to assess irrigated agriculture's effects on water quality).
> The third-party should incorporate pesticide use information, as needed, to assist in its data evaluation. Wherever possible, the third-party should utilize tables or graphs that illustrate and summarize the data evaluation.

- Pesticides Monitoring

We appreciate the addition of the following language on the pesticide monitoring evaluation process (*shown in italics*) on page 4 of the MRP:

> "The CRC shall propose the pesticides[6] to be monitored in their Annual Monitoring Report and provide the rationale for their proposal. *The pesticides to be monitored shall be reviewed as part of a rice-specific process by Water Board staff that includes input from qualified scientists and coordination with the Department of Pesticide Regulation.* Once the list is approved by the Executive Officer, the CRC shall monitor the list of pesticides in accordance with the terms and conditions of this MRP.
>
> [6]Pesticides may include environmentally stable degradates of the registered active ingredient if acceptable analytical methods to detect the degradate are available (acceptable analytical methods are defined in Attachment C, Order No. R5-2010-0805 Monitoring and Reporting Program for California Rice Commission, Quality Assurance Project Plan Guidelines (QAPP Guidelines), and any revisions thereto approved by the Executive Officer). Potential degradates to evaluate will be identified through Central Valley Water Board and CRC consultation with the Department of Pesticide Regulation."

- MRP Revisions

We appreciate the language on page 1 of the MRP that, along with other portions of the Rice Order, clarifies the Regional Board's ability to modify the monitoring program to adapt to future needs:

> *The Central Valley Water Board or Executive Officer may revise this MRP as it applies to the CRC or Growers governed by the Order. The Central Valley Water Board or Executive Officer may rescind this MRP and issue a new MRP as it applies to the CRC or Growers governed by the Order.*

- Proposed Surface Water Limitations

We appreciate the language on page 16 of the WDRs to include a trend of degradation (*shown in italics*):

> III. Receiving Water Limitations
> A. Surface Water Limitations
>
> 1. Wastes discharged from Grower operations shall not cause or contribute to an exceedance of applicable water quality objectives in surface water *or a trend of degradation* that may threaten applicable Basin Plan beneficial uses, unreasonably affect applicable beneficial uses, or cause or contribute to a condition of pollution or nuisance.

Our comments on the Tentative Rice Order follow up on our prior comments on the Administrative Draft Order, submitted on September 13, 2014. We request inclusion in the record the discussion on antidegradation provided on pages 2-4 of our September 13, 2013 comment letter, as this discussion may be important for the Regional Board to consider further during the long-term implementation of this order.

We appreciate the opportunity to discuss our stakeholder perspectives with Regional Board staff and the CRC. If there are significant changes made to the Rice Order or its attachment, prior to the March 27 or 28 public hearing, we request another public comment period.

Thank you for considering our comments and requests. We appreciate the public outreach efforts of the Regional Board on the ILRP, and the thoughtful discussions and responses to our stakeholder input.

Please contact Elissa Callman at 916-808-1424 if you have any questions or would like to discuss our comments. We look forward to working cooperatively with Regional Board staff on the completion of this order, and we look forward to working with your staff and the CRC during the implementation of the order.

Sincerely,

Sherill Huun
Supervising Engineer

Cc:
Joe Karkoski, Central Valley Water Board
Susan Fregien, Central Valley Water Board
David Duncan, CDPR
Nan Singhasemanon, CDPR
KayLynn Newhart, CDPR
Ali Rezvani, CDPH
Dave Brent, Director
Joe Robinson, Senior Deputy City Attorney
Bill Busath, Engineering & Water Resources Manager
Michael Malone, Operations & Maintenance Manager
Pravani Vandeyar, Water Quality Superintendent
Dave Phillips, Water Treatment Superintendent
Forrest Williams, Sacramento County Department of Water Resources
Vicki Butler, Sacramento County Department of Water Resources
Dan Gwaltney, Sacramento County Department of Water Resources
Dan Mount, City of West Sacramento
Hubert Lai, EBMUD
Elaine White, EBMUD
Jacques DeBra, Woodland-Davis Clean Water Agency
Tim Johnson, CRC
Roberta Firoved, CRC

Attachment 1. Additional Information on Comment 1

The following are requested modifications to Attachment B – MRP:

Pages 2-3, items B.1 and 2. *Suggested additions shown in italics.*

III. Surface Water Monitoring Requirements

1. Assessment monitoring
Assessment monitoring shall include field and general parameters, nutrients (nitrate + nitrite as nitrogen and total ammonia as nitrogen), at least two pesticides identified by CRC after evaluation and assessment as specified in Section III.C., and water column and sediment toxicity testing (Table 3). The Executive Officer may require monitoring of more than two pesticides if the Executive Officer determines that insufficient information is available to assess the potential threat to water quality of a pesticide or that available information suggests there could be a water quality threat associated with a pesticide. The pesticides shall be monitored twice during their peak use month and twice in the following month. Sediment toxicity, sediment TOC and grain size testing shall occur once during the pre-harvest drainage. The monitoring schedule for each pesticide shall be tailored to the peak use and/or time periods when the pesticides (respectively) are likely to be discharged to surface water. Water column toxicity testing with Ceriodaphnia dubia and Pimephales promelas shall occur during two monthly events when pesticides are monitored. For Selenastrum capricornutum, toxicity testing shall start during the month when pesticides are first applied and continue for a total of three months. Assessment monitoring shall begin when most rice fields start pesticides application and end with the *pre*-harvest drainage *and then re-start to include the winter drainage period, monitoring only the field measurements and general physical parameters at the primary sites during this period (see Table 3).*

2. Modified assessment monitoring
Modified assessment monitoring shall include the field and general parameters, nutrients, and two pesticides (Table 3) selected based on results from the prior assessment year. The two selected pesticides shall be monitored twice during their peak use month and twice in the following month. The monitoring schedule for each pesticide shall be tailored to the peak use and/or time periods when the respective pesticides are likely to be discharged to surface water. The monitoring period shall be for at least two months of the growing season *and then re-start to include the winter field drainage period, monitoring only the field measurements and general physical parameters at the primary sites during this period (see Table 3).*

The following is additional supporting information:

Total organic carbon (TOC) monitoring in the water column is currently included in the Tentative Rice Order in assessment and modified assessment monitoring, which will occur twice monthly during the irrigation season (April/May through August) for two out of every five years, at seven sites. The addition of monitoring at the four primary sites in the timeframe of the February or March winter discharge that occurs for a significant amount of acreage planted to rice will provide important up to date representative data on this important water quality constituent. The field measurements and other general physical parameters listed in Table 3 of the MRP will all provide useful data.

The Tentative Rice Order includes the chemical constituents narrative water quality objective per Information Sheet (Att A), Section XV – Water Quality Objectives, and this objective is explained with regards to how to be interpreted in the Monitoring and Reporting Program (MRP) (Att B) Section VII – Water Quality Triggers.

The Regional Board's Delta Drinking Water Policy specifically determined that organic carbon is to be included in the chemical constituents narrative as follows:

> Finding 12 - The proposed Amendment modifies Basin Plan Chapter III (Water Quality Objectives) to clarify the existing Water Quality Objective for Chemical Constituents. The clarification will appear as a footnote stating that the existing objective applies to drinking water chemical constituents, such as organic carbon.
>
> Footnote for existing Chemical Constituents narrative objective:
> Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.*
> *This includes drinking water chemical constituents of concern, such as organic carbon.

The Delta Drinking Water Policy work group's work on organic carbon concluded that additional data for agriculture would be useful; data for the Colusa Basin Drain was utilized in the organic carbon modeling work as representative of rice agriculture.

Rice Cultivation Summary:

The CRC prepared a Groundwater Assessment Report (GAR), dated July 2013, that presents general information on rice farm management. The timing varies each year based on weather and other growing conditions. Here is the summary which includes information that rice growers are implementing agricultural practices during the non-irrigation season (October through March).

> "A continuous flood is maintained after stand establishment (approximately April through September) until draining for harvest. After harvest, about one-third to one-half of the fields is again flooded in the winter (from October through February)... Key events in the rice-farming cycle are field preparation, planting, fertilizer and pesticide (mainly herbicide) application, irrigation flooding, field drainage, harvest, winter flood-up, and winter drainage."

Further, page 2-6 of the report provides a comparison of cultural practices for rice and shows that once water is applied for irrigation season, it is maintained at approximately five inches of depth until lowering for pesticide application or drainage for harvesting. Considerable work is done on the fields to prepare for straw management. Fields are chopped, stomped, and flooded for decomposition, while some is baled/removed or burned. It states that about one-third to two-thirds of the acreage is winter flooded between harvest (October) and drydown for spring field preparation (March).

Therefore, we believe that monitoring should be conducted during this period at the primary monitoring sites, in a timing that would ideally follow as best practical the February or March winter discharge.

Historical ILRP Monitoring Data:

Non-irrigation Season for CRC Order -

Non-irrigation season (October through March) monitoring has been very limited during the Rice Waiver Program. There has been no regular TOC monitoring required during the non-irrigation season, but turbidity was sampled periodically in 2006, 2007, and 2008. Since 2009 no additional non-irrigation season monitoring has been conducted for any constituents. In 2006, turbidity samples were collected at the primary sites in March (50 – 200 NTU) and October (20 NTU). In 2007, turbidity samples were collected at the primary sites in February (60 NTU) and October (20-70 NTU). In 2008, turbidity samples were collected at the primary sites in March (30 – 90 NTU) and October (20 – 50 NTU).

UC Davis ILRP Monitoring Projects, Phase II -

The Aquatic Ecosystems Analysis Laboratory at the UC Davis John Muir Institute of the Environment monitored surface for numerous constituents including organic carbon from 2004 through 2007. Because the study was designed to evaluate seasonal and temporal changes in water quality, it included irrigation season and storm season monitoring. It is possible that the study collected some data that may be representative of conditions after the winter rice field discharges.

UC Davis Edge of Field Study –

The first study was brief, running from September to December 2005. The TOC of the rice field outlets ranged from 3.7 to 47.3 mg/L.

The CRC participated in another UC Davis study, the Edge of Field Study, as part of their MRP requirements, to compare discharge quality of flooded fields and burned fields (Study Component 1) and evaluate the difference between field outlets and downstream peripheral drains (Study Component 2). This study included sampling of TOC and other general constituents in the rice field outlets and downstream peripheral drains (100 feet downstream) and was summarized in the 2009 Annual Monitoring Report (pp. 5-46 – 5-76). Data was collected between May 2006 and April 2008, for both growing (June – September) and winter (November – March) seasons. There were 457 TOC/DOC (dissolved organic carbon) samples collected during the study period for rice outlet locations. There were 1,278 TOC/DOC samples collected during the study period for peripheral drains.

- Field Outlets – TOC 0.8 – 84.82 mg/L, median 11.46 mg/L, DOC 0.01 – 77.34 mg/L, median 9.28 mg/L
- Peripheral Drains – TOC 0.005 – 107.2 mg/L, median 8.8 mg/L, DOC 0.005 – 84.89 mg/L, median 7.3 mg/L
- Supply Canals – ND – 13.6 mg/L, median 1.7 mg/L

Winter TOC/DOC was higher than growing season. Incorporated straw fields were higher than burned fields. Outlet levels were much higher than inlet levels. TOC levels were similar in outlet and peripheral drain samples. TOC/DOC levels were much higher in the outlets during the winter.

We understand that the results of this study do not represent the levels that may be detected in downstream receiving waters, like the primary monitoring sites. However, the results do show the potential for rice winter discharges to contribute to downstream organic carbon levels.

Other Historical Agricultural Monitoring Studies/Reports:

The following papers include discussion of winter conditions and organic carbon:

Ruark et al. Seasonal Losses of DOC and TDS from Rice Production System in Northern California. 2010.

> "Based on our data, it is evident that the export of DOC from these fields can contribute to increased DOC concentrations in the Sacramento River, but rice fields may not be the cause of peak DOC concentrations typically observed later in the winter season."

Oh et al. The Role of Irrigation Runoff and Winter Rainfall on DOC in an Agricultural Watershed. 2013. Willow Slough Watershed, 2006 – 2008.

> "More than 80% of field crops in California are flood irrigated (Cooley et al., 2009) including alfalfa and rice, and thus the field could act as a temporary wetland releasing DOC from soils and plant residue to flooded water until the irrigated water is discharged to the stream. This transient flood period and low irrigation water discharge can result in high DOC concentrations for several months (Fig. 4)."

Krupa et. Al. Control on DOC Composition and Export from Rice Dominated Systems. 2011.

> "Rice straw residues are a potentially important DOC source, as Ruark et al. (2010) found that the burning of rice straw in the winter, versus the widespread practice of rice straw incorporation into the soil by plowing, significantly lowered DOC concentration and flux in rice field outflow. This is also important to the THMFP of DOC leaving these systems, because vascular plant materials are highly aromatic DOC sources (Hernes et al. 2008; Spencer et al. 2009, 2010)."

City of
SACRAMENTO
Department of Utilities

October 10, 2013
130231:BS:EC

Sent via e-mail to Mark.Cady@waterboards.ca.gov

Subject: Sacramento River Source Water Protection Program Comments on ILRP Administrative Draft WDRs General Order for Sacramento River Watershed

Dear Mr. Mark Cady:

On behalf of the Sacramento River Source Water Protection Program (SRSWPP), thank you for the opportunity to provide comments on the Irrigated Lands Regulatory Program (ILRP) Administrative Draft Waste Discharge Requirements General Order for Growers within the Sacramento River Watershed (Sacramento Valley Order). The SRSWPP is sponsored by the City of Sacramento and the Sacramento County Department of Water Resources; this program is coordinated with other agencies that draw their drinking water from the Sacramento River (or have plans to do so), including the City of West Sacramento, East Bay Municipal Utility District, and the Woodland-Davis Clean Water Agency. We serve drinking water to more than 600,000 people in Northern California.

Watershed management programs are essential for preserving the high quality of the Sacramento River watershed. The Central Valley Regional Board and other regulatory agencies, regulated communities, and educational organizations have made significant strides. We appreciate the substantial efforts of the Sacramento Valley Water Quality Coalition (SVWQC) and the ILRP to protect water quality. We believe that the draft Sacramento Valley Order provides the major components for this long-term order, and we are proposing specific modifications to assist in finalizing the Order while meeting our interests.

The SRSWPP seeks to maintain the high quality of the Sacramento River drinking water supply for the current and future generations. It is our responsibility as water utilities to ensure that our water is both healthful and free of any unpleasant taste, odor, or other aesthetic effects. We have been actively providing stakeholder input during the development of the Long Term Irrigated Lands Regulatory Program (ILRP) orders, because they have the potential to impact source water quality for current and future water quality constituents of interest. Source water protection is part of a "multi-barrier" approach to providing safe drinking water. Drinking water treatment alone cannot always be successful in removing contaminants. Even in cases where treatment is an option, treatment can be substantially more costly than source water protection. We rely on management programs, including the Long Term ILRP, as part of the source water protection in the Sacramento Valley.

Over the last two decades, USGS and other monitoring programs have detected pesticides in the Sacramento River.[1] The presence of pesticides in the river demonstrates that there are pathways for water pollutants in agricultural discharges to reach downstream water supplies. In addition, our ongoing drinking water source assessments continue to identify agriculture as a significant possible contaminating activity in our watershed. Possible contaminating activities are human activities that are actual or potential origins of contamination for a drinking water source; these include sources of both microbiological and chemical contaminants that could have adverse effects upon human health. We appreciate the significant efforts of the SVWQC to implement extensive monitoring programs, management plans, and education and outreach efforts to its members as part of the Conditional Waiver for the Sacramento River Watershed. This has resulted in significant reductions in frequency and detected levels of pesticides in the Sacramento River.

Agriculture has the potential to contribute numerous constituents of interest to our source water. Our key interests for the Sacramento River drinking water supply, in addition to pesticides, include turbidity, organic carbon, and pathogens. Historical data collected as part of the ILRP indicates that these constituents are contributed by agriculture, so we support their inclusion in this long term Order by monitoring and implementing control measures, as appropriate.

Our comments include a summary of major items, as well as specific requested modifications to the language in the Draft Order and its supporting documents (Attachment 1).

Antidegradation

The Order and its attachments may not be fully consistent with the state Antidegradation Policy (State Water Board Resolution 68-16), state guidance for implementing this policy (including but not limited to the State Water Board Guidance Memorandum of February 16, 1995, and the Memorandum from M. Lauffer to Tom Howard dated February 22, 2013 and its attachments), and case law; e.g., Asociación de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Board (2012) 210 Cal.App.4th 1255 (AGUA).

Under the authorities cited above, the Antidegradation Policy applies whenever there is (a) existing high quality water (surface water or groundwater), and (b) an activity that will discharge waste into such high quality water. High quality waters are those that contain levels of one or more water quality constituents or characteristics that are better than the applicable water quality objective(s). Available monitoring data in the Water Board's records indicate that many—if not most—of the waters receiving agricultural discharges are "high quality waters" as defined by Resolution 68-16, as are downstream waters, such as the Sacramento River, which serves as our drinking water source.

[1] Detections include both rice pesticides and pesticides like diazinon and chlorpyrifos that are not used on rice.

Under California Antidegradation policy: (1) the existing high quality must be maintained, unless it is demonstrated that any change "will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less that that prescribed" by the applicable water quality objectives; and (2) the activity will be required to meet waste discharge requirements "which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

Prior to issuance of the Order, state policy, guidance, and case law required an antidegradation analysis and specific findings, since surface water quality has degraded, in part due to agricultural operations, and degradation would continue under the Order. The antidegradation analysis may be incomplete, including but not limited to the following:

Completeness of Required Findings of Maximum Benefit to the People of the State and Substantial Evidence to Support Each Finding. To support the required finding that that the discharge will be consistent with the maximum benefit to the people of the State, there must be a consideration of various factors, including:

(1) past, present, and probable beneficial uses of the water,
(2) environmental factors,
(3) the implementation of feasible alternative treatment or control methods, and
(4) economic and social costs of the proposed discharge compared to the benefits.

All findings required by the SWRCB's antidegradation policy cannot be conclusory and must be supported by evidence and analysis in the record.

The fourth consideration – economic and societal costs – must consider both the costs to the discharger (rice growers) and the costs to the affected public (such as increased costs to treat surface water affected by the discharge). Cost savings to the discharger, standing alone, are not adequate justification for allowing degradation.

We found no information in the Order or any of its attachments or appendices describing the cost of drinking water treatment, nor any consideration of these costs or non-monetary costs (such as odor and taste issues) when making the determination of the "maximum benefit to the people of the State" as required by Resolution 68-16, other than a single conclusory statement on page 54 of Attachment A (sixth bullet), which is not supported by any evidence in the record.

The Order, by allowing surface water degradation, could increase concentrations of constituents in surface water. Such degradation could require construction of additions to drinking water utilities' treatment facilities. Additions could potentially include capital costs for new treatment process facilities and the land for construction of the facilities, and ongoing operational costs. On a life cycle basis (including both capital and operation and maintenance),

using estimates from California-specific water industry cost information, we project that additional treatment could easily cost on the order of tens of millions, approaching hundreds of millions, of dollars per year and potentially rival the total annual cost of the Order (which includes substantial costs unrelated to surface water quality protection). To establish the maximum benefit to the people of the State, these potential costs need to be weighed against the incremental costs of surface water monitoring and management responses that minimize degradation.

To assist the Water Board with the process of developing substantial evidence for its assessment of potential costs to drinking water utilities, we have enclosed cost estimates for drinking water treatment (Attachment 2), based on a recent compilation of annualized capital and operational treatment costs by the Association of California Water Agencies (ACWA) (these data are available on the internet at http://www.acwa.com/content/water-quality/2013-public-health-goals-report-guidance). When evaluating cost ranges, the Water Board should recognize that the ACWA compilation includes very large utilities that may have lower unit treatment costs, due to the benefits of economies of scale.

For the above reasons, we believe that the Order's treatment of the antidegradation issue will require significant additional analysis and consideration on the part of the Water Board, in light of the AGUA decision and the other authorities cited above.

Intergovernmental Coordination. State Water Board Guidance for implementation of Resolution 68-16 requires "intergovernmental coordination" with affected local, state, and Federal agencies. The record must document the intergovernmental coordination, which has been defined in Water Board guidance to entail specifically requesting that affected local agencies review proposed actions. Affected downstream drinking water utilities, which are local government agencies, comprise a key group for this required intergovernmental coordination due to their responsibilities for ensuring drinking water quality for their customers.

Given the ongoing nature of the Order, which will involve many decisions that could relate to water quality degradation in future years, intergovernmental coordination should be provided on an ongoing basis in this Order. Below and in the attached mark-up of the draft Order, we propose specific mechanisms to achieve the required coordination that are intended to minimize the burdens on the Water Board and dischargers.

Cooperating Agency Request and Opportunity for Participation

The Sacramento River drinking water utilities, through the SRSWPP, propose to be included as a cooperating agency in this Order. The participation in the role of coordinating agency that we propose is intended to serve multiple purposes under the Safe Drinking Water Act and California's Porter-Cologne Water Quality Control Act, including the intergovernmental coordination requirements of

State guidance for implementation of Antidegradation requirements. This opportunity for participation is only being requested for the two Long Term ILRP Orders that address the watershed upstream of Sacramento area drinking water utility intakes — this Order and the Rice Order. It is essential for the Sacramento River drinking water utilities, through the SRSWPP, to have the opportunity for sharing information and input to this management process because of the long-term nature of this Order, our specialized expertise and information, and our commitment to provide high quality drinking water for current and future generations.

In accordance with federal and state law we operate a Source Water Protection Program which has identified agriculture as a significant potential contaminating activity. The direct relationship between agricultural discharges and downstream surface water intakes serving a large population that occurs in this watershed is relatively unique in California. We propose our role as a cooperating agency to include coordination on development of the pesticide selection process, development of trigger limits, prioritization of management plans, and periodic review of management plans. We have also requested notification of surface water exceedance reports in cases of drinking water related water quality problems in order to allow us to perform a timely assessment of potential treatment or water quality impacts. If it is not a possibility to be specifically included in the Order as a cooperating agency, we request to be listed as an interested party to receive information on key outcomes and certain submittals, to ensure the opportunity for our information and expertise to be considered during Executive Officer decision making.

Availability of Electronic Information

We request that the Central Valley Water Board make key documents readily available on its Internet website in a timely manner. The scientific information developed as part of this program is essential in the assessment portion of our Source Water Protection program. Internet accessibility reduces requests to staff and increases efficiency of information sharing.

Monitoring Program

It is essential that surface water monitoring programs in the Order be sufficiently robust to ensure detection of degradation in water quality (as required for compliance with Antidegradation requirements) and in order to address both cumulative effects and drinking water-specific water quality issues. The monitoring program must be designed to protect the safety of drinking water (e.g., MUN beneficial use) from the watershed receiving agricultural discharges. This entails a slightly different focus than monitoring focused on solely on aquatic life protection. We discuss below considerations for addressing drinking water in the surface water monitoring program.

Pesticides

Currently Ongoing Changes In Regulation Of Pesticides In Drinking Water. The United States Environmental Protection Agency (USEPA) and the California Department of Public Health

(CDPH) continually evaluate constituents for new or revised drinking water regulation. This results in periodic updates to our list of constituents of interest. The USEPA's Contaminant Candidate List (CCL) is an example of this process. Every five years the USEPA identifies a list of constituents that will be considered for Regulatory Determination. The current list, CCL3, includes 116 constituents. Chlorate, which is used in the Sacramento Valley, is included on the CCL3 and is projected by USEPA to get a positive Regulatory Determination (meaning that a primary drinking water standard will begin development) and will likely have a new standard in the next five years.

Another USEPA program is the Endocrine Disrupters Screening Program, which is evaluating chemicals for potential non-cancer impacts to the endocrine system. The initial list of constituents was comprised of 67 constituents and a second list was completed with 109 constituents; including, 2,4-D, atrazine, chlorpyrifos, chlorothalonil, diazinon, glyphosate, iprodione, permethrin, propargite, simazine, and trifluralin. This program could potentially lead to new or revised primary drinking water standards if they are determined to be of human health concern.

Current Pesticide Monitoring Priorities for Drinking Water Quality. There are many pesticide active ingredients applied to crops in the Sacramento Valley watershed. Other pesticide-related chemicals, such as degradates and other ingredients in pesticide products, can occasionally have potential to be hazardous to water quality. We agree with the Water Board that a prioritization approach is an appropriate basis for the selection of pesticides for monitoring, though we would prefer if the Order explicitly included the potential for future consideration of monitoring of pesticide degradates and/or other ingredients in pesticide products. We request that the Order be amended to explicitly provide for consultation with drinking water utility scientific experts in the process for selection of pesticides for monitoring because we have special expertise that will assist the Water Board and the third-party implementing the Sacramento Valley Order with identification of pesticide priorities from the drinking water quality and public health protection perspective.

Since 2008, the SRSWPP has used a simple methodology to prioritize pesticides for our attention. The prioritization approach is described in the enclosed memorandum (Attachment 3 - Sacramento River Watershed Pesticide Prioritization Memorandum, October 2013). This approach is relatively similar to the prioritization process previously employed by the Water Board and the California Rice Commission, except that it uses drinking water benchmark values—instead of aquatic life protection values—as the basis of the prioritization process. The prioritization process goes beyond a simple tabular comparison to bring in available scientific information about the highest ranking pesticides. This second step has the effect of winnowing down the priority list to a manageable subset.

The current review has identified several pesticides as potential monitoring priorities, to characterize concentrations of these constituents in the watershed, particularly at times

coinciding with the types of agriculture-related pesticide discharges (storm water and irrigation runoff and drift during application). The SRSWPP would like to request the opportunity to work with the Regional Board to share more information on these pesticides and potential monitoring program modifications that could address these constituents.

Organic Carbon

Total organic carbon (TOC) is a surrogate measure of disinfection by-products (DBP) precursor material in water. TOC levels in either source or treated water are used to determine treatment requirements in the Stage 1 Disinfectant/Disinfection By-Product Rule (D/DBP Rule). Disinfectants used in drinking water treatment can react with the naturally-occurring portion of organic carbon in the water to form byproducts, such as trihalomethanes and haloacetic acids, which are both defined by EPA as a carcinogen, and may pose health risks. Organic carbon is recognized in the chemical constituents narrative of the Basin Plan and therefore must be evaluated as part of the Long Term ILRP. Protection of the municipal and domestic beneficial use should include looking at cumulative effects of watershed activities and ensuring that reasonable efforts are made to prevent degradation in the long term.

If there are significant changes made to the Order or its Attachments, we request another public comment period prior to development of a Proposed Order.

Please contact Elissa Callman at 916-808-1424 if you have any questions or would like to discuss our comments. We look forward to working cooperatively with Regional Board staff on the completion of this Order.

Thank you.

Sincerely,

Sherill Huun
Supervising Engineer

Cc:
Joe Karkoski, Central Valley Water Board
Jeanne Chilcott, Central Valley Water Board
Susan Fregien, Central Valley Water Board
David Duncan, CDPR
Nan Singhasemanon, CDPR
KayLynn Newhart, CDPR
Ali Rezvani, CDPH
Dave Brent, Director
Joe Robinson, Senior Deputy City Attorney

Bill Busath, Engineering & Water Resources Manager
Michael Malone, Operations & Maintenance Manager
Pravani Vandeyar, Water Quality Superintendent
Dave Phillips, Water Treatment Superintendent
Forrest Williams, Sacramento County Department of Water Resources
Vicki Butler, Sacramento County Department of Water Resources
Dan Gwaltney, Sacramento County Department of Water Resources
Dan Mount, City of West Sacramento
Hubert Lai, EBMUD
Eileen White, EBMUD
Jacques DeBra, Woodland-Davis Clean Water Agency
Bonny Starr, Starr Consulting
Kelly Moran, TDC Environmental

List of Attachments for Sacramento River Source Water Protection Program Comments on ILRP Draft Sacramento Valley WDRs

Attachment 1: Specific proposed modifications to the Order, attachments, and appendices. These specific language modifications do not address all of the concerns identified in our comment letter, and are in addition and supplementary to the comments provided in our letter.

Attachment 2:
Data from the Association of California Water Agencies that provides ranges of costs for installing and operating various drinking water treatment technologies. These data have been gathered from a variety of sources and represent estimates for different size systems, different sources, and different constituents targeted for reduction by the treatment. Table 1 represents the results of a 2012 ACWA Survey of its member agencies. Table 2 includes data from several agencies that was gathered separately from the survey. Table 3 is treatment cost data from previous ACWA Guidance documents with the costs updated to 2012.

Attachment 3:
Sacramento River Watershed Pesticides Prioritization Memorandum, October 2013. To illustrate the use of drinking water-related quality objectives and human health risk values associated with drinking water (e.g., U.S. EPA Human Health Benchmarks for Pesticides, and other U.S. EPA and California Drinking Water Program reference values), we have enclosed a memorandum that uses these drinking water values to prioritize pesticides for potential monitoring. Subsequent to the initial prioritization, the memorandum brings in other available scientific information to develop a final recommended list of pesticides and pesticide degradates for potential near-term monitoring. This memorandum provides an example of the types of expertise that we can share with the Water Board and the third-party implementing the Sacramento Valley Order in the process for selection of pesticides for monitoring. We would like to share information with the Water Board and the third-party about these particular pesticides toward development of a final priority list for near-term monitoring.

ATTACHMENT 1
Specific Requested Modifications on Draft Sacramento Valley WDRs and Supporting Documents

Additions underlined; deletions in ~~strikeout~~

Waste Discharge Requirements General Order

Findings

Page 1, item 2, first sentence, clarify that land where commercial rice is currently being grown and covered under Rice Order is not included in this Order

> This Order applies to owners and operators of irrigated lands within the Sacramento River Watershed, excluding land where commercial rice, species *Oryza sativa,* is currently being grown and is covered under a separate Irrigated Lands Regulatory Program Order.

Page 6, item 22, second to last sentence, clarify to show the necessity of reviewing and updating vulnerability designations

> High and low vulnerability area designations ~~will~~ shall be reviewed and updated throughout the implementation of this Order.

Page 10, item 37, second paragraph, last sentence, addition to clarify consistency with antidegradation requirements

> The Order will also result in the implementation of BPTC by those discharging to high quality waters and assure that any change in water quality will provide the highest water quality ~~be~~ consistent with maximum benefit to the people of the state.

Page 12, item 44, first and last sentences, clarify that land where rice is grown and covered under Rice Order is not included in this Order

> This order excludes all land that is planted to commercial rice (Oryza sativa), which is covered by the General Order for Sacramento Valley Rice Growers (R5-2014-XXXX), which authorizes the California Rice Commission to represent rice growers with respect to waste discharge requirements on that land. .... The Order for Rice Growers does not include rice grown for seed or wild rice, so growers of wild rice and rice for seed must obtain regulatory coverage under this or another General Order.

Page 12-13, Coordination and Cooperation with Other Agencies, add new:

> *Sacramento River drinking water utilities.* The Sacramento River is the source of drinking water for drinking water utilities serving the greater Sacramento area. In accordance with

California and Federal law, Sacramento River drinking water utilities operate Source Water Protection Programs to assess and protect the Sacramento River – their source of drinking water – from microbiological and chemical contaminants. The Central Valley Water Board will work cooperatively with the Sacramento River drinking water utilities to coordinate and leverage their efforts and to ensure protection of Sacramento River source water quality.

Page 15, item 52, item j), clarify that failures to implement management practices apply to surface water as well

j) Failure to implement applicable management practices, or equivalent practices, identified as protective of surface water or groundwater in the Management Practices Evaluation Report.

IV. Provisions, B. Requirements for Members of the Third-Party Group

Page 18, item 7, third sentence, clarify that sediment discharge and erosion prevention practices may be implemented by either Individual Plans or Watershed/Subwatershed Plans

Alternatively, as specified in section VII.C.2, Members ~~shall~~ may participate in the development and implementation of a watershed/subwatershed based (or collective) Sediment and Erosion Control Plan that includes collective management practices (e.g., sediment control basin at the bottom of a drainage area), in addition to individual management practices, for the control of sediment.

Page 20, item 20, add two farm management performance standards that were identified in other ILRP Orders for consistency with Order objectives

d. prevent pollution and nuisance
e. Achieve and maintain water quality objectives and beneficial uses

IV. Provisions, C. Requirements for the Third-Party Group

Page 21, item 8.b, third sentence, addition to provide the Water Board with a means to determine the extent of compliance with Grower requirement IV. B.4.

The annual summary must report the total number of growers who attended the outreach events and specify the percentage of all growers with parcels in an area governed by a SQMP/GWMP that attended.

Page 21, item 9, first sentence, modification to clarify that all exceedances or degradation – not solely issues identified by the third-party group or board – must be addressed.

Work cooperatively with the Central Valley Water Board to ensure all Members are providing required information and taking necessary steps to address exceedances or degradation ~~identified by the third-party or board~~.

VII. Required Reports and Notices – Member

Page 23, introductory paragraph, third sentence, add text to clarify potential conflict with MRP Order R5-2012-0116

> Reports and notices shall be submitted in accordance with section IX, Reporting Provisions, as well as MRP Order R5-2012-0116. If there are any conflicts, the requirements of this Order will prevail.

Page 24, item B.2., modification to ensure accuracy of information in Farm Evaluation while minimizing burden on members:

> After 1 March 2018, the Executive Officer may approve ~~reduction in the frequency of updates and submission of~~ optional submittal of certifications of no changes in lieu of annual updates to Farm Evaluations if none of the Member's parcels are in an area governed by a SQMP/GQMP or Source Identification Study, if the third-party demonstrates that year to year changes in Farm Evaluation updates are minimal and the Executive Officer concurs that the practices identified in the Farm Evaluations are consistent with practices that, when properly implemented, will achieve receiving water limitations or best practicable treatment or control, where applicable.

VIII. Required Reports and Notices – Third Party

Page 29, item C, The SRSWPP submitted formal comments on the Templates for the Eastern San Joaquin WDRs. The final templates have not yet been posted on the Regional Board website. We are incorporating by reference our August 16, 2013 comments on the Templates for the Eastern San Joaquin WDRs previously submitted to the Central Valley Water Board. If there are any proposed modifications to the Templates, we request another opportunity for public review and comment as per MRP R5-2012-0116, section VI.

Page 31, item H. Monitoring Report, modify text to add posting of the final Monitoring Report to the Central Valley Water Board website:

> The Central Valley Water Board will post the final Monitoring Report on its website in a timely manner.

Page 32, item I.1, SQMP/GQMP General Requirements, first paragraph, fourth sentence, modify text to add Source Identification Study to public review and comment period:

The Central Valley Water Board will post the proposed SQMP/GQMP, or Source Identification Study, on its website for a public review and comment period.

Page 32, item I. 2, Surface Water Quality Management Plan (SQMP), modify to correct reference to MRP and for compliance with state Antidegradation policy:

A SQMP shall be developed by the third-party where: (1) an applicable water quality objective or applicable water quality trigger limit is exceeded (considering applicable averaging periods) twice in a three year period for the same constituent at a monitoring location (trigger limits are described in Section ~~VIII~~IX of the MRP) and irrigated agriculture may cause or contribute to the exceedances; (2) the Basin Plan requires development of a surface water quality management plan for a constituent or constituents discharged by irrigated agriculture, or (3) the Executive Officer determines that irrigated agriculture may be causing or contributing to a trend of degradation of surface water ~~that may threaten applicable Basin Plan beneficial uses~~.

Page 33, item I. 3, modification to provide public review and comment on determination:

At the request of the third-party or upon recommendation by Central Valley Water Board staff, the Executive Officer may determine the development of a SQMP/GQMP is not required. Prior to the Executive Officer's determination, the Central Valley Water Board will post the third-party request or staff recommendation on its website for a review and comment period.

IX. Reporting Provisions

Page 34, item 3, modification to provide the public the ability to know that a report exists:

All reports prepared and submitted to the Executive Officer in accordance with the terms of this Order will be made available for public inspection at the offices of the Central Valley Water Board, except for reports, or portions of such reports, subject to an exemption from public disclosure in accordance with California law and regulations, including the Public Records Act, Water Code section 13267(b)(2), and the California Food and Agriculture Code. A list of all reports submitted will be posted to the Central Valley Water Board website.

Attachment A – Information Sheet

IV. Description of the Sacramento River Watershed Area

Page 6, Table 1, first asterisk, clarify that this excludes commercial rice, not wild rice or seed rice

*Excluding commercial rice (Oryza sativa) only, wild rice and seed rice are included

VI. Grower Participation under the Conditional Waiver and Compliance Enforcement Activities

Page 12, introductory paragraph, second sentence, clarify this excludes only commercial rice, not wild rice or seed rice

> The estimated total irrigated cropland in the Coalition area is 2.36 million acres, or 1.8 million acres excluding commercial rice (Oryza sativa) and dairies.

IX. Surface Water and Groundwater Monitoring

Page 17, item A.1, bullet number one, revise text to correct reference to MRP and for consistency with the Order:

> The basic questions to be answered by the updated surface water quality monitoring program are similar to those established under the previous MRP Order (R5-2008-0805):
>
> 1. Are receiving waters to which irrigated lands discharge meeting receiving water limitations specified (Section III of the Order)~~applicable water quality objectives and Basin Plan provisions~~?

X. Farm Evaluations

Pages 30 and 31, third paragraph, second sentence, revise to reflect requirement to comply with any requirements of the Order

> The farm evaluation is intended to provide the third-party and the Central Valley Water Board with information regarding individual Member implementation of the Order's requirements. Without this information, the board would rely solely on representative surface and groundwater monitoring to determine compliance with ~~water quality objectives~~ the Order.

XVI. Water Quality Objectives

Page 38, second and third paragraph of section, revise to include all enforceable California MCLs, including secondary MCLs, which were omitted in the cited code references, and drinking water related narrative objectives:

> Water quality objectives that apply to surface water are described in the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan). Applicable water quality objectives include, but are not limited to, (1) the numeric objectives, including the bacteria objective, the chemical constituents objective (includes listed chemicals and state drinking water standards, i.e., maximum contaminant levels (MCLs) promulgated in Title 22 California Code of Regulations (CCR) Division 4, Chapter 15 ~~sections 64431 and 64444~~ that are applicable through the Basin Plan to waters designated as municipal and domestic

supply), dissolved oxygen objectives, pH objectives, and the turbidity objectives, and (2) the narrative objectives, including the biostimulatory substances objective, the chemical constituents objective, the taste and odor objective, the pesticides objective, the sediment objective, and the toxicity objective. The Basin Plan also contains numeric water quality objectives that apply to specifically identified water bodies, such as specific temperature and salinity objectives. Federal water quality criteria that apply to surface water are contained in federal regulations referred to as the California Toxics Rule and the National Toxics Rule. CFR, sections 131.36 and 131.38.

Water quality objectives that apply to groundwater include, but are not limited to, (1) numeric objectives, including the bacteria objective and the chemical constituents objective (includes state MCLs promulgated in Title 22 CCR Division 4, Chapter 15~~, sections 64431 and 64444~~ and are applicable through the Basin Plan to municipal and domestic supply), and (2) narrative objectives including the chemical constituents, taste and odor, and toxicity objectives.

Page 39, item A, "Implementation of Water Quality Objectives", third paragraph, third sentence, modify to include all cooperating agencies with responsibilities for water quality protection in the Sacramento River watershed in the process to develop trigger limits:

For constituents that are not assigned Basin Plan numeric water quality objectives, Central Valley Water Board staff will develop trigger limits in consultation with the Department of Pesticide Regulation (for pesticides), Sacramento River drinking water utilities, and other agencies as appropriate.

XIX. Statement of policy with respect to maintaining high quality waters in California (State Water Board Resolution 68-16)

Page 42, This section requires substantial revisions in order to comply with State Water Board Resolution 68-16, as clarified by the AGUA case. Given its direct relevance to this Order, this section should include a summary of the AGUA case.

Pages 42-43, revise second and third paragraphs of section for consistency with antidegradation requirements and available evidence

Second paragraph, second sentence:
Through the process of becoming aware of effective management practices; evaluating their practices; and implementing improved practices; Members are expected to meet the farm management performance measures and, thereby, achieve best practicable treatment or control (BPTC) except in situations where the receiving water body can be demonstrated to not have achieved the applicable water quality objective since 1968, in which case growers are expected to demonstrate best efforts~~, where applicable~~.

Third paragraph, second sentence:
If trends in such degradation are identified ~~that could result in impacts to beneficial uses~~, a surface (or groundwater) quality management plan must be prepared by the third-party.

Page 43, item A, first paragraph, fourth sentence, revise text to read:

In such waters, some degradation of water quality may occur without compromising protection of beneficial uses, subject to the analysis and findings required by State Water Board Resolution 68-16.

Page 47, item B, third paragraph, first sentence, clarify conclusion related to waterbody impairments in the Sacramento Valley

~~However, d~~Data collected by the Central Valley Water Board, dischargers, educational institutions, and others demonstrate that many water bodies within the Sacramento River Watershed are already impaired for various constituents that are or could be associated with agricultural activities, however all of those water bodies flow into downstream water bodies which are classified as high-quality waters.

Page 48, item C, third paragraph, revise for consistency with antidegradation requirements:

There is no specific set of technologies, practices, or treatment devices that can be said to achieve BPTC/best efforts universally in the watershed. This Order, therefore, establishes a set of performance standards that must be achieved and an iterative planning approach that will lead to implementation of BPTC/best efforts. The iterative planning approach will be implemented as two distinct processes, 1) establishment of a baseline set of universal farm water quality management standards combined with upfront evaluation, planning and implementation of management practices to attain those goals, and 2) additional planning and implementation measures where degradation trends are observed ~~that threaten to impair a beneficial use~~ or where beneficial uses are impaired (i.e., water quality objectives are not being met).

Page 49, item C.1, addition to list of performance standards consistent with antidegradation requirements:

h. minimize degradation of high-quality waters

Page 54, item D, sixth bullet, revise to reflect consistency with antidegradation requirements and to delete inaccurate statement about costs to water utilities associated with the water quality degradation allowed by this Order:

- The Order prohibits degradation ~~above a water quality objective~~ and establishes representative surface water monitoring and groundwater monitoring programs to determine whether irrigated agricultural waste discharges are in compliance with the

Order's receiving water limitations or causing trends of degradation~~, local communities should not incur any additional treatment costs associated with the degradation authorized by this Order;~~.

Table 8

Page 61, line item Farm Evaluations, clarify text to include correct approximate due date for high vulnerability areas

All others, High Vulnerability Areas 1-Mar-2015, updated annually thereafter 1-Mar-2015

Page 61, line item Individual Sediment Plans, revise text to accurately reflect requirements from Order and MRP (sediment plans required for any farm designated through the Farm Evaluations or Sediment Discharge and Erosion Assessment Report)

Individual Sediment Plans, Small Farming Operations, Designated, 1 year from Sediment Report approval
Individual Sediment Plans, Large Farming Operations, Designated, 180 days from Sediment Report approval
Individual Sediment Plans, All Farming Operations Not Designated, not required

Attachment B – Monitoring and Reporting Program

III. Surface Water Quality Monitoring Requirements

Page 5, before item A, add monitoring objectives consistent with the WDR and antidegradation requirements:

The objectives of surface water quality monitoring are to determine compliance with the receiving water limitations in Section III of the Waste Discharge Requirements and to determine if a trend of degradation of surface water is occurring. The Executive Officer may require modification of the monitoring program upon determination that the monitoring program does not meet these objectives.

Page 5, item A, third sentence, clarify text to be consistent with requirements

Integration sites are monitored comprehensively on an annual basis~~, but less frequently,~~ to assess broad long term trends.

Page 5, item A.2, fourth sentence, modify text to clarify four distinct sample events and the need to target vulnerable periods during the irrigation season

Integration site monitoring will be conducted four times annually on an ongoing basis, twice following separate storms events in the rainy season and twice during irrigation season, separated to target periods of expected vulnerability to agricultural practices.

Page 8, item C.1.a, modify text to reflect Information Sheet that this option will not apply to the valley floor areas

~~The Central Valley Water Board does not anticipate that t~~This option will not apply to areas on the valley floor due to intensive agricultural land use.

Page 9, item C.1.a, second bullet, modify text to include human health toxicity

- A description of the low threat of pesticide discharges, evaluated based on information such as the types of pesticides applied and their toxicity to aquatic life and human health;

Page 9, item C.1.a, first paragraph, modify text to address exceedances in subwatersheds with reduced monitoring/management practices

An exceedance of any pesticide, toxicity, copper, or nutrient water quality objective or trigger limit will require monitoring of that constituent for an additional two years and ~~may result in the modification or suspension~~ will result in an evaluation of the appropriateness of continuation of this option for the subwatershed where the exceedance occurred.

Page 11, C.3, first paragraph, first sentence, modify to clarify that Water Board staff will lead the pesticide process and reflect coordination with Sacramento River drinking water utilities

The pesticides identified as "to be determined" (TBD) on Table 2 shall be identified as part of a process by Water Board staff that includes input from qualified scientists, including the Sacramento River drinking water utilities, and coordination with the Department of Pesticide Regulation.

Page 11, C.3, first paragraph, we understand that the third-party will apply "evaluation factors" to the list of priority pesticides identified by Regional Board staff to further refine the monitoring program, we request that there is clarification provided in the section to describe what these factors are and how these will be applied (i.e. use in subwatersheds)

Page 16, item C.5, last paragraph, request public notice of Special Project Monitoring proposals by adding sentence:

The Central Valley Water Board will make final Special Project Monitoring proposals, and any revisions, available on their website in a timely manner.

V. Third-Party Reporting Requirements

Page 27, item A.7.d, request to provide definitions for RLs and MDLs in the document as these are not included in Attachment E – Definitions, Acronyms, and Abbreviations.

Page 28, item C. Annual Monitoring Report, modify text to add posting of the final Annual Monitoring Report (AMR) to the Central Valley Water Board website:

> The Central Valley Water Board will post the final AMR on its website in a timely manner.

Page 29, items C. 14 and 15, modify for consistency with antidegradation requirements:

> 14. Summary of exceedances of water quality objectives/Trigger Limits, and any trends of degradation of surface water occurring during the reporting period and for surface water related pesticide use information;
> 15. Actions taken to address water quality exceedances and any trends of degradation of surface water that have occurred, including but not limited to, revised or additional management practices implemented;

Page 30, item C, Report Component No. 14 – Summary of Exceedances, first sentence, clarify that reporting for item 14 must address antidegradation requirements:

> A summary of the exceedances of water quality objectives or triggers that have occurred during the monitoring period and identification of any trends of degradation of surface water is required in the Monitoring Report.

Page 30, item C, Report Component No. 16 – Evaluation of Monitoring Data, second sentence, clarify that addressing deficiencies for item 16 could include more considerations in addition to sampling locations

> As part of this evaluation, the third-party must analyze all readily available monitoring data that meet program quality assurance requirements to determine deficiencies in monitoring for discharges from irrigated agricultural lands and whether additional ~~sampling locations~~ information is~~are~~ needed, such as sampling locations, sample frequency, or constituent list.

Page 32, item D, top of page, first paragraph, modify text to include drinking water notification of exceedance report preparation in case of drinking water related water quality problems to allow for timely notice of potential cause for impact to water treatment:

> Upon determining an exceedance, the third-party shall send the Exceedance Report by email to the third-party's designated Central Valley Water Board staff contact by the next business day. The third-party or Central Valley Water Board staff shall notify the Sacramento River drinking water utilities of exceedances on drinking water related water quality problems within 7 days of the notification from the third-party.

VI. Templates

Page 32, The SRSWPP refers to our previous comment on the Order, Section VIII.C.

VIII. Watershed/Subwatershed Based Sediment and Erosion Control Plans

Page 33, first bullet item, modify text to show that the Sediment and Erosion Control Plan must be installed, operational, and meeting water quality objectives in accordance with Provision XII of the Order

1) A time schedule for implementation and/or installation of collective management practices to ensure compliance with water quality objectives

IX. Water Quality Triggers for Development of Management Plans

Page 33, first and second paragraphs, modify to clarify meaning of Table 5 and to specify coordination with agencies with regulatory responsibilities related to discharges in the Sacramento River watershed:

First paragraph, last sentence:
Table 5 of this MRP provides a non-comprehensive lists of Basin Plan numeric water quality objectives and NTR/CTR criteria for constituents of concern that may be discharged by Members.

Second paragraph, second sentence:
Trigger limits will be developed by the Central Valley Water Board staff through a process involving coordination with the Department of Pesticide Regulation (for pesticides), Sacramento River drinking water utilities, and stakeholder input.

Appendix MRP-1 – Management Plan Requirements

I. Management Plan Development and Required Components

Page 2, fourth paragraph, next to last sentence, provide for coordination with agencies with regulatory responsibilities related to discharges in the Sacramento River watershed when establishing priorities for the order of multiple SQMP/GWMPs:

After consultation with Department of Pesticide Regulation (for pesticides) and Sacramento River drinking water utilities, tThe Executive Officer may approve or require changes be made to the SQMP/GQMP priority list.

Page 5, item D.1, first paragraph, clarify requirements of the Order

The monitoring system must be designed to measure effectiveness at achieving the goals and objectives of the SQMP or GQMP and capable of determining whether management practice changes made in response to the management plan are effective in ending the water quality problem and can comply with the terms of the Order.

Page 5, item D.2, bullets a. and b., clarify requirement for downstream monitoring and reference to the MRP

a. The location(s) of the monitoring site and schedule (including frequencies) for monitoring should be chosen to be representative of the COC discharge to the watershed. Where the water quality problem being addressed occurs downstream of the discharge, monitoring should include at least one representative downstream location to determine the effectiveness of the SQMP in addressing the water quality problem that is the basis for the SQMP.
b. Surface water monitoring data must be submitted electronically per the requirements given in section III.~~E~~D of the MRP.

Page 7, item G, first paragraph, clarify Source Identification Study is part of a Management Plan

Should the third-party conduct a Source Identification Study as part of the Management Plan to comply with this Order, the third-party must first receive approval from the Executive Officer.

II. Approval and Review of the Management Plan

Page 7, item a, first sentence, clarify that Source Identification Studies are also subject to review and comment:

a. Water quality management plan approval – Prior to Executive Officer approval of any management plan (including a Source Identification Study), the Central Valley Water Board will post the draft management plan or Source Identification Study on its website for a review and comment period.

Page 7, item b, second sentence, specifically list the Sacramento River drinking water utilities as an interested party:

Central Valley Water Board staff will meet with the third-party and other interested parties, including Sacramento River drinking water utilities, to evaluate the performance of management plans.

III. Management Plan Completion

Pages 8 and 9, item a, provide that a minimum of three years of monitoring data are required for all determinations of completion of a management plan:

> a) Demonstration through evaluation of monitoring data that the water quality problem is no longer occurring (i.e., 3 or more years with no exceedances during the times of the year when previous exceedances occurred) or demonstrated compliance with the Order's surface and groundwater receiving water limitations for a minimum of 3 consecutive years.

Appendix MRP-3

This document is an excellent presentation of information related to the wide variety of conditions in the SVWQC's subwatershed groups. There is a large amount of information to support the selection of representative monitoring sites. We would like to suggest a few modifications to the document to further support its purpose. Also, we believe that the integration sites should be included in this document to support why they serve to represent the overall activities covered under this Order and will provide long-term assessment information.

1. Add an introductory paragraph which clarifies and confirms the type of information used as the basis for selecting representative sites (i.e., crop type, agricultural practices, hydrologic connection of waterbodies).
2. Show the representative monitoring sites on the subwatershed maps (Figures 2-12). This will allow for easy identification of the hydrologic connection/representativeness of the monitoring sites selected.
3. Complete identification of representative sites for indicated subwatersheds.
4. Add discussion regarding the selection of the integration sites. This should include a map showing which portions of the area included in the Order are tributary to each site and a description of the percentages. This will ensure substantial representation of all the lands included in the Order.

Attachment E – Definitions, Acronyms & Abbreviations

Page 2, item 8, revise to add trigger limits, consistent with use of this term in Attachments A and MRP-1:

> 8. Exceedance - For the purposes of this Order, an exceedance is a reading using a field instrument or detection by a California State-certified analytical laboratory where the detected result indicates an impact to the beneficial use of the receiving water when compared to a water quality standard or trigger limit for the parameter or constituent. Exceedances will be determined based on available data and application of the appropriate averaging period. The appropriate averaging period may be defined in the Basin Plan, as part of the water quality criteria established by the U.S. EPA, or as part of the water quality criteria or trigger limit being used interpret a narrative water quality objective. If averaging

periods are not defined as part of the water quality objective, trigger limit, or the water quality criteria being used, then the Executive Officer may use its best professional judgment to determine an appropriate period.

Page 4, item 22, this definition has been changed by adding the option of as determined by the Executive Officer. There is no process or basis provided for this revised definition in the Order or its Attachments, and we request that this information be developed and included in the Order or deleted from this definition.

Page 7, item 49, clarify that pesticide discharges known to occur from agricultural fields are included in the definition of waste discharge:

> 49. Waste discharges from irrigated lands – The discharge or release of waste to surface water or groundwater. Waste discharges to surface water include, but are not limited to, irrigation return flows, tailwater, drainage water, subsurface (tile) drains, stormwater runoff flowing from irrigated lands, aerial drift, seepage through dikes, and overspraying of pesticides. Waste can be discharged to groundwater through pathways including, but not limited to, percolation of irrigation or storm water through the subsurface, backflow of waste into wells (e.g., backflow during chemigation), discharges into unprotected wells and dry wells, and leaching of waste from tailwater ponds or sedimentation basins to groundwater.
>
> A discharge of waste subject to the Order is one that could directly or indirectly reach waters of the state, which includes both surface waters and groundwaters. Direct discharges may include, for example, discharges directly from piping, tile drains, wells, ditches or sheet flow to waters of the state, or seepage or percolation of wastes through the soil to surface water or groundwater. Indirect discharges may include aerial drift or discharges from one parcel to another parcel and then to waters of the state. See also the definition for "waste".

Page 7, item 53, revise for consistency with Receiving Water Limitations and antidegradation requirements:

> 53. Water quality problem – Exceedance of an applicable water quality objective, condition of pollution or nuisance, impairment of a Basin Plan beneficial use, or a trend of degradation of surface waters or ground waters~~that may threaten applicable Basin Plan beneficial uses~~.

City of SACRAMENTO
Department of Utilities

August 6, 2014
140268:EC

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Via Email: commentletters@waterboards.ca.gov

Subject: Comments and Recommendations for the Expert Panel on the Draft Conclusions of the Agricultural Expert Panel: Recommendations to the State Water Resources Control Board Pertaining to the Irrigated Lands Regulatory Program

Dear Members of the Agricultural Expert Panel:

On behalf of the Sacramento River Source Water Protection Program (SRSWPP), thank you for the opportunity to provide comments and recommendations on the Draft Conclusions of the Agricultural Expert Panel: Recommendations to the State Water Resources Control Board Pertaining to the Irrigated Lands Regulatory Program (Draft Conclusions Report). The SRSWPP is sponsored by the City of Sacramento, the City of West Sacramento, and the Sacramento County Department of Water Resources; this program is coordinated with other agencies that draw drinking water from the Sacramento River (or have plans to do so), including East Bay Municipal Utility District and the Woodland-Davis Clean Water Agency. We serve drinking water to more than 650,000 people in Northern California.

The SRSWPP seeks to maintain the high quality of the Sacramento River drinking water supply for the current and future generations. It is our responsibility as water utilities to ensure that our water is both healthful and free of any unpleasant taste, odor, or other aesthetic effects. Watershed management programs are essential for preserving the high quality of the Sacramento River watershed. We actively provided stakeholder input during the development of the Long-Term Irrigated Lands Regulatory Program (ILRP) orders in the Central Valley, because they have the potential to impact source water quality for current and future water quality constituents of interest.

Agriculture has the potential to contribute numerous constituents of interest to our surface water supply. Our key interests for the Sacramento River drinking water supply, in addition to pesticides, include turbidity, organic carbon, and pathogens. Historical data collected as part of the ILRP indicates that these constituents are

contributed by agriculture. Fortunately, our surface water supply does not currently have elevated levels of nutrients, specifically nitrate.

Over the last two decades, USGS and other monitoring programs have detected pesticides in the Sacramento River. The presence of pesticides in the river demonstrates that there are pathways for water pollutants in agricultural discharges to reach downstream water supplies. Our ongoing drinking water source assessments continue to identify agriculture as a significant possible contaminating activity in our watershed. Possible contaminating activities are human activities that are actual or potential origins of contamination for a drinking water source; these include sources of both microbiological and chemical contaminants that could have adverse effects upon human health.

We appreciate the significant efforts of the coalition groups in the Sacramento Valley to implement extensive monitoring programs, management plans, and education and outreach efforts to their members as part of the Conditional Waivers for the ILRP. This has resulted in significant reductions in frequency and detected levels of pesticides in the Sacramento River.

The original scope of the Agricultural Expert Panel was focused on nitrate in groundwater, which is not a primary concern for the SRSWPP. As the State Water Resources Control Board (State Water Board) expanded the scope of the panel to include three questions related to surface water impacts of agricultural discharges, we reviewed the Draft Conclusions Report with regard to the conclusions and recommendations for Questions 3, 4, and 11. We appreciate the State Water Board soliciting input on Questions 3, 4, and 11 at an earlier date per request of the Agricultural Expert Panel; we were not able to provide a response at that time due to the tight schedule.

The following are our comments and recommendations on Questions 3, 4, and 11:

Request for Summary Responses for Each Question

This Draft Conclusions Report includes presentations of the questions to be addressed, discussions of various categories of information related to the ILRP, and key points related to those categories. Specific responses are not provided to address each question; this does not provide the opportunity to completely review the conclusions and recommendations related to surface water concerns.

We recommend that the Expert Panel present a summary response to each question, delineating the applicability to groundwater and/or surface water.

Request for Clarifications if Key Points Relate to Nitrate Only

The majority of the information presented, discussed, and evaluated in the Draft Conclusions Report is related specifically to nutrient application and nitrate concentrations. It is unclear if the intent of the document is for the Key Points to be applied only to nitrate and nutrient management activities, or more broadly to other

constituents. Nutrients, including nitrate, have very specific application, management, and fate and transport mechanisms that can vary greatly by site and medium (groundwater versus surface water). These characteristics cannot be equally applied to other water quality concerns, and it is not applicable to relate decisions based solely on nitrate to other constituents.

We recommend that the Expert Panel clarify which Key Points and recommendations only apply to nitrate issues in groundwater. If various Key Points and recommendations apply to other constituents, we recommend that the report include more supporting materials on the other constituents, explanations of the validity of any extrapolation to other constituents, and clarification if the conclusions apply to groundwater and/or surface water.

Clarification on Question 4.d

The original Question 4.d asks the Expert Panel to evaluate and develop recommendations for the current approaches taken to assessing risk to or vulnerability of surface water on High Vulnerability Areas Methodology (as developed by the Central Valley Regional Water Board in a series of Waste Discharge Requirements issued to agricultural coalitions in the ILRP). Appendix C includes a brief that revised the question to specifically include sediment/erosion risk as well as Surface Water Quality Management Plans. However, the Draft Conclusions Report doesn't include a discussion on solids loading to surface water or any evaluation of the management plan programs.

We recommend that the Expert Panel clarify whether they addressed the original Question 4.d or the revised Question 4.d in the Draft Conclusions Report, and include additional information as necessary to support any conclusions and recommendations.

Key Point B

Key Point B in Section 3.2.1 states, "The Panel was not confident that the designation of high or low "risk" or "vulnerability" should even be relevant for regulation. However, risk level may be considered in the administration of responsibilities of growers to the coalitions." Per Table 1, this Key Point is applied to Questions 3 and 4 related to surface water. The discussion on vulnerability and risk presented in Section 3.2.1 is completely focused on the nitrate in groundwater issues. There is no supporting information presented related to surface water or any other constituents of interest. In the Central Valley, the determination of vulnerability is different for surface waters and groundwater, as described in the Sacramento River Watershed Order, Attachment E Items 14 and 15.

We recommend that the Expert Panel clarify that the discussion on vulnerability and risk presented in Section 3.2.1 is only applicable to the evaluation of groundwater risk and remove its applicability to Questions 3 and 4 - or present information related to the risk and vulnerability determinations for surface waters.

Key Point J

Key Point J in Section 3.2.2 states, "Regulatory programs must meet the challenge of being meaningful without being overly complex. Programs with excess complexity and excessive data collection/reporting will likely fail." However, there is no supporting information provided to show the likelihood of failure. The interpretation of Key Point J regarding excess complexity and excessive data collection/reporting could be very wide ranging and possibly used to discourage a scientifically appropriate, cost-effective, and informative monitoring design. Some constituents, such as pesticides, have programs in place which could facilitate data evaluations, and there are regulatory agencies, such as USEPA, which can assist by providing access to existing tools. Per Table 1, this Key Point is applied to Question 4 on surface water. The discussion in Section 3.2.2 is focused on groundwater nitrate concerns, so it is unclear how Key Point J would apply to surface waters.

We recommend that the Expert Panel clarify that Key Point J is only applicable to nitrate programs and remove its applicability to Question 4 - or present information to explain and support their concerns about program complexity and data collection for surface waters.

Surface Water Discharge Evaluation

The discussion on surface water discharges presents three concerns associated with individual farm/field monitoring. Although we understand that this type of monitoring is least efficient, we note that the concerns presented in Item 2 may not be entirely valid. Since growers know the timing of their chemical use and their irrigation practices, timing of sample collection can be coordinated to ensure that high risk periods are sampled, such as during pesticide use application or during a storm event. Also, some constituents of interest in surface water quality can be collected and preserved for many days prior to analysis. Good preparation can address the concerns on timing for laboratory analysis.

We concur with the Expert Panel that a network of receiving water sampling locations is the correct starting point for an ILRP monitoring program. Sampling locations and timing need to account for watershed-specific factors such as constituents of interest, fertilization practices for the crops in the watershed, pesticides used, pesticide application methods, annual pesticide and fertilizer application schedules, irrigation practices, and typical management practices in place in the watershed, as well as other factors including weather. A good example of a watershed-specific regional monitoring program is in the Sacramento River Watershed Order's Monitoring and Reporting Program, which has identified representative, integration, and special monitoring sites.

We suggest that the Expert Panel consider this input during finalization of the report.

We appreciate the opportunity to provide comments and recommendations for consideration by the Expert Panel. Please do not hesitate to contact me via phone at 916-808-1424 or email at ecallman@cityofsacramento.org if you would like to discuss the above.

Sincerely,



Elissa Callman
Senior Engineer

Cc: Dave Brent, Director
Bill Busath, Engineering and Water Resources Division Manager
Michael Malone, Operations and Maintenance Division Manager
Sherill Huun, Supervising Engineer
Pravani Vandeyar, Water Quality Superintendent
Dave Phillips, Water Treatment Superintendent
Dan Mount, City of West Sacramento
Paulina Benner, City of West Sacramento
Vicki Butler, Sacramento County Water Agency
Dan Gwaltney, Sacramento County Water Agency
Eileen White, EBMUD
Hubert Lai, EBMUD
Dennis Diemer, Woodland-Davis Clean Water Agency
Bonny Starr, Starr Consulting
Kelly Moran, TDC Environmental

FACT SHEET FOR SODIUM CHLORATE

General Information and Pesticide Registration

- Sodium chlorate is an inorganic salt herbicide, and it is used as a post-emergent defoliant and a desiccant. It may also be used to kill grasses and weeds in industrial and non-agricultural sites such as driveways, tennis courts, and recreational areas. It is not a naturally occurring chemical.

- Products formulated as soluble concentrates can be applied using aerial, ground boom, or handheld equipment. Within the Sacramento River watershed, the product is applied both aerially and with a ground boom.

- The most recent complete U.S. Environmental Protection Agency (USEPA) review, reflected in a Re-registration Eligibility Decision (RED), was completed in July 2006.

- The 2006 RED stated that although the use of sodium chlorate as an herbicide may lead to levels in drinking water due to surface and groundwater contamination, the majority of chlorate in drinking water is a result of drinking water disinfection treatment practices.

- The use of chlorine dioxide and sodium hypochlorite as a primary disinfectant, produce chlorate as a disinfection byproduct.

Pesticide Use Patterns in the Sacramento River Watershed and Application

- The total amount of sodium chlorate applied in the Sacramento River watershed varied significantly over the past ten years. **Table 1** provides a summary of the annual pounds of sodium chlorate applied in the Sacramento River watershed. The Sacramento River watershed is defined to include the counties discharging to the Sacramento River, and its tributaries, upstream of the Freeport Regional Water Authority intake structure near River Mile 47.

- Sodium chlorate has been applied on row crops, rice crops, and for landscape management. A major increase in application in 2010 was caused by a significant increase in rice crop application; approximately 55,000 pound increase in that year over the previous five years.

- Within the Sacramento River watershed, sodium chlorate is generally applied between June and November. Therefore, the likely timing of potential surface water runoff would be after the first significant storm event in the October to December time period.

- The product names used for the applications in **Table 1** included Drexel Defol, Barespot Monobor, and M.A.P.C.O. 5 lb. sodium chlorate defoliant-desiccant.

Table 1
Sodium Chlorate Use in the Sacramento River Watershed, 2001 - 2011

Year	Pounds Applied
2001	4,895
2002	8,757
2003	11,995
2004	610
2005	4,245
2006	37,992
2007	14,436
2008	18,033
2009	17,126
2010	89,766
2011	60,016

Source: California Department of Pesticide Regulation Pesticide Use CalPIP Reports

Fate and Transport

- Sodium chlorate is not expected to volatilize from soil or water and has low potential to bioaccumulate. Sodium chlorate will metabolize in soil and the most favored degradate is the chloride anion. The half-life in soil ranges from three months to five years, but is generally less than six months. (Reregistration Eligibility Decision for Inorganic Chlorates, EPA 738-R-06-014, July 2006)
- Sodium chlorate is highly soluble and is expected to be very mobile and partition predominately into water. In the environment, extensive redox reactions are expected to reduce the concentration of chlorate in the water column. (Inorganic Chlorates Facts EPA 738-F-08-001, February 2008)

Water Quality Standards and Guidances

- Chlorate is included on USEPA's third Contaminant Candidate List (CCL3) and is projected to get a positive Regulatory Determination (meaning that a primary drinking water standard will begin development). Chlorate will likely have a new federal drinking water standard in the next five years.
- Chlorate currently has a DPH Notification Level of 0.8 mg/L and a USEPA Human Health Benchmark for Pesticides of 0.210 mg/L.
- Chloride (the favored degradate) has a secondary Maximum Contaminant Level (MCL) of 250 mg/L and is included in the Total Dissolved Solids (TDS) secondary MCL of 500 mg/L.
- Chlorite (another potential degradate) has an MCL of 1.0 mg/L.

Human Health Impacts

- USEPA confirmed the presence of chlorate in untreated source water which may be the result of agriculture and other uses of sodium chlorate. However, the chlorate concentrations in ambient water are generally very low and are minor compared to those in drinking water treated with chlorine dioxide or sodium hypochlorite (not applicable to the City of Sacramento or Sacramento County Water Agency since they use chlorine gas).

- Data on the occurrence of chlorate ion in treated drinking water were available from the Information Collection Rule database. **Table 2** shows annual chlorate concentrations for plants that use chlorine dioxide, for plants that use sodium hypochlorite, and for plants that use a combination of the two. The highest annual average concentration for chlorate was 0.69 mg/L.

Table 2 Chlorate Concentrations, ug/L for WTPs using Chlorine Dioxide and/or Sodium Hypochlorite

	Hypochlorite WTPs[a]	Chlorine Dioxide WTPs[b]	Combined Hypochlorite and Chlorine Dioxide WTPs
10th Percentile	23	52	24
50th Percentile	99	129	108
90th Percentile	239	264	242
Maximum	502	691	691

a. Concentrations for hypochlorite WTPs are an average of samples collected from distribution system entry points.

b. For chlorine dioxide WTPs, the distribution average concentration was calculated for each WTP using three distribution sampling points

- The chronic dietary risk assessment for chlorate in drinking water, using the highest annual average concentration estimated at 0.69 mg/L is below 100 percent of the cPAD (chronic population adjusted dose). The cPAD is the dose at which an individual could be exposed over the course of a lifetime and no adverse health effects would be expected. Since the risk estimate is less than 100 percent of the cPAD, it is below the USEPA's level of concern for the general U.S. population and all population subgroups except for infants. Exposure to infants was 159 percent of the cPAD, based on the highest annual average concentration of chlorate. However, using the 90th percentile annual average concentration of 0.24 mg/L, the chronic dietary (water only) risk for infants was 55 percent of the cPAD.

- An important revision to track will be the Regulatory Determination of chlorate through the CCL3. If there is a positive determination, USEPA will begin development of a health-based drinking water standard. This will result in a new risk assessment that may revise the human health impact numbers and the subsequent evaluation of available data.

Monitoring Data

- A water quality assessment was recently completed for the Woodland Davis Project. Four chlorite and four chlorate samples were collected from the Sacramento River at the proposed intake location (RiverMile 70.5) from August 2009 through May 2010 and all were ND. (Sacramento River Watershed Sanitary Survey 2010 Update)

- The City of Sacramento has not sampled for chlorate or chlorite in either source or treated waters. TDS levels in the surface water supplies have averaged 70 mg/L and chloride levels are non-detectable.

Recommendations

- According to USEPA the levels of chlorate in drinking water are primarily due to disinfection practices, rather than agricultural practices. Fate and transport indicates a low likelihood for chlorate to persist in surface waters. Chloride is the most likely degradate and it has not been detected at a level of interest in the American or Sacramento River supplies. No available monitoring data for rice drainage discharge or for the Sacramento River watershed were readily available. The SRSWPP should consider requesting monitoring of chlorate in the Irrigated Lands Regulatory Program (ILRP) Rice Order.

- Track the Regulatory Determination through the CCL3. If a drinking water standard is developed, the City of Sacramento and Sacramento County Water Agency should commence source water monitoring as required and seek opportunities to request that watershed management programs add the constituent to their analyses as well. The pesticide could be re-evaluated for relative risk once a drinking water standard is set.

REFERENCES

CDPR. 2010. Summary of Pesticide Use Report Data 2007-2010 Indexed by Chemical.

Updated RED Fact Sheet for Sodium Chlorate. February 2008.

USEPA. July 2006. Re-registration Eligibility Decision (RED) for Inorganic Chlorates.

tdc environmental

MEMO

TO:	Elissa Callman	**DATE:**	September 13, 2013
FROM:	Kelly D. Moran	**PROJECT:**	56d
SUBJECT:	Rice Pesticide Prioritization		

This memorandum was prepared to inform prioritization of rice pesticides for the purposes of the Sacramento River Source Water Protection Program (SRSWPP) water utilities. The memorandum uses scientific information to identify those pesticides that are priorities to encourage data collection (i.e. water quality monitoring data), regulatory tracking and engagement, and other potential source water protection actions. This is the third update of the rice pesticide prioritization, which was first conducted in 2008. This update incorporates the most recently available pesticide use data (DPR 2013a), new scientific information, and for the first time, a drinking water reference value from U.S. EPA or California's Drinking Water Program for nearly every pesticide evaluated.

This memorandum relies heavily on information from Bonny Starr of Starr Consulting, whose expertise contributed greatly to this work. The drinking water sections of this memorandum are largely drawn from Starr Consulting work for the SRSWPP.

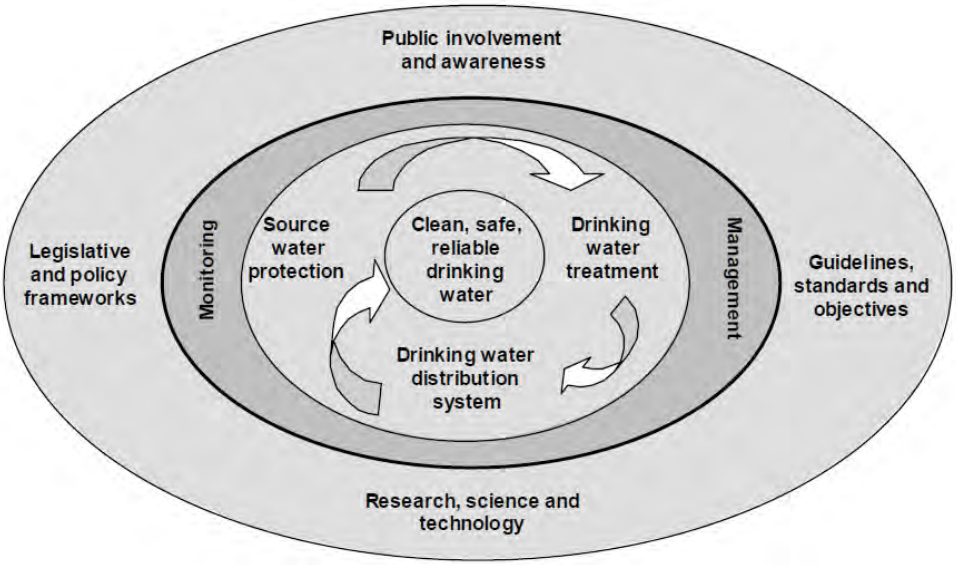
Background

A critical concept in supplying potable drinking water to the public is the Multi-Barrier Approach. This approach is endorsed by the U.S. EPA, the California Department of Public Health (DPH), and the American Water Works Association (AWWA). The Multi-Barrier Approach is defined as "an integrated system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health." A schematic of the concept is provided in Figure 1. Source water protection is a critical component of the Multi-Barrier Approach.

Water utilities using surface water as a source of drinking water supply are required to conduct a Watershed Sanitary Survey under the California Surface Water Treatment Rule (SWTR) and the Interim Enhanced SWTR. A watershed sanitary survey focuses on the first barrier to contamination of the drinking water supply, namely source water protection. Evaluating source water quality and watershed contaminant sources provides key information to aid in understanding how to maintain and possibly improve the first barrier. Of importance is to target contaminant activities that have the most potential to affect source water quality, such as activities located close to the water intakes or activities that are predominant in the watershed.

Since the SRSWPP's first Watershed Sanitary Survey in 1995, pesticides associated with irrigated agriculture have been identified as priorities. Irrigated agriculture is a primary land use in the Sacramento Valley. Rice is the single largest crop grown in the downstream portion of the Sacramento River watershed closest to water utilities intakes.

Figure 1. Multi-Barrier Approach



Source: Canadian Council of Ministers of the Environment (2002). *From Source to Tap*.

Rice pesticides are of interest to Sacramento River drinking water utilities because over the last two decades, on many occasions pesticides used only on rice have been detected at drinking water treatment plant intakes. The efforts of the rice industry and regulatory agencies through the Rice Pesticide Program have resulted in significant reductions in frequency and detected levels of thiobencarb in the Sacramento River. However, the historic presence of rice pesticides at plant intakes demonstrates that there are pathways for water pollutants in rice discharges to reach downstream water supplies.

For pesticides, source water protection efforts are focused on working within the existing regulatory and management programs that manage the various potential contaminating activities, such as the California Department of Pesticide Regulation (DPR), the Central Valley Regional Water Quality Control Board (Water Board), and the U.S. EPA Office of Pesticide Programs.

Drinking Water Standards

There are numerous pesticides currently regulated in treated drinking water either by the U.S. EPA or by the DPH (see http://water.epa.gov/drink/contaminants/index.cfm and http://www.cdph.ca.gov/certlic/drinkingwater/Pages/default.aspx). Note that California has its own drinking water standards for some constituents and that in California, both primary and secondary Maximum Contaminant Levels are enforceable.

In addition to drinking water standards, DPH has developed Notification Levels for additional constituents of interest (DPH 2012). These are health based levels that require action by the water utility, ranging from public notification to treatment, if found above the Notification Levels. Similar action is required for a related set of values known as "archived advisory levels" (DPH 2012).

U.S. EPA has also developed Health Advisories for other constituents in drinking water that are not currently regulated. These are non-enforceable levels which can provide guidance to water systems on the potential risk to public health. The Health Advisories include acute and chronic risk for cancer and non-cancer health effects. U.S. EPA has conveniently compiled Federal drinking water standards, including health advisories, into a reference handbook (U.S. EPA 2012a).

Drinking water standards are not static. The U.S. EPA Office of Groundwater and Drinking Water has several programs in place to review the current drinking water standards (called the Six Year Review) as well as identify new constituents which may require a new drinking water standard (the Contaminant Candidate List). Another USEPA program that may affect drinking water standards is the Endocrine Disrupters Screening Program, which is evaluating chemicals for potential non-cancer impacts to the endocrine system. This program could potentially lead to new or revised primary drinking water standards if they are determined to be of human health concern.

Drinking Water Benchmarks

For those pesticides without drinking water standards, U.S. EPA has developed Human Health Benchmarks for use by the states in water quality management. These values, which are periodically updated, are available on the Internet (U.S. EPA 2012b).

Pesticide Prioritization Methodology

The SRSWPP pesticide prioritization methodology, known as the Risk Screening Ratio method, involves the following steps:

1. Obtain Sacramento River watershed pesticide use data from DPR (DPR 2013a). (The most recent data currently available are from calendar year 2011).
2. Obtain human health impact reference values for each pesticide. Use standards where available (U.S. EPA 2012a; DPH 2012); otherwise, use U.S. EPA Human Health Benchmarks (U.S. EPA 2012b). (Care must be taken in selection of these values, as available benchmark values are often not comparable because they are based on varying levels of acceptable human health risk, and newer values may reflect important new scientific information.)
3. Calculate the ratio of quantity of each pesticide used, by sector, to the human health impact benchmark values. Rank these "Risk Screening Ratios" from largest to smallest.
4. For those pesticides with the highest Risk Screening Ratios, review other available information about the pesticide, such as the pesticide's environmental fate, available water quality monitoring data, and U.S. EPA modeling results to determine if available information is sufficient to establish a final priority level. Water quality monitoring data can provide the most valuable input and can come from watershed-wide monitoring programs, scientific researchers, government agencies like USGS, the Water Board, water utilities, and DPR, and participants in regulatory programs like the Water Board Irrigated Lands Regulatory Program. It is important to verify the data quality, the detection limits (which may be higher than benchmarks), and that the data was collected in a manner and timeframe consistent with pesticide use patterns.

Rice Pesticide Prioritization 2013

Table 1 presents a summary of the 25 pesticides most heavily used (on the basis of the quantity of pesticide active ingredient) used on rice in 2011. Table 1 provides the selected human health drinking water reference values for 24 of these pesticides (no value is currently available for limonene). A risk ratio has been calculated for each pesticide with a reference value. The table is sorted by the risk ratio to provide the initial prioritization list.

Table 2 presents the second portion of the review, which brings in available scientific information (primarily water quality monitoring data) for the ten highest ranked pesticides. On the basis of this information, Table 2 includes recommendations for potential next steps for consideration by the SRSWPP. The key recommendations (see highlighted rows in the table) are to request monitoring of propanil and its major degradate 3,4-dichloroaniline, and chlorate in the Rice Waste Discharge Requirements under the Water Board Irrigated Lands Regulatory Program. Periodic copper monitoring should also be considered under the Rice Waste Discharge Requirements to confirm that future management practices continue to keep copper concentrations below regulated levels.

The propanil degradate 3,4-dichloroaniline is a new addition to this list. There are outstanding questions about the health implications of this degradate, which have been raised by the Water Board and others (primarily in relationship to a proposed Basin Plan Amendment for Diuron, which also degrades to 3,4-dichloroaniline). New scientific data just collected this year by the USGS identified a strong linkage between 3,4-dichloroaniline and propanil (Orlando and Hladik 2013). Previously, it had been thought to primarily occur in the Sacramento/San Joaquin River watershed as a consequence of diuron degradation.

Pesticide priorities have changed with each of the three rice pesticide prioritizations conducted for the SRSWPP. Changes occurred in response to changes in pesticide use, new monitoring data, and new scientific information about pesticide hazards. Recognizing that regulatory actions like U.S. EPA's 15-year cycle of Registration Reviews, new pesticide products, and a backlog of U.S. EPA and U.S. Fish and Wildlife Service pesticide "consultations" under the Endangered Species Act will continue to have significant effects on Sacramento Valley pesticide usage, the source water protection program will have best information if it updates this prioritization every 2-3 years.

Table 1. Initial Rice Pesticide Prioritization

Pesticide	2011 Use (lb. a.i.)	Drinking Water Reference Value (µg/L)	Type of Reference Value	2011 Risk Ratio*	Priority Ranking
Thiobencarb	246,927	1	Enforceable Secondary DWS	246,927	*1*
Propanil**	2,221,673	63	HHBP - Chronic	35,265	*2*
Copper Sulfate (Pentahydrate)	1,069,824	1,000 (Copper)	Enforceable Secondary DWS	1,070	*3*
Lambda-Cyhalothrin	4,737	7	HHBP - Chronic	677	*4*
Cyhalofop Butyl	25,607	70	HHBP - Chronic	366	*5*
Sodium Chlorate	32,521	210	HHBP - Chronic	155	*6*
Triclopyr, Triethylamine Salt	63,845	350	HHBP - Chronic	182	*7*
Pendimethalin	4,776	210	HHBP - Chronic	23	*8*
2,4-D, Dimethylamine Salt	3,050	70 (2,4-D)	Enforceable Primary DWS	44	*9*
Azoxystrobin	46,083	1,260	HHBP - Chronic	37	*10*
Clomazone	132,786	5,880	HHBP - Chronic	23	*11*
Glyphosate (Isopropylamine Salt + Potassium Salt)	12,068	700	Enforceable Primary DWS	17	*12*
Mancozeb	9	0.6	HHBP – Cancer (10^{-6} risk)	15	*13*
Trifloxystrobin	2,921	266	HHBP - Chronic	11	*14*
Paraquat Dichloride	101	30	Health Advisory - Lifetime	3	*15*
Carfentrazone-Ethyl	722	210	HHBP - Chronic	3	*16*
Diflubenzuron	244	140	HHBP - Chronic	2	*17*
Penoxsulam	4,817	1,029	HHBP - Chronic	5	*18*
Bispyribac-Sodium	2,574	700	HHBP - Chronic	4	*19*
Propiconazole	3,212	700	HHBP - Chronic	5	*20*
(S)-Cypermethrin	1,444	420	HHBP - Chronic	3	*21*
Bensulfuron Methyl	3,325	1,400	HHBP - Chronic	2	*22*
Orthosulfamuron	263	350	HHBP - Chronic	1	*23*
Carbaryl	804	700	Archived Advisory Level	1	*24*
Limonene	5,015	-	None available	?	*25*

Sources: DPR Pesticide Use Reporting Database (DPR 2013a). Total quantity of pesticide active ingredient (a.i.) applications reporting in 2011 as used on rice.
DWS = California or U.S. EPA established Drinking Water Standard. Note that all DWS are enforceable in California, including secondary standards.
HHBP = U.S. EPA Human Health Benchmark for Pesticides (U.S. EPA 2012b); Health Advisory (U.S. EPA 2012a); Notification Level (DPH 2012)
*Ratio of use quantity to drinking water benchmark.
**Does not include degradate 3,4-dichloroaniline; there are outstanding questions about the health implications of this degradate.

Table 2. Evaluation of Ten Highest Ranking Rice Pesticides

Pesticide	Drinking Water Benchmark (µg/L)	Evaluation	Recommendation
Thiobencarb	1	Managed through the RPP	Continue to manage through the RPP.
Propanil	63	Monitoring has been conducted by both CRC and USGS. Both propanil and a major degradate that is currently being investigated by the Water Board to answer questions about its human health and aquatic toxicity – 3,4-dichloroaniline (3,4-DCA) – have been detected in the watershed on more than 100 occasions at concentrations up to 47 µg/L (Hladik 2011; CRC 2011; DPR Surface Water Database 2013b). Recent monitoring by the USGS (Orlando and Hladik, 2013) showed that propanil degradation is the source of most 3,4-DCA in the watershed and that concentrations of the degradate were often three or more times the concentration of propanil.	Request monitoring of propanil and its major degradate 3,4-dichloroaniline in the Rice WDRs.
Copper Sulfate (Pentahydrate)	1,000 (Copper)	Multiple monitoring programs (e.g., USGS 2000) and water utility monitoring have sampled for copper, which is consistently detected at concentrations well below the benchmark in the Sacramento River.	A limited amount of confirmation monitoring may be appropriate to be addressed in the Rice WDRs. Enough monitoring data are available to demonstrate that current management practices provide sufficient protection for source water quality. Future monitoring may be appropriate to confirm that management practices at that time provide sufficient protections.
Lambda-Cyhalothrin	7	Detected in watershed monitoring, but at concentrations orders of magnitude lower than the human health benchmark (e.g., Weston 2010, CRC 2003-2006). Used on multiple types of crops in the watershed.	Water Board and DPR management measures for pyrethroids that are intended to protect aquatic life (including the upcoming pyrethroids Basin Plan Amendment), should provide sufficient protection for source water quality, since pyrethroids' aquatic toxicity occurs at concentrations 100-1,000 times lower than human health benchmarks for pyrethroids.

Table 2. Evaluation of Ten Highest Ranking Rice Pesticides (Continued)

Pesticide	Drinking Water Benchmark (µg/L)	Evaluation	Recommendation
Cyhalofop Butyl	70	Watershed monitoring by the CRC in 2008 and 2009 resulted in no detections, with a reporting limit of 0.1 µg/L (CRC 2008, 2009).	Consider monitoring again if usage grows or benchmark decreases.
Sodium Chlorate	210	Creates chlorate ion in water. We have not identified any readily available monitoring data for rice or for the watershed.	Continue to track regulatory developments on sodium chlorate. Consider requesting monitoring of chlorate in the Rice WDRs.
Triclopyr, Triethylamine Salt	350	Becomes triclopyr in water. CRC monitoring in 2008 and 2009 resulted in a peak detection of 0.71 µg/L. U.S. EPA reported that DPR has detected in the watershed at concentrations up to 14.5 µg/L (U.S. EPA 2009).	Consider monitoring again if usage grows or benchmark decreases.
Pendimethalin	210	CRC monitoring in 2008 and 2009 resulted in no detections, with a reporting limit of 0.2 µg/L (CRC 2008, 2009). USGS detected at nanograms per liter concentrations, which is orders of magnitude below benchmark (Hladik 2011).	Consider monitoring again if usage grows or benchmark decreases.
2,4-D, Dimethylamine Salt	70	Becomes 2,4-D in water. Used on many other crops in the watershed. Monitoring data from the 1990s, when use on rice was greater, showed concentrations consistently less than 3 µg/L in the Sacramento Valley's rice growing area (DPR Surface Water database 2013b).	Additional monitoring for rice is unnecessary from the source water protection perspective. Enough monitoring data are available to demonstrate that current management practices for rice provide sufficient protection for source water quality.
Azoxystrobin	1,260	CRC monitoring in 2008 and 2009 resulted in peak detection of 0.87 µg/L. Watershed monitoring by USGS in 2010 had frequent detections, majority <25 µg/L, but one was >120 µg/L benchmark (Hladik 2011). Recent USGS monitoring of the Sacramento River at Freeport found a maximum concentration of <0.4 µg/L (Orlando and Hladik 2013).	Consider monitoring again if usage grows or benchmark decreases.

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tdc environmental

MEMO

TO:	Elissa Callman	**DATE:**	October 7, 2013
FROM:	Kelly D. Moran	**PROJECT:**	56d
SUBJECT:	Sacramento River Watershed Pesticide Prioritization		

This memorandum was prepared to inform prioritization of pesticides used in the Sacramento River watershed for the purposes of the Sacramento River Source Water Protection Program (SRSWPP) water utilities. The memorandum uses scientific information to identify those pesticides that are priorities to encourage data collection (i.e. water quality monitoring data), regulatory tracking and engagement, and other potential source water protection actions. This is the third update of the Sacramento River watershed pesticide prioritization, which was first conducted in 2008. This update incorporates the most recently available pesticide use data (DPR 2013a), new scientific information, and for the first time, a drinking water reference value from U.S. EPA or California's Drinking Water Program for nearly every pesticide evaluated and cancer risk benchmarks for a few pesticides. This update does not include rice pesticides, which were evaluated separately.

This memorandum relies heavily on information from Bonny Starr of Starr Consulting, whose expertise contributed greatly to this work. The drinking water sections of this memorandum are largely drawn from Starr Consulting work for the SRSWPP.

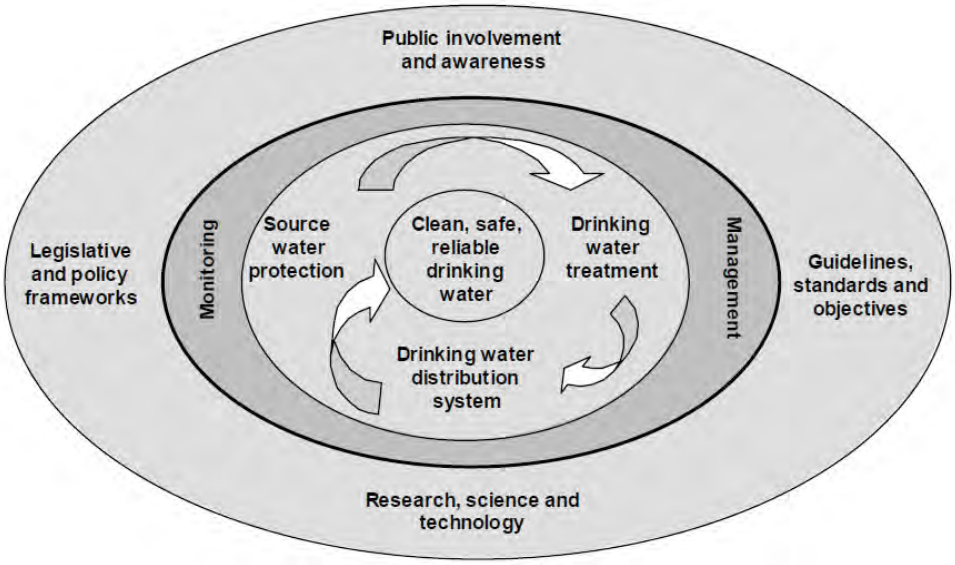
Background

A critical concept in supplying potable drinking water to the public is the Multi-Barrier Approach. This approach is endorsed by the U.S. EPA, the California Department of Public Health (DPH), and the American Water Works Association (AWWA). The Multi-Barrier Approach is defined as "an integrated system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health." A schematic of the concept is provided in Figure 1. Source water protection is a critical component of the Multi-Barrier Approach.

Water utilities using surface water as a source of drinking water supply are required to conduct a Watershed Sanitary Survey under the California Surface Water Treatment Rule (SWTR) and the Interim Enhanced SWTR. A watershed sanitary survey focuses on the first barrier to contamination of the drinking water supply, namely source water protection. Evaluating source water quality and watershed contaminant sources provides key information to aid in understanding how to maintain and possibly improve the first barrier. Of importance is to target contaminant activities that have the most potential to affect source water quality, such as activities located close to the water intakes or activities that are predominant in the watershed.

Since the SRSWPP's first Watershed Sanitary Survey in 1995, pesticides associated with irrigated agriculture have been identified as priorities. Irrigated agriculture is a primary land use in the Sacramento Valley.

Figure 1. Multi-Barrier Approach



Source: Canadian Council of Ministers of the Environment (2002). *From Source to Tap*.

Pesticides are of interest to Sacramento River drinking water utilities because over the last two decades, on many occasions pesticides have been detected at drinking water treatment plant intakes. The efforts of the rice industry and regulatory agencies through the Rice Pesticide Program have resulted in significant reductions in frequency and detected levels of rice pesticides in the Sacramento River. However, the historic presence of pesticides at plant intakes demonstrates that there are pathways for water pollutants in agricultural discharges to reach downstream water supplies.

For pesticides, source water protection efforts are focused on working within the existing regulatory and management programs that manage the various potential contaminating activities, such as the California Department of Pesticide Regulation (DPR), the Central Valley Regional Water Quality Control Board (Water Board), and the U.S. EPA Office of Pesticide Programs.

Drinking Water Standards

There are numerous pesticides currently regulated in treated drinking water either by the U.S. EPA or by the DPH (see http://water.epa.gov/drink/contaminants/index.cfm and http://www.cdph.ca.gov/certlic/drinkingwater/Pages/default.aspx). Note that California has its own drinking water standards for some constituents and that in California, both primary and secondary Maximum Contaminant Levels are enforceable.

In addition to drinking water standards, DPH has developed Notification Levels for additional constituents of interest (DPH 2012). These are health based levels that require action by the water utility, ranging from public notification to treatment, if found above the Notification Levels. Similar action is required for a related set of values known as "archived advisory levels" (DPH 2012).

U.S. EPA has also developed Health Advisories for other constituents in drinking water that are not currently regulated. These are non-enforceable levels which can provide guidance to water systems on the potential risk to public health. The Health Advisories include acute and chronic risk for cancer and non-cancer health effects. U.S. EPA has conveniently compiled Federal drinking water standards, including health advisories, into a reference handbook (U.S. EPA 2012).

Drinking water standards are not static. The U.S. EPA Office of Groundwater and Drinking Water has several programs in place to review the current drinking water standards (called the Six Year Review) as well as identify new constituents which may require a new drinking water standard (the Contaminant Candidate List). Another USEPA program that may affect drinking water standards is the Endocrine Disrupters Screening Program, which is evaluating chemicals for potential non-cancer impacts to the endocrine system. This program could potentially lead to new or revised primary drinking water standards if they are determined to be of human health concern.

Drinking Water Benchmarks

For those pesticides without drinking water standards, U.S. EPA has developed Human Health Benchmarks for use by the states in water quality management. These values, which are periodically updated, are available on the Internet (U.S. EPA 2013). U.S. EPA recently started development of cancer risk benchmarks, the first of which were published in August 2013.

Pesticide Prioritization Methodology

The SRSWPP pesticide prioritization methodology, known as the Risk Screening Ratio method, involves the following steps:

1. Obtain Sacramento River watershed pesticide use data from DPR (DPR 2013a). (The most recent data currently available are from calendar year 2011). For purposes of this prioritization, the Sacramento River watershed was defined to include the counties discharging to the Sacramento River and its tributaries upstream of the Sacramento River water utility drinking water intakes: Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Yolo, and Yuba. To simplify the assessment, it was assumed that the amount of pesticide use in the portions of these counties that are not within the Sacramento River watershed is not large compared to the total amount of pesticide use within the watershed. Rice pesticides were removed from the data set as they are addressed in a separate evaluation.
2. Obtain human health impact reference values for each pesticide. Use standards where available (U.S. EPA 2012; DPH 2012); otherwise, use U.S. EPA Human Health Benchmarks (U.S. EPA 2013). (Care must be taken in selection of these values, as available benchmark values are often not comparable because they are based on varying levels of acceptable human health risk, and newer values may reflect important new scientific information.)

3. Calculate the ratio of quantity of each pesticide used, by sector, to the human health impact benchmark values. Rank these "Risk Screening Ratios" from largest to smallest.
4. For those pesticides with the highest Risk Screening Ratios, review other available information about the pesticide, such as the pesticide's environmental fate, available water quality monitoring data, and U.S. EPA modeling results to determine if available information is sufficient to establish a final priority level. Water quality monitoring data can provide the most valuable input and can come from DPR, watershed-wide monitoring programs, scientific researchers, government agencies like USGS, the Water Board, water utilities, and participants in regulatory programs like the Water Board Irrigated Lands Regulatory Program. It is important to verify the data quality, the detection limits (which may be higher than benchmarks), and that the data was collected in a manner and timeframe consistent with pesticide use patterns.

Ingredients other than the pesticide active ingredient in products and adjuvants (whose chemical identities are not disclosed to the public) were excluded from this prioritization process, as were oils, clays, polymers, sulfur, solvents, biopesticides, mineral salts, and chemicals applied in quantities less than 3,500 pounds (non-carcinogens) or 1,000 pounds (carcinogens and other chemicals with relatively low human health reference values).

Four chemicals with usage greater than 3,500 pounds were not evaluated due to the lack of an available human health impact reference value: Dazomet, Metconazole, Maleic hydrazide potassium salt, and Diglycolamine salt of 3,6-Dichloro-o-anisic acid.

Sacramento River Watershed Pesticide Non-Rice Pesticide Prioritization 2013

Table 1 lists the 25 highest-ranking non-rice pesticides (on the basis of the risk ratio) in the watershed in 2011. Table 1 provides the selected human health drinking water reference values for each pesticide. A risk-screening ratio has been calculated for each pesticide. The table is sorted by the risk-screening ratio to provide the initial prioritization list.

Table 2 presents the second portion of the review, which brings in available scientific information (primarily water quality monitoring data from DPR and the Irrigated Lands Program) for the twelve highest ranked pesticides. On the basis of this information, Table 2 includes recommendations for potential next steps for consideration by the SRSWPP. The highlighted rows indicate pesticides for which it is recommended that the SRSWPP request Water Board staff and the coalition of growers covered by the Sacramento River Watershed WDRs—the Sacramento Valley Water Quality Coalition (SVWQC)—evaluate the pesticide and include monitoring of that pesticide in the Irrigated Lands Regulatory Program (ILRP) Sacramento River Watershed Waste Discharge Requirements (WDRs) monitoring program to ensure that management practices provide sufficient protections for drinking water quality.

Though not included in Table 2, consideration should be given to monitoring of chlorothalonil under the ILRP Sacramento River Watershed WDRs. The risk-screening ratio for chlorothalonil was based on a DPH Health Advisory value targeting a 10^{-4} cancer risk. If a 10^{-6} cancer risk had been the target (and the benchmark adjusted

accordingly), chlorothalonil would have been the second highest-ranking pesticide. Chlorothalonil use has increased significantly over the past ten years, from about 76,000 pounds in 2002 to about 242,000 pounds in 2011 (DPR 2013a). Chlorothalonil products contain multiple trace contaminants, including dioxins (primary MCL 3×10^{-8} µg/L), that contribute to the risks of this pesticide. Since the contaminants—particularly dioxins—are challenging and costly to measure, monitoring of these contaminants should only be considered after first evaluating chlorothalonil monitoring data. The SRSWPP should consider conducting additional review of chlorothalonil to determine whether to recommend further evaluation by Water Board staff and the SVWQC.

Pesticide priorities have changed with each of the three Sacramento River watershed prioritizations conducted for the SRSWPP on non-rice pesticides. This current review generated the most significant changes, largely due to the new information about pesticide cancer risk from U.S. EPA (U.S. EPA 2013). Changes also occurred in response to changes in pesticide use, new monitoring data, and other new scientific information about pesticide hazards. Recognizing that regulatory actions like U.S. EPA's 15-year cycle of Registration Reviews, new pesticide products, and a backlog of U.S. EPA and U.S. Fish and Wildlife Service pesticide "consultations" under the Endangered Species Act will continue to have significant effects on Sacramento Valley pesticide usage, and that U.S. EPA plans to continue to update and expand its human health benchmarks for pesticides, the source water protection program will have best information if it updates this prioritization every 2-3 years.

Summary of Recommendations

- Request Water Board staff and the SVWQC evaluate 1,3 dichloropropene, metam sodium, and metam potassium and include 1,3-dichloropropene, methyl isothiocyanate (MITC),[1] oxyfluorfen, oryzalin, and simazine in the pesticide monitoring to be conducted under the ILRP Sacramento River Watershed WDRs to ensure that management practices provide sufficient protections for drinking water quality.
- Request that Water Board staff and SVWQC evaluate mancozeb, ethalfluralin, and iprodione during planning for the pesticides monitoring under the ILRP Sacramento River Watershed WDRs to determine if mancozeb, ethylenethiourea,[2] ethalfluralin, and/or iprodione monitoring is warranted in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections for drinking water quality.
- Consider conducting additional review of chlorothalonil and propargite to determine whether to recommend further evaluation by Water Board staff and the SVWQC.
- Request that the Water Board use the most recent U.S. EPA Human Health Benchmark for Pesticides to evaluate monitoring data (e.g., as water quality triggers for development of management plans) under the ILRP Sacramento River Watershed WDRs for those pesticides without drinking water standards.
- Update this Sacramento River watershed pesticide prioritization in 2015 or 2016.

[1] The quickly formed and toxic degradate of both metam sodium and metam potassium.
[2] The toxic degradate of mancozeb.

Table 1. Initial Sacramento River Watershed Non-Rice Pesticide Prioritization

Pesticide	2011 Use (lb. a.i.)	Drinking Water Reference Value (µg/L)	Type of Reference Value	2011 Risk Ratio*	Priority Ranking
1,3-Dichloropropene	734,910	0.5	Enforceable Primary DWS	1,469,819	*1*
Metam Sodium (Sodium N-Methyl dithiocarbamate)	122,331	0.19 (N-Methyl dithiocarbamate)	Archived Advisory Level	643,850	*2*
Mancozeb	344,545	0.6	HHBP – Cancer (10^{-6} risk)	574,241	*3*
Potassium N-Methyl dithiocarbamate	89,991	0.19 (N-Methyl dithiocarbamate)	Archived Advisory Level	473,637	*4*
Oxyfluorfen	98,683	0.5	HHBP – Cancer (10^{-6} risk)	197,365	*5*
Ethalfluralin	26,306	0.4	HHBP – Cancer (10^{-6} risk)	65,765	*6*
Chlorpyrifos	118,229	2	Health Advisory - Lifetime	59,115	*7*
Oryzalin	146,766	5	HHBP – Cancer (10^{-6} risk)	29,353	*8*
Iprodione	21,130	0.8	HHBP – Cancer (10^{-6} risk)	26,412	*9*
Diazinon	18,047	1.2	Notification Level	15,039	*10*
Propargite	13,232	1	HHBP – Cancer (10^{-6} risk)	13,232	*11*
Simazine	52,836	4	Enforceable Primary DWS	13,209	*12*
Chloropicrin	523,588	50	Archived Advisory Level	10,472	*13*
Methyl Bromide	972,597	140	HHBP - Chronic	6,947	*14*
Trifluralin	40,534	10	Health Advisory - Lifetime	4,053	*15*
Paraquat Dichloride	105,376	30	Health Advisory - Lifetime	3,513	*16*
Ziram	316,611	112	HHBP - Chronic	2,827	*17*
Clofentezine	2,434	0.9	HHBP – Cancer (10^{-6} risk)	2,704	*18*
Glufosinate-Ammonium	97,528	42	HHBP - Chronic	2,322	*19*
Permethrin	7,092	4	HHBP – Cancer (10^{-6} risk)	1,773	*20*
Chlorothalonil**	242,454	150	Health Advisory - 10^{-4} cancer risk	1,616	*21*
Oxytetracycline, Calcium Complex	5,910	4	HHBP - Chronic	1,478	*22*
MCPA, Dimethylamine Salt	36,717	30	Health Advisory - Lifetime	1,224	*23*
2,4-D, Dimethylamine Salt	84,314	70 (2,4-D)	Enforceable Primary DWS	1,204	*24*
Methyl Parathion	2,515	2	Notification Level	1,204	*25*

Sources: DPR Pesticide Use Reporting Database (DPR 2013a). Total quantity of pesticide active ingredient (a.i.) applications reporting in 2011 as used on crops other than rice in Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Yolo, and Yuba Counties.
DWS = California or U.S. EPA established Drinking Water Standard. HHBP = U.S. EPA Human Health Benchmark for Pesticides (U.S. EPA 2013); Health Advisory (U.S. EPA 2012); Notification Level (DPH 2012); Archived Advisory Level prepared for the Central Valley Water Board (DPH 2012).
*Ratio of use quantity to drinking water benchmark. **Does not include toxic impurities, including dioxins, furans, and hexachlorobenzene.

Table 2. Evaluation of Twelve Highest Ranking Non-Rice Pesticides

Pesticide	Drinking Water Benchmark (µg/L)	Evaluation	Recommendation
1,3-Dichloropropene	0.5 (California has a non-enforceable Public Health Goal of 0.2)	No monitoring data with appropriate timing and detection limits were identified for the Sacramento River watershed (DPR 2013b). Use has increased significantly over the past ten years, from about 220,000 pounds in 2002 to about 735,000 pounds in 2011 (DPR 2013a). Although it has generally been assumed that this volatile pesticide would not occur in runoff, a recent DPR review found experimental data indicating that the fraction occurring in runoff, though very small, could cause surface water concentrations significantly greater than 0.5 µg/L (Vidrio 2012, p. 10-11 and 15-16).	Request that Water Board staff and SVWQC evaluate 1,3-dichloropropene and add monitoring of 1,3-dichloropropene during vulnerable periods, such as storm events during and immediately after the application period in the monitoring to be conducted under the ILRP Sacramento River Watershed WDRs.
Metam Sodium (Sodium N-Methyl dithiocarbamate)	0.19 (N-Methyl dithiocarbamate)	Salt of N-Methyl dithiocarbamate, which dissociates and then quickly degrades in water to methyl isothiocyanate (MITC), a more toxic chemical that is the principal component of metam sodium's fumigation functionality. No monitoring data for N-Methyl dithiocarbamate or MITC were identified for the Sacramento River watershed or elsewhere in California (DPR 2013b). Although it has generally been assumed that this volatile pesticide would not occur in runoff, a recent EPA review used numerical modeling to estimate that the fraction occurring in runoff, though very small, could cause surface water concentrations significantly greater than 0.19 µg/L (U.S. EPA 2010).	Request that Water Board staff and SVWQC evaluate metam sodium and metam potassium (see below) and add monitoring of MITC during vulnerable periods, such as storm events during and immediately after the application period, be included in the monitoring to be conducted under the ILRP Sacramento River Watershed WDRs.
Mancozeb	0.6	No monitoring data were identified for either mancozeb or its toxic degradate ethylenethiourea for the Sacramento River watershed (DPR 2013b). Use has increased significantly over the past ten years from about 47,000 pounds in 2002 to about 345,000 pounds in 2011 (DPR 2013a). U.S. EPA's most recent risk assessment concluded that under the scenarios it evaluated, mancozeb would decompose to ethylenethiourea in water prior to reaching drinking water sources, where levels were not estimated to be of concern (U.S. EPA 2005). It is unclear whether this assessment accounted for the cancer risks that are the basis of the drinking water benchmark.	Request that Water Board staff and SVWQC evaluate mancozeb during planning for the pesticides monitoring under the ILRP Sacramento River Watershed WDRs. Environmental fate, modeling, and monitoring studies (if available) should be evaluated in light of the new EPA cancer risk benchmark, current use patterns, and the most vulnerable time periods to determine if mancozeb and or ethylenethiourea monitoring is warranted in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.

Table 2. Evaluation of Twelve Highest Ranking Non-Rice Pesticides (Continued)

Pesticide	Drinking Water Benchmark (µg/L)	Evaluation	Recommendation
Potassium N-Methyl dithiocarbamate	0.19 (N-Methyl dithiocarbamate)	Salt of N-Methyl dithiocarbamate, which dissociates and then quickly degrades to methyl isothiocyanate (MITC) (see Metam Sodium (see above). On the basis of the formation of the same toxic degradate, this compound should be prioritized and evaluated together with Metam Sodium.	See metam sodium (above).
Oxyfluorfen	0.5	Has been monitored by the SVWQC. In 2012, there were five detections upstream of the Sacramento River at Freeport, all less than 0.07 µg/L; in 2011, there were 8 detections less than 0.4 µg/L, but a sample from the Colusa Basin Drain contained 0.77 µg/L, which is higher than the benchmark (SVWQC 2012, 2013). The highest concentration in the Sacramento Valley watershed in DPR's surface water database is 0.22 µg/L (DPR 2013b). Statewide, concentrations as high as 4.7 µg/L have been reported in surface water, but most values are less than the benchmark (DPR 2013b).	Since a concentration greater than the benchmark was measured, monitoring is appropriate in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.
Ethalfluralin	0.4	Statewide, detections are rare, but concentrations as high as 0.36 µg/L have been reported in surface water. Sampling in the Sacramento Valley was from relatively limited locations receiving agricultural runoff, but does include many samples from the Sacramento River at Freeport between 1999 and 2004 with no detections (reporting limit of 0.004-0.009 µg/L) (DPR 2013b). Use has increased significantly over the past ten years from about 10,000 pounds in 2002 to about 26,000 pounds in 2011 (DPR 2013a).	Request that Water Board staff and SVWQC evaluate ethalfluralin during planning for the pesticides monitoring under the ILRP Sacramento River Watershed WDRs. Environmental fate and monitoring studies should be evaluated in light of the new EPA cancer risk benchmark, current use patterns, and the most vulnerable time periods to clarify if past monitoring is representative of risks in the Sacramento River Watershed and whether monitoring is warranted in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.

Table 2. Evaluation of Twelve Highest Ranking Non-Rice Pesticides (Continued)

Pesticide	Drinking Water Benchmark (µg/L)	Evaluation	Recommendation
Chlorpyrifos	2	Since 2006, more than 900 surface water samples have been collected in the Sacramento River watershed, none of which exceeded the drinking water benchmark, and less than 0.2 percent exceeded 10 percent of the benchmark (SVWQC 2007-2011). Since 2006, there have been no detections in the Sacramento River main stem (SRCSD CMP 2006-2011). The upcoming Diazinon and Chlorpyrifos Basin Plan Amendment will address chlorpyrifos for purposes of aquatic life protection. Threats to aquatic life occur at concentrations below the human health benchmark.	Additional monitoring is unnecessary at this time from the drinking water source protection perspective. Monitoring data associated with TMDL implementation should be periodically evaluated to confirm that future management practices continue to provide sufficient protections.
Oryzalin	5	Has been monitored by the SVWQC. In 2011, it was detected in a sample upstream of the Sacramento River at Freeport at 0.6 µg/L; in 2009, it was detected in 2 samples in Walker Creek, an upstream watershed, with a maximum concentration of 4.9 µg/L (SVWQC 2012, 2013). The highest concentration in the Sacramento Valley watershed in DPR's surface water database is 2.2 µg/L (DPR 2013b). Statewide, excluding spills, concentrations as high as 15 µg/L have been reported in surface water, but most values are less than the benchmark (DPR 2013b).	Since measured concentrations approached the benchmark, monitoring is appropriate in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.
Iprodione	0.8	Statewide no detections have been reported in surface water. Sampling in the Sacramento Valley was from relatively limited locations receiving agricultural runoff, but does include many samples from the Sacramento River at Freeport between 2005 and 2010 with no detections (reporting limit of 0.01 to 0.538 µg/L) (DPR 2013b). Use has increased over the past ten years from about 13,500 pounds in 2002 to about 21,000 pounds in 2011 (DPR 2013a).	Request that Water Board staff and SVWQC evaluate iprodione during planning for the pesticides monitoring under the ILRP Sacramento River Watershed WDRs. Environmental fate and monitoring studies should be evaluated in light of the new EPA cancer risk benchmark, current use patterns, and the most vulnerable time periods to clarify if past monitoring is representative of risks in the Sacramento River Watershed and whether monitoring is warranted in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.

Table 2. Evaluation of Twelve Highest Ranking Non-Rice Pesticides (Continued)

Pesticide	Drinking Water Benchmark (µg/L)	Evaluation	Recommendation
Diazinon	1.2	Since 2006, more than 900 surface water samples have been collected in the Sacramento River watershed, none of which exceeded the drinking water benchmark, and less than 0.5 percent exceeded 10 percent of the benchmark (SVWQC 2007-2011). Since 2006, there have been 22 detections in the Sacramento River main stem, yet all were less than 10 percent of the benchmark (SRCSD CMP 2006-2011). The upcoming Diazinon and Chlorpyrifos Basin Plan Amendment will address diazinon for purposes of aquatic life protection. Threats to aquatic life occur at concentrations below the human health benchmark.	Additional monitoring is unnecessary at this time from the drinking water source protection perspective. Monitoring data associated with TMDL implementation should be periodically evaluated to confirm that future management practices continue to provide sufficient protections.
Propargite	1	In the Sacramento Valley, measurements have occurred at many locations receiving agricultural runoff, including many samples from the Sacramento River at Freeport between 1996 and 2010 with no detections reported (reporting limits <0.1). Only four detections were reported in Sacramento Valley sampling locations; the highest concentration in the Sacramento Valley watershed in DPR's surface water database is 0.3 µg/L (DPR 2013b). Statewide concentrations as high as 20 µg/L have been reported in surface water, but most measurements are lower than the benchmark (DPR 2013b). Use has decreased significantly over the past ten years from about 116,000 pounds in 2002 to about 13,000 pounds in 2011 (DPR 2013a).	Consider conducting additional review of propargite. Environmental fate and monitoring studies should be evaluated in light of the new EPA cancer risk benchmark, declining use, current use patterns and anticipated use trends, and the most vulnerable time periods to clarify if past monitoring is representative of risks in the Sacramento River Watershed and whether additional monitoring is appropriate in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.
Simazine	4	Simazine has been monitored by the SVWQC and the California Rice Commission with detections, at concentrations less then 0.4 µg/L (SVWQC and CRC 2006-2011; SVWQC 2012). However, in 2012, the SVWQC had a detection of 5.4 µg/L in Pine Creek and in 2009 there was a detection of 10 µg/L in Walker Creek, both of which are upstream watersheds (SVWQC 2011, 2013).	Since concentrations greater than the MCL were measured, monitoring is appropriate in the ILRP Sacramento River Watershed WDRs monitoring program to ensure that management practices provide sufficient protections.

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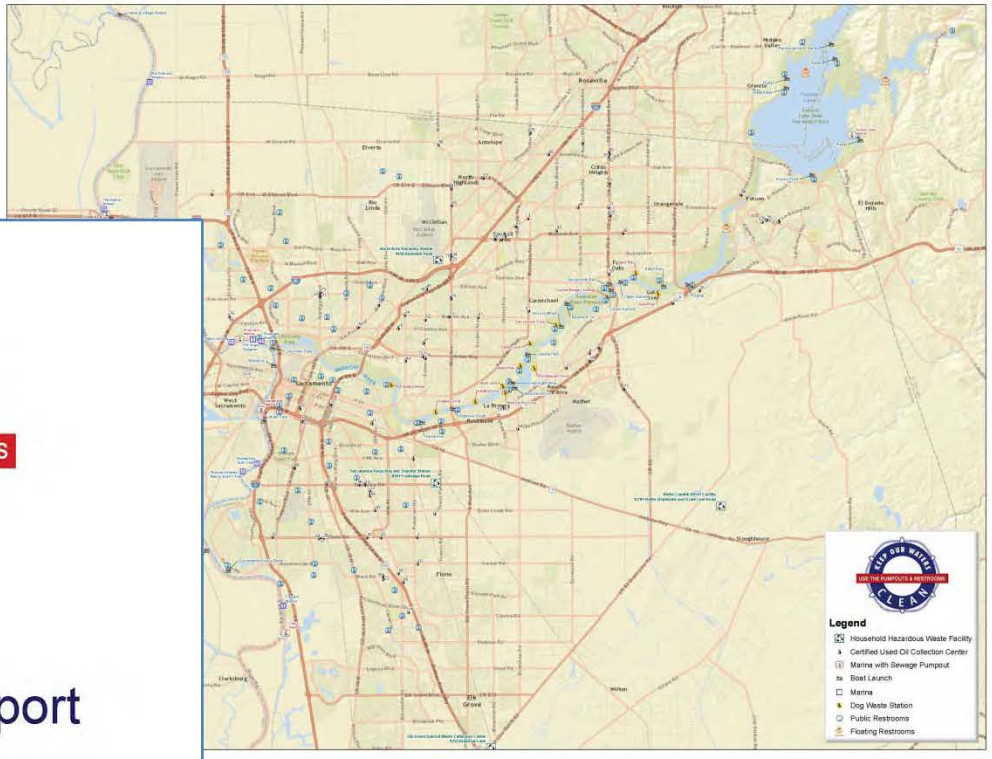
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Keep Our Waters Clean Campaign Materials





KEEP OUR WATERS
USE THE PUMPOUT & RESTROOMS
CLEAN

2014 Annual Report



Attachment B: Reported Spills on OES Website[1]
January - December 2010

#	Date	Location/County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
January								
1	1/4/2010	Sacramento County	Sacramento County Regional Sanitation Dist.	Sewage	20	No	East Drainage Canal	Sacramento River
2	1/4/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	1,500	No	Unknown Creek	Sacramento River
3	1/5/2010	Sacramento County	Sac Co Env Mngmnt Dept	Chemical	Unknown	No	Unknown Creek	Sacramento River
4	1/14/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	500	No	Unknown Creek	Sacramento River
5	1/17/2010	Placer County	Roseville City Fire Dept	Petroleum	30	No	Pleasant Grove Creek	Sacramento River
6	1/18/2010	El Dorado County	Veeder Root	Petroleum	0.5	No	Storm Drain	American River
7	1/19/2010	Yuba County	Beale Air Force Base	Sewage	1,000	No	Bear River	Sacramento River
8	1/21/2010	Yuba County	City of Yuba	Sewage	250	No	Sanford Creek	Sacramento River
9	1/22/2010	Yuba County	City of Yuba	Sewage	7,000	No	Sanford Creek	Sacramento River
10	1/29/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	276	No	American River	American River
11	1/29/2010	El Dorado County	City of Placerville Public Works Dept	Other	50,000	No	Hangtown Creek	American River
12	1/30/2010	Sacramento County	Sacramento County Hazmat	Petroleum	10	No	Storm Drain	American River
February								
13	2/2/2010	Sacramento County	Private Citizen	Sewage	Unknown	No	Storm Drain	American River
14	2/4/2010	Sutter County	Sutter County Sheriff	Petroleum	Unknown	No	Sacramento River	Sacramento River
15	2/10/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	700	No	American River	American River
16	2/12/2010	Placer County	Calfire Region 4	Petroleum	20	No	Bear River	Sacramento River
17	2/19/2010	Placer County	CH2M Hill	Sewage	750	No	Storm Drain	Sacramento River
18	2/21/2010	Sacramento County	Sac City Hazmat	Other	Unknown	No	Storm Drain	Sacramento River
19	2/23/2010	Sacramento County	Sacramento Regional County SD	Other	4,800	No	Cripple Creek	Sacramento River
20	2/26/2010	Sacramento County	Folsom Prison	Sewage	900	No	American River	American River
21	2/27/2010	Sacramento County	Sac City FD	Petroleum	1	No	Storm Drain	Sacramento River
March								
22	3/3/2010	Placer County	Roseville Fire	Petroleum	Unknown	No	Dry Creek	Sacramento River
23	3/3/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	4,450	No	Arcade Creek	Sacramento River
24	3/4/2010	Yuba County	Yuba County	Sewage	1,200	No	Sanford Creek	Sacramento River
25	3/10/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	Unknown	No	Arcade Creek	Sacramento River
26	3/27/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	360	No	Unknown Creek	Sacramento River
27	3/29/2010	Yuba County	Beale Air Force Base	Sewage	1,000	No	Dry Creek	Sacramento River
April								
28	4/4/2010	Sacramento County	Sac City FD	Petroleum	10	No	Storm Drain	American River
29	4/8/2010	El Dorado County	Private Citizen	Sewage	Unknown	No	New York Creek	American River
30	4/13/2010	Sacramento County	Sacramento Sheriff's Disp	Unknown	Unknown	No	Arcade Creek	Sacramento River
31	4/13/2010	Placer County	Private Citizen	Unknown	Unknown	No	Middle Fork American River	American River
32	4/23/2010	Sacramento County	NRC	Petroleum	Unknown	No	Storm Drain	American River
May								
33	5/7/2010	Placer County	City of Roseville	Sewage	100	No	Cirby Creek	Sacramento River
34	5/8/2010	Yolo County	NRC	Petroleum	1	No	Sacramento River	Sacramento River
35	5/9/2010	Sacramento County	Sacramento Fire	Other	55	No	Sacramento River	Sacramento River

Attachment B: Reported Spills on OES Website[1]
January - December 2010

#	Date	Location/County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
36	5/9/2010	Yolo County	Coast Guard Auxiliary	Unknown	Unknown	No	Sacramento River	Sacramento River
37	5/9/2010	Placer County	Roseville Fire Dept	Chemical	1 Lbs	No	Miners Ravine	Sacramento River
38	5/10/2010	Sacramento County	Sacramento County EMD	Other	Unknown	No	Storm Drain	American River
39	5/12/2010	Sacramento County	DTSC / Hotline	Other	Unknown	No	Storm Drain	Sacramento River
40	5/15/2010	Sacramento County	Sac Metro Fire	Chemical	50-100	No	Storm Drain	American River
41	5/24/2010	Yolo County	NRC	Petroleum	1.00	No	Sacramento River	Sacramento River
42	5/28/2010	Sacramento County	Sac Metro Fire	Other	Unknown	No	Storm Drain	Sacramento River
43	5/29/2010	El Dorado County	Private Citizen	Other	Unknown	No	Folsom Lake	American River
June								
44	6/5/2010	Sacramento County	Sacramento County Hazmat	Chemical	2	No	Storm Drain	American River
45	6/8/2010	Placer County	Cal EPA, Office of Environmental Health Hazard Assessment	Other	Unknown	No	Secrete Ravine	Sacramento River
46	6/11/2010	Sacramento County	Sacramento Co Env Management	Chemical	15	No	Strong Ranch Slough	American River
47	6/17/2010	Yuba County	Yuba County OES	Chemical	75-100	No	Yuba River	Sacramento River
48	6/22/2010	Sacramento County	Sacramento County Hazmat	Petroleum & Chemical	20 & 20	No	Arcade Creek	Sacramento River
July								
49	7/14/2010	Sacramento County	NRC	Petroleum	0.25	No	Sacramento River	Sacramento River
50	7/15/2010	Sacramento County	Sac City FD	Petroleum	10	No	Storm Drain	Sacramento River
51	7/20/2010	Sacramento County	Private Citizen	Other	Unknown	No	Buffalo Creek	American River
52	7/29/2010	Sacramento County	City of Folsom	Other	500	No	Storm Drain/Lake Natoma	American River
August								
53	8/1/2010	Placer County	CHP Sacramento	Petroleum	20	No	Bear River	Sacramento River
54	8/1/2010	Sacramento County	Sacramento Env	Petroleum	3	No	Storm Drain	American River
55	8/2/2010	Sutter County	NRC	Petroleum	1	No	Sutter Bypass Canal	Sacramento River
56	8/19/2010	Sacramento County	CHP Sacramento	Petroleum	1	No	Magpie Creek	Sacramento River
57	8/29/2010	Sacramento County	NRC	Petroleum	20	No	Sacramento River	Sacramento River
58	8/30/2010	El Dorado County	El Dorado Irrigation District	Sewage	285	No	New York Creek	American River
September								
59	9/3/2010	El Dorado County	El Dorado Irrigation District	Sewage	50	No	Unknown Creek	American River
60	9/6/2010	El Dorado County	El Dorado Irrigation District	Other	150	No	Unknown Creek	American River
61	9/9/2010	El Dorado County	El Dorado Irrigation District	Other	45	No	Unknown Creek	American River
62	9/13/2010	El Dorado County	El Dorado Irrigation District	Other	20	No	Unknown Creek	American River
63	9/17/2010	El Dorado County	El Dorado Irrigation District	Other	15	No	Unknown Creek	American River
64	9/23/2010	El Dorado County	City of Placerville	Sewage	450	No	Cedar Ravine Creek	American River
65	9/26/2010	El Dorado County	El Dorado Irrigation District	Other	650	No	Unknown Creek	American River
October								
66	10/2/2010	Yuba County	NRC	Petroleum	Unknown	No	Bullards Bar Reservoir	Sacramento River
67	10/4/2010	Colusa County	Colusa Co SO	Petroleum	Unknown	No	Sacramento River	Sacramento River
68	10/5/2010	El Dorado County	City of Placerville	Sewage	100	No	Storm Drain	American River
69	10/9/2010	Sacramento County	Sacramento County Dispatch	Other	Unknown	No	Arcade Creek	Sacramento River
70	10/14/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	4,880	No	Storm Drain/Verde Cruz Creek	Sacramento River
71	10/18/2010	El Dorado County	El Dorado Irrigation District	Other	60	No	Unknown Creek	American River

Attachment B: Reported Spills on OES Website[1]
January - December 2010

#	Date	Location/County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
72	10/20/2010	El Dorado County	El Dorado Irrigation District	Other	144,000	No	Folsom Lake	American River
73	10/21/2010	Yolo County	Dept of Fish and Game	Petroleum	Unknown	No	Sacramento River	Sacramento River
74	10/24/2010	Placer County	Placer County Facility Services	Sewage	1,200	No	Storm Drain	Sacramento River
75	10/24/2010	Sutter County	Fish and Game / OSPR	Petroleum	Unknown	No	Sacramento River	Sacramento River
76	10/24/2010	El Dorado County	El Dorado Irrigation Dist	Sewage	2,500	No	New York Creek	American River
77	10/24/2010	Sacramento County	City Sac Utilities	Sewage	10,000,000	No	Sacramento River	Sacramento River
78	10/26/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	1,420	No	Chicken Ranch Slough	American River
79	10/29/2010	Sacramento County	Sacamento Area Sewer District	Sewage	Unknown	No	Unknown Creek	American River
November								
80	11/1/2010	Sacramento County	Sacramento County Airport System	Petroleum	0.25	No	Storm Drain	Sacramento River
81	11/1/2010	Placer County	Private Citizen	Petroleum	Unknown	No	Unknown Creek	Sacramento River
82	11/4/2010	El Dorado County	City of Placerville	Sewage	60	No	Hangtown Creek	American River
83	11/8/2010	Placer County	Placer Co Env Health	Petroleum	1	No	Unknown Creek	Sacramento River
84	11/13/2010	Placer County	Placer County Utilities	Sewage	700	No	Storm Drain	Sacramento River
85	11/22/2010	Placer County	NRC	Petroleum	Unknown	No	Middle Fork American River	American River
86	11/28/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	2 gpm	No	Strong Ranch Slough	American River
87	11/28/2010	Placer County	UPRR	Chemical	300	No	Storm Drain	Sacramento River
88	11/30/2010	Sacramento County	Sacramento Metro FD	Sewage	100-200	No	Storm Drain	American River
December								
89	12/8/2010	El Dorado County	City Of Placerville	Chemical	5	No	Hangtown Creek	American River
90	12/13/2010	Yuba County	Marysville P.D.	Petroleum	Unknown	No	Yuba River	Sacramento River
91	12/16/2010	Sacramento County	Sacramento County	Chemical	1	No	Chicken Ranch Slough	American River
92	12/18/2010	Sacramento County	Citrus Heights PD	Petroleum	1	No	Unknown Creek	Sacramento River
93	12/18/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	Unknown	No	American River	American River
94	12/19/2010	Sacramento County	Sacramento Area Sewer Dist	Sewage	8,000	No	Storm Drain	Sacramento River
95	12/20/2010	Yuba County	City of Yuba	Sewage	25,000	No	Sanford Creek	Sacramento River
96	12/20/2010	Placer County	City of Auburn	Sewage	300	No	Auburn Ravine Creek	Sacramento River
97	12/20/2010	Sacramento County	Sacramento International Airport	Petroleum	10	No	Storm Drain	Sacramento River
98	12/22/2010	Sacramento County	Sacramento International Airport	Petroleum	Unknown	No	Storm Drain	Sacramento River
99	12/22/2010	Placer County	CALFIRE-Grass Valley	Chemical	3	No	Auburn Ravine Creek	Sacramento River
100	12/23/2010	El Dorado County	EID	Other	4,000	No	Hangtown Creek	American River
101	12/25/2010	Placer County	County of Nevada	Sewage	45,000	No	Magnolia Creek to Bear River	Sacramento River
102	12/28/2010	Yuba County	Yuba Molding & Millwork	Chemical	7	No	Feather River	Sacramento River
103	12/30/2010	Placer County	Placer Co Utilities Div	Other	45,000	No	Clipper Creek	American River
104	12/30/2010	Placer County	Placer Co - Facility Services	Sewage	550	No	Rock Creek to Auburn Ravine Creek	Sacramento River

[1] This includes seven counties: Sacramento, Placer, El Dorado, Yolo, Sutter, Yuba, and Colusa

Attachment B: Reported Spills on OES Website[1]
January - December 2011

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
January									
1	1/3/2011	4596 BOMARK WAY	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	1,850	YES	NO	-
2	1/4/2011	Penryn Exit off I-80 about 34 miles south of Taylor Rd at the end of Irish Ln.	PLACER COUNTY	NEWCASTLE WASTE WATER TREATMENT FACILITY	OTHER	2,000	PARTIAL	RED RAVINE	SACRAMENTO RIVER
3	1/10/2011	3117 39TH STREET	SACRAMENTO COUNTY	SACRAMENTO FIRE DEPT	PETROLEUM	6	YES	NO	-
4	1/11/2011	2308 GLENVIEW DR	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	1,000	NO	VERDE CRUZ CREEK	AMERICAN RIVER
5	1/12/2011	1380 SHORE STREET	YOLO COUNTY	UPS WEST SACRAMENTO	PETROLEUM	90-100	YES	NO	-
6	1/15/2011	3RD ST & R ST, LINCOLN	PLACER COUNTY	CITY OF LINCOLN	SEWAGE	50	YES	NO	-
7	1/16/2011	1040 MARSHALL WAY, PLACERVILLE	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	300	NO	HANKTOWN CREEK	AMERICAN RIVER
8	1/31/2011	5724 PALMERA LN	SACRAMENTO COUNTY	CITIZEN-SACRAMENTO CITY FIRE DEPT	PETROLEUM	40	NO	STORM DRAIN	SACRAMENTO RIVER
9	1/31/2011	23869 CANYON WAY, COLFAX	PLACER COUNTY	CITY OF COLFAX	SEWAGE	1,000	NO	BUNCH CREEK	AMERICAN RIVER
February									
10	2/1/2011	HICKORY LN & ASPEN WAY, OLIVEHURST	YUBA COUNTY	OLIVEHURST PU DIST	SEWAGE	40	YES	NO	-
11	2/1/2011	205 SOUTH CANYON CT, COLFAX	PLACER COUNTY	CITY OF COLFAX	SEWAGE	100/80	PARTIAL	STORM DRAIN	AMERICAN RIVER
12	2/1/2011	23861 CANYON WAY, COLFAX	PLACER COUNTY	CARMICHAEL WATER	SEWAGE	3,000	NO	UNKNOWN WATERWAY	AMERICAN RIVER
13	2/3/2011	1040 MARSHALL WAY, PLACERVILLE	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	300	NO	CEDAR CREEK	AMERICAN RIVER
14	2/8/2011	1040 MARSHALL WAY, PLACERVILLE	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	180	NO	HANGTOWN CREEK	AMERICAN RIVER
15	2/8/2011	CANAL STREET & LUTHER ST, AUBURN	PLACER COUNTY	PLACER COUNTY UTILITIES	SEWAGE	1,000	NO	STORM DRAIN	SACRAMENTO RIVER
16	2/13/2011	100 WATERFRONT PL	YOLO COUNTY	NRC	UNKNOWN MATERIAL	UNKNOWN	UNKNOWN	SACRAMENTO RIVER	SACRAMENTO RIVER
17	2/21/2011	GREENHAVEN & WINDBRIDGE (Sump 132)	SACRAMENTO COUNTY	SACRAMENTO CO HAZMAT	PETROLEUM	UNKNOWN	YES	NO	-
18	2/22/2011	5207 RAVINE VIEW LN	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	300	NO	DRAINAGE CANAL	AMERICAN RIVER
19	2/25/2011	8242 LICHEN DR	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	2,330	NO	STORM DRAIN	AMERICAN RIVER
20	2/26/2011	3990 LAKESIDE CT, LOOMIS	PLACER COUNTY	PLACER COUNTY UTILITIES	SEWAGE	900	NO	FOLSOM LAKE	AMERICAN RIVER
March									
21	3/2/2011	TAYLOR RD OFF HWY 193, NEWCASTLE	PLACER COUNTY	NEWCASTLE SANITARY DIST	SEWAGE	UNKNOWN	NO	RED RAVINE	SACRAMENTO RIVER
22	3/7/2011	23550 GRANDVIEW AVE, COLFAX	PLACER COUNTY	CITY OF COLFAX	SEWAGE	4,000	NO	BUNCH CREEK	AMERICAN RIVER
23	3/8/2011	End of Sylvan Glenn Place and Sylvan Vista Drive, AUBURN	PLACER COUNTY	PLACER COUNTY ENV UTILITIES	SEWAGE	1,000	NO	STORM DRAIN	AMERICAN RIVER
24	3/15/2011	EL DORADO TRAIL 1/4 TO 1/2 MILE EAST OF MISSOURI FLAT	EL DORADO COUNTY	CITIZEN	CHEMICAL	UNKNOWN	UNKNOWN	WEBBER CREEK	AMERICAN RIVER
25	3/15/2011	4254 MEADOW GLEN RD	PLACER COUNTY	Placer Co Facility Svcs Dept	SEWAGE	500	NO	ROCK CREEK	SACRAMENTO RIVER
26	3/15/2011	AUBURN RAVINE RD & OAK TREE DRIVE	PLACER COUNTY	Placer Co Facility Svcs Dept	SEWAGE	200	NO	AUBURN RAVINE	SACRAMENTO RIVER
27	3/16/2011	Applegate Waste Water Treatment Plant	PLACER COUNTY	Placer Co Facility Svcs Dept	OTHER	800,000	NO	CLIPPER CREEK	AMERICAN RIVER
28	3/17/2011	1296 BROADWAY AVE, PLACERVILLE	EL DORADO COUNTY	EL DORADO ENV MANAGEMENT	UNKNOWN MATERIAL	20 gpm	NO	HANGTOWN CREEK	AMERICAN RIVER
29	3/18/2011	1403 F ST	SACRAMENTO COUNTY	SACRAMENTO CITY FIRE	CHEMICAL	2	NO	STORM DRAIN	SACRAMENTO RIVER
30	3/18/2011	1229 I ST	SACRAMENTO COUNTY	SACRAMENTO CITY FIRE	CHEMICAL	4	NO	STORM DRAIN	SACRAMENTO RIVER
31	3/18/2011	SOUTH BEALE RD	YUBA COUNTY	PRIVATE CITIZEN	CHEMICAL	UNKNOWN	NO	BEST SLOUGH	SACRAMENTO RIVER
32	3/18/2011	9391 TROY WAY, GRANITE BAY	PLACER COUNTY	PLACER COUNTY ENV UTILITIES	SEWAGE	1,000	NO	DRAINAGE CHANNEL	SACRAMENTO RIVER
33	3/21/2011	LAT 38 59'34.82" N LONG 121 47' 44.23"	SUTTER COUNTY	PG&E	PETROLEUM	5	NO	AGRICULTRUAL DITCH	SACRAMENTO RIVER
34	3/21/2011	1 MILE N. OF HWY 20 ON WINCORP RD	SUTTER COUNTY	PG&E	PETROLEUM	10	NO	IRRIGATION DITCH	SACRAMENTO RIVER
35	3/24/2011	1320 CORTA WAY	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	1,000	UNKNOWN	STORM DRAIN	AMERICAN RIVER
36	3/24/2011	6469 CHANNING DR	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	1,000	UNKNOWN	STORM DRAIN	SACRAMENTO RIVER
37	3/24/2011	7600 GREENHAVEN DR	SACRAMENTO COUNTY	SACRAMENTO CITY WASTE WATER	SEWAGE	2,500	YES	NO	-
38	3/24/2011	7257 10TH ST	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	1,000	NO	STORM DRAIN	AMERICAN RIVER

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January - December 2011

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
39	3/26/2011	I ST BRIDGE	SACRAMENTO COUNTY	NRC	OTHER	UNKNOWN	UNKNOWN	SACRAMENTO RIVER	SACRAMENTO RIVER
40	3/30/2011	10803 RIATA WAY, Lake of Pines WWTP	PLACER COUNTY	County of Nevada Sanitation Dist #1 (Lake of Pines WWTP)	SEWAGE	500	YES	NO	-
41	3/31/2011	ALHAMBRA BLVD & H ST	SACRAMENTO COUNTY	SACRAMENTO CITY FIRE	PETROLEUM	2	YES	NO	-
42	3/31/2011	Maidu Ave at Auburn Folsom Rd, AUBURN	PLACER COUNTY	CITY OF AUBURN	SEWAGE	6,500	NO	SEASONAL CREEK	SACRAMENTO RIVER
April									
43	4/1/2011	1801 GARDEN HWY, Riverview Marina	SACRAMENTO COUNTY	NRC/RIVERVIEW MARINA	PETROLEUM	1 MILE SHEEN	UNKNOWN	SACRAMENTO RIVER	SACRAMENTO RIVER
44	4/1/2011	8462 SMARTVILLE RD, SMARTVILLE	YUBA COUNTY	CALFIRE GRASS VALLEY	PETROLEUM	15	NO	UNKOWN CREEK/ YUBA RIVER	SACRAMENTO RIVER
45	4/7/2011	6900 AIRPORT BLVD	SACRAMENTO COUNTY	SACRAMENTO INTERNATIONAL AIRPORT	SEWAGE	1.5	YES	NO	-
46	4/13/2011	Mosquito Ridge Road at Circle Bridge	PLACER COUNTY	Tahoe National Forest	PETROLEUM	UNKNOWN	NO	North Fork American River	AMERICAN RIVER
47	4/15/2011	8204 PLATINUM CIR, SMARTVILLE	YUBA COUNTY	YUBA CITY WASTE WATER TREATMENT PLANT	SEWAGE	15	NO	SANDFORD CREEK	SACRAMENTO RIVER
48	4/17/2011	HWY 80 AND I-5 JUNCTION	SACRAMENTO COUNTY	NRC	PETROLEUM	UNKNOWN	UNKNOWN	SACRAMENTO RIVER	SACRAMENTO RIVER
49	4/19/2011	3182 Laurelhurst Dr	SACRAMENTO COUNTY	SMUD	PETROLEUM	30	YES	NO	-
50	4/19/2011	1 1/2 miles downstream from the Rollins Reservoir,	PLACER COUNTY	PG&E	OTHER	UNKNOWN	UNKNOWN	BEAR RIVER	SACRAMENTO RIVER
51	4/21/2011	MILE POST 180.3	YUBA COUNTY	UPRR	CHEMICAL	UNKNOWN	UNKNOWN	UNKNOWN WATERWAYS	SACRAMENTO RIVER
52	4/23/2011	WEBBER CREEK 1/2 UP FROM BRIDGE	EL DORADO COUNTY	CITIZEN	UNKNOWN MATERIAL	UNKNOWN	NO	WEBBER CREEK	AMERICAN RIVER
May									
53	5/3/2011	RYDEN PARK ON BEALE AFB	YUBA COUNTY	BEALE AIR FORCE BASE	SEWAGE	UNKNOWN	NO	DRY CREEK	SACRAMENTO RIVER
54	5/6/2011	GENERAL CHUCH YEAGER RD NORTH OF WALSH RD, SMARTVILLE	YUBA COUNTY	CITIZEN	CHEMICAL	UNKNOWN	NO	SEASONAL STREAM	SACRAMENTO RIVER
55	5/17/2011	TRAILER PARK- BEHIND PRINCETON HIGH SCHOOL	COLUSA COUNTY	PRIVATE CITIZEN	PETROLEUM	5	NO	SACRAMENTO RIVER	SACRAMENTO RIVER
56	5/19/2011	3180 WASHINGTON STREET, PLACERVILLE	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	1,331	NO	HANGTOWN CREEK	AMERICAN RIVER
57	5/23/2011	321 RIVERSIDE AVE, ROSEVILLE	PLACER COUNTY	ANONYMOUS	PETROLEUM	UNKNOWN	NO	STORM DRAIN/ LINDA CREEK	SACRAMENTO RIVER
58	5/25/2011	8805 SWALLOW WAY	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	2,865	YES	NO	-
59	5/25/2011	TRAILER PARK- BEHIND PRINCETON HIGH SCHOOL	COLUSA COUNTY	COLUSA COUNTY SHERIFF	UNKNOWN MATERIAL	UNKNOWN	UNKNOWN	SACRAMENTO RIVER	SACRAMENTO RIVER
June									
60	6/6/2011	8434 APLITE CT	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	11,250	NO	CRIPPLE CREEK	AMERICAN RIVER
61	6/22/2011	409 SCOTTS MILL CT, ROSEVILLE	PLACER COUNTY	CITIZEN	CHEMICAL	600 LBS	NO	LINDA CREEK	SACRAMENTO RIVER
62	6/23/2011	7433 ROLLINGWOOD BLVD	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	4,950	YES	NO	-
63	6/24/2011	EAST BORROW CANNEL, SUTTER BYPASS	SUTTER COUNTY	DEPT OF WATER RESOURCES	PETROLEUM	20	YES	NO	-
64	6/29/2011	EB HWY 20 JWO 22ND ST	YUBA COUNTY	CALTRANS MARYSVILLE	PETROLEUM & OIL	50 & 10 GALS	YES	NO	-
July									
65	7/1/2011	3785 CHANNEL DR, WEST SACRAMENTO	YOLO COUNTY	VSS EMULTECH	PETROLEUM	1000	YES	NO	-
66	7/12/2011	DAUGHTERY RD & PATINE RD, SMARTVILLE	YUBA COUNTY	CITIZEN	CHEMICAL	UNKNOWN	NO	DEMPSEY CREEK	SACRAMENTO RIVER
67	7/19/2011	6800 block of Mt. Vernon Rd., AUBURN	PLACER COUNTY	PRIVATE CITIZEN	SEWAGE	UNKNOWN	NO	SAILORS RAVINE	SACRAMENTO RIVER
68	7/25/2011	1708 59TH ST	SACRAMENTO COUNTY	SACRAMENTO MUNICIPAL UTILITIES DIST	PETROLEUM	30	YES	NO	-
69	7/26/2011	661 GREEN VALLEY RD, EL DORADO HILLS	EL DORADO COUNTY	FOLSOM LAKE MARINA	CHEMICAL	1'X300' SHEEN	NO	FOLSOM LAKE	AMERICAN RIVER
70	7/27/2011	9400 WENTWORTH SPRINGS RD#3	EL DORADO COUNTY	CITIZEN	OTHER	UNKNOWN	NO	ROCK CREEK	SACRAMENTO RIVER
71	7/28/2011	532 MAIN ST, PLACERVILLE	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	4	YES	NO	-
August									
72	8/2/2011	1266 BROADWAY	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	10	YES	NO	-

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73	8/4/2011	HAMPTON SMARTVILLE RD, SMARTVILLE	YUBA COUNTY	CITY OF YUBA	SEWAGE	1,000	YES	NO	-
74	8/8/2011	HWY 50 JWO KYBURZ	EL DORADO COUNTY	EL DORADO COUNTY OF SHERIFFS DISPATCH	PETROLEUM	UNKNOWN	UNKNOWN	AMERICAN RIVER	AMERICAN RIVER
75	8/9/2011	ROLLINS LAKE RD, COLFAX	PLACER COUNTY	CHP TRUCKEE	PETROLEUM	150	UNKNOWN	ROLLINS LAKE	SACRAMENTO RIVER
76	8/20/2011	3186 FOUR SEASONS DR, EL DORADO HILLS	EL DORADO COUNTY	EL DORADO IRRIGATION DIST	OTHER	900	NO	UNKNOWN WATERWAY/ FOLSOM LAKE	AMERICAN RIVER
September									
77	9/13/2011	RUSH RIVER DR & WINDBRIDGE	SACRAMENTO COUNTY	SACRAMENTO CITY FIRE	PETROLEUM	5 QTS	YES	NO	-
78	9/14/2011	8165 PEAVINE RIDGE	EL DORADO COUNTY	CITIZEN	SEWAGE	UNKNOWN	NO	CREEK	AMERICAN RIVER
79	9/18/2011	88332 MOHAWK WAY	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	UNKNOWN	NO	UNKNOWN WATERWAY	SACRAMENTO RIVER
80	9/22/2011	EAGLES NEST AT ROSEMARY, AUBURN	PLACER COUNTY	CITY OF AUBURN	SEWAGE	20	YES	NO	-
81	9/28/2011	693 MAIN ST, PLACERVILLE	EL DORADO COUNTY	CAL FIRE	PETROLEUM	5	UNKNOWN	HANGTOWN CREEK	AMERICAN RIVER
October									
82	10/5/2011	INTERSECTION OF TYBURN DR & EAST GARRANA DR, BEALE AFB	YUBA COUNTY	BEALE AFB	PETROLEUM	25	NO	STORM DRAIN	SACRAMENTO RIVER
83	10/7/2011	1851 BELL AVE	SACRAMENTO COUNTY	GRANITE CONSTRUCTION	PETROLEUM	60	YES	NO	-
84	10/10/2011	858 HIGH ST, AUBURN	PLACER COUNTY	AUBURN POLICE	PETROLEUM	UNKNOWN	UNKNOWN	AUBURN RAVINE	SACRAMENTO RIVER
85	10/19/2011	1309 BROADWAY, PLACERVILLE	EL DORADO COUNTY	CITY OF PLACERVILLE	SEWAGE	150	NO	STORM DRAIN	AMERICAN RIVER
86	10/22/2011	DAVINCIA DR AT PANNINI WAY, EL DORADO HILLS	EL DORADO COUNTY	EL DORADO IRRIGATION DIST	OTHER	50	YES	NO	-
87	10/11/2012	177 PANNI WAY at Divinic, EL DORADO HILLS	EL DORADO COUNTY	EL DORADO IRRIGATION DIST	OTHER	10	NO	STORM DRAIN	AMERICAN RIVER
November									
88	11/2/2011	11755 JOEGER RD, AUBURN	PLACER COUNTY	PLACER COUNTY UTILITES	SEWAGE	108,000	NO	ROCK CREEK	SACRAMENTO RIVER
89	11/4/2011	10700 SUNRISE RIDGE CIR, AUBURN	PLACER COUNTY	CITY OF AUBURN	SEWAGE	3,960	NO	STORM DRAIN	AMERICAN RIVER
90	11/16/2011	670 PLACERVILLE DR, PLACERVILLE	EL DORADO COUNTY	EL DORADO COUNTY ENV MANAGEMENT	PETROLEUM	15	UNKNOWN	HANGTOWN CREEK	AMERICAN RIVER
91	11/20/2011	716 GRAND AVE	SACRAMENTO COUNTY	CITY OF SACRAMENTO	SEWAGE	1515/100	PARTIAL	STORM DRAIN	SACRAMENTO RIVER
92	11/23/2011	13730 LINCOLN WAY, AUBURN	PLACER COUNTY	PLACER COUNTY ENV HEALTH	SEWAGE	500	NO	STORM DRAIN	AMERICAN RIVER
93	11/24/2011	SACRMENTO YACHT CLUB	SACRAMENTO COUNTY	CITIZEN- SACRAMENTO FIRE	PETROLEUM	UNKNOWN	NO	SACRAMENTO RIVER	SACRAMENTO RIVER
94	11/24/2011	8616 PERSHING AVE	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	15,400	NO	CHANNEL-ARCADE CREEK	AMERICAN RIVER
95	11/27/2011	OLD TOWN SACRAMENTO PIER	SACRAMENTO COUNTY	GRAYS HARBOR	PETROLEUM	1 CUP	NO	SACRAMENTO RIVER	SACRAMENTO RIVER
December									
96	12/9/2011	SANKEY RD & GARDEN HWY, PLEASANT GROVE	SUTTER COUNTY	CITIZEN-SUTTER COUNTY FIRE	PETROLEUM	UNKNOWN	UNKNOWN	IRRIGATION CANAL	SACRAMENTO RIVER
97	12/21/2011	600 PLACERVILLE DR, PLACERVILLE	EL DORADO COUNTY	3 E CO	PETROLEUM	2	YES	NO	-
98	12/27/2011	8621 Story Ridge Wy	SACRAMENTO COUNTY	SACRAMENTO SEWER DIST	SEWAGE	7,100	YES	NO	-
99	12/31/2011	ROLLINS LAKE, COLFAX	PLACER COUNTY	CALFIRE GRASS VALLEY	PETROLEUM	UNKNOWN	UNKNOWN	ROLLINS LAKE	SACRAMENTO RIVER

[1] This includes seven counties: Sacramento, Placer, El Dorado, Yolo, Sutter, Yuba, and Colusa

Attachment B: Spills Reported to OES That Reached Surface Water
January - December 2012

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
January									
1	1/1/2012	North Shingle at Oakdale Road	El Dorado County	El Dorado Irrigation District	Water	18,000	NO	Tennessee Creek	American River
2	1/5/2012	300 Prison Road, Folsom State Prison	Sacramento County	CDCR - Folsom	Sewage	200	NO	Storm Drain	American River
3	1/8/2012	9490 Goethe Road, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	Unknown	NO	Concrete Canal	American River
4	1/12/2012	2830 Hocking Street, Placerville	El Dorado County	Carmichael Water/City of Placerville	Sewage	120	NO	Immigrant Creek	American River
5	1/23/2012	6018 Cowden St., Orangevale	Sacramento County	Sacramento Area Sewer Dist	Sewage	20	NO	Storm Drain	Sacramento River
6	1/23/2012	1181 Grand River, Sacramento	Sacramento County	Sacramento City FD	Fire Fighting Water	50	NO	Storm Drain	Sacramento River
7	1/25/2012	832 Skipper Circle, Sacramento	Sacramento County	Sacramento County HazMat	Other	Unknown	NO	Sacramento River	Sacramento River
8	1/25/2013	1307 Broadway Way, Placerville	El Dorado County	City of Placerville Public Works	Sewage	40	NO	Hangtown Creek	American River
9	1/26/2012	Myrtle at Paladena, Sacramento	Sacramento County	ANONYMOUS	Other	Unknown	NO	Arcade Creek	Sacramento River
10	1/31/2012	Indiana Ranch Road and Forsythe Road, near Brownsville	Yuba County	Regional Water Quality Control District 5B	Unknown	Unknown	NO	Unknown Creek	Sacramento River
February									
11	2/7/2012	320 Mill Valley Circle, Sacramento	Sacramento County	Sacramento Area Sewer Dist	Sewage	830	NO	Storm Drain	Sacramento River
12	2/9/2012	3090 Butte Slough Rd, Colusa	Colusa County	Colusa County S/O	Petroleum	SHEEN	NO	Sacramento River	Sacramento River
13	2/9/2012	Marysville Blvd. x Alamos Ave, Sacramento	Sacramento County	Sacramento Fire Hazmat 30	Sewage	50	NO	Hagginwood Drainage Creek	Sacramento River
14	2/10/2012	Granite Bay	Placer County	Norcom	Petroleum	1 to 3	NO	Folsom Lake	American River
15	2/11/2012	3101 Center St (Cross St was Hwy 50), Placerville	El Dorado County	City of Placerville	Petroleum	1 Qt	NO	Hangtown Creek	American River
16	2/11/2012	West El Camino Ave x East Levee Road	Sacramento County	Sacramento City Fire	Chemical	3	NO	East Main Drain Canal	Sacramento River
17	2/14/2012	3110 Cowan Circle, Sacramento	Sacramento County	Sacramento Area Sewer Dist	Sewage	425	NO	Chicken Ranch Slough	American River
18	2/14/2012	300 Prison Road, Folsom State Prison	Sacramento County	CDCR - Folsom	Sewage	750	NO	Storm Drain	American River
19	2/21/2012	2224 Burney Way, Arden	Sacramento County	Sac Metro Fire	Chemical	4 Qts	NO	Storm Drain	American River
20	2/22/2012	2025 Morse Ave, Sacramento	Sacramento County	Sacramento Area Sewer Dist	Sewage	1,000	NO	Strong Ranch Slough	American River
March									
21	3/9/2012	Auburn Folsom Rd at Greenback, Folsom	Sacramento County	City of Folsom	Water	100,000	NO	Storm Drain	American River
22	3/16/2012	11755 Joeger Rd, Auburn	Placer County	Placer County Facility Sevices SMD1	Sewage	1,000	NO	Rock Creek	Sacramento River
23	3/16/2012	Auburn Ravine at Mullberry St, Auburn	Placer County	County Placer	Sewage	Unknown	NO	Auburn Ravine Creek	Sacramento River
24	3/16/2012	City of Grass Valley WWTP	Placer County	City of Grass Valley	Sewage	4,000,000	NO	Wolf Creek	Sacramento River
25	3/16/2012	300 Prison Road, Folsom State Prison	Sacramento County	CDCR - Folsom	Sewage	70	NO	Storm Drain	American River
26	3/19/2012	6468 Channing Drive, North Highlands	Sacramento County	Sacramento Area Sewer District	Sewage	1,120	NO	Storm Drain	Sacramento River
27	3/20/2012	8235 Post Rd., Fair Oaks	Sacramento County	Sacramento Area Sewer District	Sewage	Unknown	NO	Unnamed Creek	American River
28	3/27/2012	2200 Stockton Blvd, Sacramento	Sacramento County	Citizen	Petroleum	220 LBS	NO	Storm Drain	Sacramento River
29	3/28/2012	South Auburn And Whitcome Ave, Colfax	Placer County	City of Colfax	Sewage	4,000	NO	Bunch Creek	American River
30	3/28/2012	Jasper Lane, 1 mile north Spenceville Rd. with the nearest community Wheatland	Yuba County	PG&E	Petroleum	1	NO	Unnamed Roadside Ditch	Sacramento River
31	3/30/2012	1060 Sylvan Glen Place, Auburn	Placer County	Placer County Utilities	Sewage	200	NO	Season Drainage Ditch	American River
April									
32	4/2/2012	6371 King Rd, Loomis	Placer County	Citizen	Sewage	Unknown	NO	Laird Creek	Sacramento River
33	4/3/2012	Folsom Auburn Rd at Folsom Lake Crossing, Folsom	Sacramento County	Citizen	Sewage	3,000	NO	Storm Drain	American River
34	4/9/2012	Miller Way and East Garryanna, Beale AFB	Yuba County	Beale AFB	Sewage	750	NO	Storm Drain/Broskey Lake	Sacramento River
35	4/9/2012	WB 50 at Kyburz	El Dorado County	CHP Sacramento	Petroleum	10	NO	Drainage Basin	American River
36	4/10/2012	4807 Echo Ridge Rd, Rocklin	Placer County	Citizen	Petroleum	5	NO	Storm Drain	Sacramento River
37	4/13/2012	4124 Joy Ln, Carmichael	Sacramento County	Sacramento Area Sewer Dist	Sewage	270	NO	Storm Drain-Drainage Channel	American River
38	4/19/2012	374 Spanish Ravine St, Placerville	El Dorado County	City of Placerville	Sewage	5	NO	Hangtown Creek	American River
39	4/21/2012	750 Lincoln Rd, Yuba City	Sutter County	Yuba City Fire Dept	Sewage	750	NO	Storm Drain	Sacramento River
40	4/24/2012	5840 Santa Fe Way, North Highlands	Sacramento County	Sacramento County EMD	Fire Fighting Water	1,000	NO	Storm Drain	Sacramento River

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41	4/27/2012	408 Kesner Ave, Sacramento	Sacramento County	Sacramento City FD	Gasoline	15	NO	Storm Drain	Sacramento River
May									
42	5/7/2012	8221 Joe Rodger Rd, Granite Bay	Placer County	Citizen	Unknown	Unknown	NO	Ditch	Sacramento River
43	5/9/2012	Stone Briar at White Rock, El Dorado Hills	El Dorado County	El Dorado Irrigation District	Sewage	360	NO	Unknown Creek	American River
44	5/11/2012	200 Sun Rock Dr, Folsom	Sacramento County	City of Folsom	Sewage	1,000	NO	Storm Drain	American River
45	5/25/2012	20070 Riverfront St, West Sacramento	Yolo County	NRC	Petroleum	Unknown	NO	Sacramento River	Sacramento River
46	5/29/2012	Edson Dam on Wentworth Springs Rd, Georgetown	El Dorado County	Georgetown Divide Public Utility District	Petroleum	4 Qts	NO	Stumpy Meadows Lake	American River
June									
47	6/1/2012	5985 Devecchi Ave, Citrus Heights	Sacramento County	Sacramento County EMD	Fire Fighting Water	Unknown	NO	Arcade Creek	Sacramento River
48	6/6/2012	Behind Creekside Middle School, off of Cook Rielo Rd, Roseville	Placer County	Placer Co Utilities	Sewage	30,000	NO	Dry Creek	Sacramento River
49	6/16/2012	281 Green Valley Rd, El Dorado Hills	El Dorado County	Shimmick Construction	Petroleum	150-200	NO	Drainage Ditch	American River
50	6/18/2012	4949 Heatherdale Lane, Carmichael	Sacramento County	Sacramento Area Sewer District	Sewage	122	NO	Storm Drain	Sacramento River
51	6/25/2012	987 King John Way, El Dorado Hills	El Dorado County	Citizen	Petroleum	2	NO	Drainage Ditch	American River
July									
52	7/6/2012	French Meadows Reservoir	Placer County	USFS Grass Valley	Petroleum	Unknown	NO	French Meadows Reservoir	American River
53	7/6/2012	SB 113 JNO of the Sutter Bypass. MP 10.9	Sutter County	Cal Trans	Other	Unknown	NO	Drainage Ditch	Sacramento River
54	7/9/2012	5341 Walnut Ave, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	2,000	NO	Unnamed Drainage Creek	Sacramento River
55	7/17/2012	Indian Creek SW of Iowa Hill, Colfax	Placer County	Citizen	Other	Unknown	NO	Indian Creek	American River
56	7/19/2012	347 Rafael Dr, Elverta	Sacramento County	Sacramento County Sheriff	Sewage	Unknown	NO	Storm Drain	Sacramento River
57	7/23/2012	Elkhorn Boat Ramp, 5865 Garden Highway	Sacramento County	Sacramento FD	Petroleum	Unknown	NO	Sacramento River	Sacramento River
August									
58	8/6/2012	Stumpy Meadows Lake	El Dorado County	USFS El Dorado National Forest	Petroleum	Unknown	NO	Stumpy Meadows Lake	American River
59	8/7/2012	3844 Henderson Way, Carmichael	Sacramento County	Sacramento Area Sewer District	Sewage	5,400	NO	Storm Drain	Sacramento River
60	8/16/2012	12571 Marysville, Dobbins	Yuba County	Emerald Cove Marina	Petroleum	15	NO	Bullards Bar Reservoir	Sacramento River
61	8/28/2012	Mcclatchey at E. Sutter Bypass Levee, Sutter	Sutter County	DWR	Other	20	NO	E. Borrow Canal, Sutter Bypass	Sacramento River
62	8/28/2012	6900 Airport Blvd W, Sacramento	Sacramento County	Sacramento International Airport	Petroleum	4-5	NO	Storm Drain	Sacramento River
September									
63	9/4/2012	7433 Rollingwood Blvd, Citrus Heights	Sacramento County	Sacramento Area Sewer District	Sewage	520	NO	Storm Drain	Sacramento River
64	9/5/2012	1630 Taylor Rd, Penryn	Placer County	Citizen	Unknown	Unknown	NO	Unnamed Creek	Sacramento River
65	9/11/2012	3965 Meadow Wood Dr, El Dorado Hills	El Dorado County	El Dorado Irrigation Dist	Other	73	NO	Storm Drain	American River
66	9/12/2012	177 Pennini Way, El Dorado Hills	El Dorado County	El Dorado Irrigation Dist	Other	48	NO	Storm Drain	American River
67	9/15/2012	Old River Road at I-80, West Sacramento	Yolo County	West Sacramento Fire Dispatch	Unknown	Unknown	NO	Sacramento River	Sacramento River
68	9/25/2012	Sacramento River, 300 Yrds SO American River	Sacramento County	Citizen	Petroleum	SHEEN	NO	Sacramento River	Sacramento River
69	9/28/2012	120 Jacquier Court, Placerville	El Dorado County	Citizen	Other	Unknown	NO	Hangtown Creek	American River
October									
70	10/2/2012	1401 Garden Hwy, Sacramento	Sacramento County	NRC	Petroleum	1 TEASPOON	NO	Sacramento River	Sacramento River
71	10/7/2012	1270 Broadway, Placerville	El Dorado County	City of Placerville	Sewage	20	NO	Hangtown Creek	American River
72	10/9/2012	JNO of Rock Creek Rd and Hwy 193, Placerville	El Dorado County	Citizen	Other	Unknown	NO	American River	American River
734	10/9/2012	1000 Garden HWY, Sacramento	Sacramento County	NRC	Petroleum	SHEEN	NO	Sacramento River	Sacramento River
74	10/10/2012	1263 Franklin Ave, Yuba City	Sutter County	Circle K Store Inc	Petroleum	3	NO	Storm Drain	Sacramento River
75	10/11/2012	300 Prison Road, Folsom State Prison	Sacramento County	CDCR - Folsom	Sewage	400	NO	Storm Drain	American River
76	10/18/2012	13069 Lincoln Way, Auburn	Placer County	Placer Co OES	Petroleum	5	NO	Pond	Sacramento River
77	10/19/2012	6320 Santa Catarina Way, Citrus Heights	Sacramento County	Sacramento Area Sewer District	Sewage	1,500	NO	Flood Control Channel	Sacramento River
78	10/22/2012	Magpie Creek east of the runway of McClellan Air Force Base	Sacramento County	ANONYMOUS	Radiological	Unknown	NO	Magpie Creek	Sacramento River
79	10/22/2012	1900 Harris Avenue, Sacramento	Sacramento County	SMUD	Petroleum	40-45	NO	Storm Drain	Sacramento River
80	10/22/2012	Coloma at Cordova, Rancho Cordova	Sacramento County	SMUD	Petroleum	15	NO	Storm Drain	American River
81	10/25/2012	Bay Oaks Way, Citrus Heights	Sacramento County	SMUD	Petroleum	20	NO	Storm Drain	Sacramento River

Attachment B: Spills Reported to OES That Reached Surface Water
January - December 2012

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
82	10/26/2012	Gamay Dr. at Silvaner Ct., El Dorado Hills	El Dorado County	El Dorado Irrigation Dist	Other	15	NO	Storm Drain	American River
83	10/30/2012	5790 Parkoaks Dr, Sacramento	Sacramento County	Sacramento Sewer District	Sewage	1,220	NO	Storm Drain	Sacramento River
November									
84	11/1/2012	571 Canal Street, Placerville	El Dorado County	City of Placerville Public Works	Sewage	20-50	NO	Hangtown Creek	American River
85	11/5/2012	Discovery Park Bridge from Garden Highway	Sacramento County	Sacramento County Regional Parks	Sewage	25	NO	Bannon Slough	Sacramento River
86	11/11/2012	Sacramento Int'l Airport: Terminal A Gate A10	Sacramento County	Sacramento Int'l Airport	Chemical	Unknown	NO	Storm Drain	Sacramento River
87	11/18/2012	3447 Hillwood Dr, Shingle Springs	El Dorado County	NRC	Petroleum	4.00	NO	Drainage Creek	American River
88	11/18/2012	1835 Francisco Road, El Dorado Hills Water Treatment Plant	El Dorado County	El Dorado Irrigation Dist	Other	233	NO	Storm Drain, runs to Folsom Lake	American River
89	11/18/2012	Pumphouse Rd @ East Camp, Williams	Colusa County	CHP Chico	Petroleum	25	NO	Glenn-Colusa Canal	Sacramento River
90	11/26/2012	2495 Meadowland Way, Lincoln	Placer County	City of Lincoln	Sewage	10	NO	Storm Drain	Sacramento River
91	11/30/2012	Intersection of El Dorado Rd and Motherlode Dr, El Dorado	El Dorado County	El Dorado Irrigation Dist	Sewage	2,800	NO	Unnamed Creek	American River
92	11/30/2012	Hwy 99 at Elverta, Elverta	Sacramento County	CHP Sacramento	Diesel	60	NO	Storm Drain	Sacramento River
December									
93	12/1/2012	EB Hwy 160 JWO Arden, Sacramento	Sacramento County	Sacramento City Fire	Petroleum	20	NO	Storm Drain	Sacramento River
94	12/1/2012	4420 Oak Hollow Dr, North Highlands	Sacramento County	Sac Metro Fire	Petroleum	4	NO	Storm Drain	Sacramento River
95	12/2/2012	430' West OF East Ridge Drive, Roseville	Placer County	City of Roseville ENV Utilities	Sewage	Unknown	NO	Unknown Creek	Sacramento River
96	12/2/2012	Lakeshore South x Torrey Pines Rd, Lake of the Pines	Placer County	Nevada County Sanitation Department	Other	200	NO	Lake of the Pines	Sacramento River
97	12/2/2012	Encina Drive, El Dorado Hills	El Dorado County	El Dorado Irrigation District	Sewage	138	NO	Storm Drain	American River
98	12/2/2012	3706 Willow Street, Sacramento	Sacramento County	City of Sacramento Utilities	Sewage	913	NO	Storm Drain	Sacramento River
99	12/2/2012	Lincoln at High Street, Auburn	Placer County	City of Auburn	Sewage	600	NO	Storm Drain	Sacramento River
100	12/2/2012	7261 10th Street	Sacramento County	Sacramento Area Sewer District	Sewage	10 gpm	NO	Storm Drain	Sacramento River
101	12/4/2012	On Fiske Street, closest cross street is Benham, Placerville	El Dorado County	City of Placerville	Sewage	1,000	NO	Hangtown Creek	American River
102	12/17/2012	4491 Bowman Way, Olivehurst	Yuba County	Olivehurst Public Utilities Dist	Sewage	5,000	NO	Storm Drain	Sacramento River
103	12/23/2012	1 Mile north of the west end of North Butte Rd, Live Oak	Sutter County	NRC	Petroleum	4	NO	Cherokee Creek	Sacramento River
104	12/23/2012	7108 Palabin Way, Rio Linda	Sacramento County	Sacramento Sewer District	Sewage	Unknown	NO	Unnamed Creek	Sacramento River
105	12/24/2012	4928 Auburn Folsom Road, Loomis	Placer County	Placer County Utilities	Treated Sewage	600	NO	Miners Ravine	Sacramento River
106	12/24/2012	6900 Almond Ave, Orangevale	Sacramento County	Sacramento Area Sewer District	Sewage	Unknown	NO	Storm Drain	Sacramento River
107	12/26/2012	2971 Miller Way, Placerville	El Dorado County	City of Placerville Public Works	Sewage	75	NO	Hangtown Creek	American River
108	12/28/2012	701 Bidwell Street, Folsom	Sacramento County	City of Folsom	Sewage	Unknown	NO	Storm Drain	American River

[1] This includes seven counties: Sacramento, Placer, El Dorado, Yolo, Sutter, Yuba, and Colusa

Attachment B: Spills Reported to OES
January - December 2013

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
January									
1	1/6/2013	1347 Martin Ln, Placerville	El Dorado County	City of Placerville	Sewage	1,000 Gals	No	Hangtown Creek	American River
2	1/9/2013	Behind 3908 Lockie Ct, Diamond Springs	El Dorado County	DTSC	Unknown	10 Gals	No	Webber Creek	American River
3	1/15/2013	550 Canal St, Placerville	El Dorado County	City of Placerville	Sewage	750 Gals	No	Hangtown Creek	American River
4	1/16/2013	Folsom Dam, 7794 Folsom Dam Road, Folsom	Sacramento County	USBR	Petroleum	700 gals	No	Folsom Lake	American River
5	1/17/2013	100 Prison Rd, Represa	Sacramento County	Californina State Prison Sacramento	Sewage	10 Gals	No	Storm drain	American River
6	1/18/2013	Main St and Depot St, Colfax	Placer County	City Of Colfax	Sewage	80 Gals	No	Storm drain	Sacramento River
7	1/23/2013	6601 B. St, Beale AFB	Yuba County	Beale AFB	Other	Unknown	No	Hutchinson Creek	Sacramento River
8	1/29/2013	3685 Elk Horn Blvd, North Highlands	Sacramento County	Sacramento County HazMat	Petroleum	20 Gals	No	Storm drain	Sacramento River
9	1/31/2013	Knights Landing Boat Ramp 9350 State Route 45	Yolo County	Yolo County Sheriff	Unknown	Unknown	No	Sacramento River	Sacramento River
February									
10	2/10/2013	7846 Oak Forest, Citrus Heights	Sacramento County	Sacramento Area Sewer Dist	Sewage	8,034 gals	No	Cripple Creek	Sacramento River
11	2/14/2013	Canal St and Myrtle St, Placerville	El Dorado County	City of Placerville	Sewage	200 Gals	No	Hangtown Creek	American River
12	2/16/2013	7755 Olive St, Fair Oaks	Sacramento County	Sacramento Area Sewer Dist	Sewage	2,070 Gals	No	Minnesota Creek	American River
13	2/20/2013	2700 Castle Hill Ct, Sacramento	Sacramento County	Sacramento Area Sewer Dist	Sewage	2,180 Gals	No	Chicken Ranch Slough	American River
14	2/21/2013	Hamilton Smartsville Rd, Yuba City	Yuba County	CHP Chico	Petroleum	Unknown	No	Unknown Creek	Sacramento River
15	2/22/2013	7747 Greenback Lane, Citrus Heights	Sacramento County	Sacramento Area Sewer Dist	Sewage	3,250 Gals	No	Arcade Creek	Sacramento River
March									
16	3/4/2013	Parking Lot of 7840 Greenback Lane, Citrus Heights	Sacramento County	Sacramento Metro Fire	Other	6 gals	No	Arcade Creek	Sacramento River
17	3/5/2013	4600 Garden Hwy, Sacramento	Sacramento County	Sacramento City Fire Dept	Other	Unknown	No	Sacramento River	Sacramento River
18	3/9/2013	812 Spring St, Placerville	El Dorado County	City Of Placerville	Other	24,000 Gals	No	Hangtown Creek	American River
19	3/11/2013	River Ranch Rd, Camptonville	Yuba County	Cal Fire Grass Valley	PETROLEUM	200 Gals	No	Middle Yuba River	Sacramento River
20	3/13/2013	695 Regatta Drive, Sacramento	Sacramento County	Sacramento City Fire Dept	PETROLEUM	30 Gals	No	Storm Drain	Sacramento River
21	3/15/2013	Fowler Way and Marshall Way, Placerville	El Dorado County	City Of Placerville	Sewage	2,400 Gals	No	Cedar Ravine Creek	American River
April									
22	4/4/2013	I-5 (Seamas Ave), Sacramento	Sacramento County	Sacramento County Environmental Management	Petroleum	20 Gals	No	Storm Drain	Sacramento River
23	4/7/2013	Westbound Hwy 80 (Madison Ave), Sacramento	Sacramento County	Caltrans	Petroleum	1 Gal	No	Storm Drain	Sacramento River
24	4/13/2013	Locust Ave and Hwy 50, Placerville	El Dorado County	City of Placerville	Sewage	115 Gals	No	Hangtown Creek	American River
25	4/15/2013	Godwin Tunnel, Folsom State Prison, 300 Prison Road, Represa	Sacramento County	Folsom Prison Fire Department	Other	Sheen	No	American River	American River
26	4/26/2013	2832 Morine Dr, Placerville	El Dorado County	City of Placerville	Sewage	7,000 Gals	No	Hangtown Creek	American River
27	4/29/2013	2826 Mosquito Rd, Placerville	El Dorado County	City of Placerville Public Works	Other (Chlorinated Water)	848 Gals	No	Hangtown Creek	American River
28	4/30/2013	Hutchinson Creek and South Beale Rd, Beale AFB	Yuba County	USAF	Treated Sewage	15,000-20,000 Gals	No	Hutchinson Creek	Sacramento River
29	4/30/2013	8200 Fair Oaks Blvd, Carmichael	Sacramento County	Sacramento Area Sewer Dist	Sewage	990 Gals	No	Storm Drain	American River
May									
30	5/16/2013	370 Whyte Ave, Roseville	Placer County	Placer County Utilities	Sewage	1,000 Gals	No	Storm Drain	Sacramento River
31	5/20/2013	547 Estay Way, Placerville	El Dorado County	City of Placerville	Other (Water)	192 Gals	No	Hangtown Creek	American River
32	5/21/2013	690 Fair Oaks Blvd, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	490 Gals	No	Unammed Creek	American River
33	5/23/2013	Under 160 Freeway, Sacramento	Sacramento County	Sacramento City Fire Dept	Petroleum	Sheen	No	American River	American River
34	5/24/2013	Verona Marina	Sutter County	Sutter County Fire	Petroleum	1 Mi Long Sheen	No	Sacramento River	Sacramento River
June									

Attachment B: Spills Reported to OES
January - December 2013

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
35	6/7/2013	457 Grass Valley Hwy, Auburn	Placer County	Citizen	Chemical	Unknown	No	Storm Drain	Sacramento River
36	6/10/2013	3191 Corker St, Placerville	El Dorado County	City of Placerville Public Works	Other	675 gals	No	Cedar Ravine	American River
37	6/20/2013	342 Renoir Ct, El Dorado Hills	El Dorado County	El Dorado Irrigation District	Other	30 Gals	No	Storm drain	American River
38	6/23/2013	102 Pardy Way, Placerville	El Dorado County	Placerville Public Works	Other	480 gpm	No	Hangtown Creek	American River
39	6/24/2013	P St and 4th St, Sacramento	Sacramento County	Waste Management	Petroleum	10-15 Gals	No	Storm drain	Sacramento River
40	6/25/2013	O St and Front St, Sacramento	Sacramento County	Citizen	PETROLEUM	Sheen	No	Sacramento River	Sacramento River
				July					
41	7/2/2013	715 Main St, Placerville	El Dorado County	City of Placerville	Sewage	90 Gals	No	Hangtown Creek	American River
42	7/2/2013	1447 L Street, Rio Linda	Sacramento County	Private Citizen	Petroleum	10 Gals	No	Dry Creek	Sacramento River
43	7/10/2013	1201 Fulton Ave, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	15 gpm	No	Strong Ranch Slough	American River
44	7/11/2013	2960 Conrad St, Placerville	El Dorado County	City of Placerville	Other (Potable Water)	1,980 gals	No	Hangtown Creek	American River
45	7/14/2013	63rd Street and Suburban Court, Sacramento	Sacramento County	Sacramento City Fire Dept	Sewage	10 Gals	No	Storm drain	American River
46	7/15/2013	Washington St, Placerville	El Dorado County	City of Placerville	Other (Potable Water)	228 gals	No	Cedar Ravine Creek	American River
47	7/21/2013	Stans Marina, 31075 S. River Rd, West Sacramento	Yolo County	West Sac Fire Dept	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
48	7/26/2013	850 Conrad St, Placerville	El Dorado County	City of Placerville	Sewage	750 Gals	No	Hangtown Creek	American River
49	7/28/2013	1685 First Street, Lincoln	Placer County	City of Lincoln	Sewage	100 Gals	No	Storm Drain	Sacramento River
50	7/29/2013	5740 Roseville Road, Hillsdale Business Park, Foothills Farms	Sacramento County	Sacramento County Environmental Management	Petroleum	20 Gals	No	Storm drain	Sacramento River
51	7/29/2013	3089 Goldner St, Placerville	El Dorado County	City of Placerville Public Works	Sewage	Unknown	No	Hangtown Creek	American River
52	7/30/2013	Flight Line Area, Hangar 6, Beale Air Force Base	Yuba County	Beale AFB	Other	400 Gals	No	Storm drain	Sacramento River
53	7/30/2013	1428 El Camino Ave, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	540 Gals	No	Storm Drain	American River
				August					
54	8/3/2013	Madison & San Juan Arco Food Mart, Citrus Heights	Sacramento County	DTSC	Petroleum	Unknown	No	Storm drain	Sacramento River
55	8/13/2013	4315 Arden Way, Sacramento	Sacramento County	Sacramento Sewer	Sewage	500 Gals	No	Storm Drain	American River
56	8/17/2013	7412 Esteem Dr, Sacramento	Sacramento County	Sacramento Area Sewer Dist.	Sewage	825 gals	No	Unamed Creek	Sacramento River
57	8/19/2013	989 Sunrise Ave, Roseville	Placer County	Safeway Store	PETROLEUM	Unknown	No	Cirby Creek	Sacramento River
58	8/20/2013	property to right of 9791 Gary Drive, Browns Valley	Yuba County	Private Citizen	Sewage	Unknown	No	Unamed Creek	Sacramento River
59	8/20/2013	7972 Arcadia Dr, Citrus Heights	Sacramento County	Sacramento Area Sewer Dist.	Sewage	1,000 Gals	No	Arcade Creek	Sacramento River
60	8/27/2013	Miller Park, Sacramento	Sacramento County	Sacramento County FD	PETROLEUM	Sheen	No	Sacramento River	Sacramento River
				September					
61	9/6/2013	7794 Folsom Dam Road, Folsom	Sacramento County	CCAO Folsom Dam	Petroleum	2 Qts	No	Folsom Lake	American River
62	9/9/2013	8651 River Rd (Cliff's Marina), Sacramento	Sacramento County	NRC	Sewage	Unknown	No	Sacramento River	Sacramento River
63	9/13/2013	7794 Folsom Dam Road, Folsom	Sacramento County	USBR	Petroleum	1 Pt	No	Folsom Lake	American River
64	9/17/2013	23550 Grandview Ave, Colfax	Placer County	City of Colfax	Partially Treated Sewage	10,800 Gals	No	Bunch Creek	American River
65	9/18/2013	321 Riverside, Roseville	Placer County	Citizen	PETROLEUM	Unknown	No	Dry Creek	Sacramento River
66	9/23/2013	401 Watt Ave, Sacramento	Sacramento County	Waste Management	PETROLEUM	60 Gals	No	Storm Drain	American River
67	9/23/2013	Miller Park Marina, Sacramento	Sacramento County	Sacramento City Fire Dept	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
68	9/23/2013	Sacramento International Airport, Sacramento	Sacramento County	Sacramento County Airport System	Sewage	Unknown	No	Storm Drain	Sacramento River
				October					
69	10/6/2013	Sacramento International Airport, Sacramento	Sacramento County	Sacramento International Airport	Sewage	3 Gals	No	Storm Drain	Sacramento River
70	10/10/2013	728 Colusa Ave, Yuba City	Sutter County	Brodvent & Assoc.	PETROLEUM	60 Gals	No	Storm Drain	Sacramento River
71	10/10/2013	Rossmore Lane, El Dorado	El Dorado County	El Dorado Irrigation District	Other	3,000 gals	No	Storm drain	American River
72	10/12/2013	Woodhurst Ct, Yuba City	Sutter County	City of Yuba City	Sewage	100 Gals	No	Gilsizer Slew	Sacramento River

Attachment B: Spills Reported to OES
January - December 2013

#	Date	Location	County	Agency Notifying	Type of Spill	Amount Spilled (Gal(s))	Contained Before Enter Waterway?	Waterway Entered	Tributary To
73	10/16/2013	Garden Hwy (Elverta Rd), Sacramento	Sacramento County	CHP Sacramento	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
74	10/16/2013	3032 Aurburn Blvd, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	980 Gals	No	Arcade Creek	Sacramento River
75	10/20/2013	5162 Greenberry Dr, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	10,000 Gals	No	Arcade Creek	Sacramento River
76	10/21/2013	1880 Auburn Folsom Rd., Auburn	Placer County	El Pino Quality Pools	Sewage	1,000 Gals	No	Unamed Creek	American River
77	10/26/2013	Empty lot north of 6253 Panini Way, El Dorado Hills	El Dorado County	El Dorado Irrigation District	Other	37.5 Gal	No	Storm drain	American River
78	10/28/2013	160 Wescott Ct, Auburn	Placer County	City of Auburn	Sewage	300 Gals	No	Newcastle Canal	Sacramento River
79	10/29/2013	Elkorn Boat Ramp, Yolo County	Yolo County	Yolo County Environmental Health	PETROLEUM	Sheen	No	Sacramento River	Sacramento River
80	10/29/2013	Cliff's Marina - 8651 River Rd., Sacramento	Sacramento County	NRC	Other	Unknown	No	Sacramento River	Sacramento River
November									
81	11/4/2013	4928 Aurburn Folsom Rd, Loomis	Placer County	Placer Co.	Sewage	5,500 Gals	No	Miners Ravine	Sacramento River
82	11/4/2013	7948 Red Ruby Way, Antelope	Sacramento County	Sacramento County Dispatch	Other	Unknown	No	Storm drain	Sacramento River
83	11/5/2013	4928 Auburn Folsom Rd, Loomis	Placer County	Placer Co. Utilites	Chemical	1,540 Gals	No	Miners Ravine	Sacramento River
84	11/6/2013	Hwy 49 & Lotus Rd, Lotus	El Dorado County	El Dorado Irrigation District	Other (Drinking Water)	2,400 Gals	No	South Fork American River	American River
85	11/13/2013	3900 Sierra Gold Dr., Antelope	Sacramento County	Sacramento Area Sewer District	Sewage	25,000 gals	No	Storm drain	Sacramento River
86	11/14/2013	1724 Mercury Way, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	1,380 Gals	No	Strong Ranch Slough	American River
87	11/22/2013	3220 Barberry Ln, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	443 Gals	No	Unammed Creek	American River
88	11/22/2013	2900 Channel Ct, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	92 Gals	No	Strong Ranch Slough	American River
89	11/27/2013	4949 South Cirby Way, Roseville	Placer County	Private Citizen	Other	Unknown	No	Linda Creek, Dry Creek	Sacramento River
December									
90	12/2/2013	4101 Kenneth Ave, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	25 Gals	No	Unammed	American River
91	12/9/2013	Rafters Lane, Placerville	El Dorado County	PG&E	PETROLEUM	1/2 Cup	No	South Fork American River	American River
92	12/12/2013	4022 Raphael Dr., El Dorado Hills	El Dorado County	El Dorado Irrigation District	Other	80 gals	No	Storm drain	American River
93	12/19/2013	1010 Biz Johnson Dr, Marysville	Yuba County	Private Citizen	Other (Muddy Water)	Unknown	No	Feather River	Sacramento River
94	12/20/2013	2636 Carmichael Way, Sacramento	Sacramento County	Sacramento Area Sewer District	Sewage	12,000 Gals	No	Unammed Creek	American River
95	12/23/2013	2660 South Whitney Blvd, Rocklin	Placer County	South Placer Utilities Dist.	Sewage	2,246 Gals	No	Antelope Creek, Dry Creek	Sacramento River

[1] This includes seven counties: Sacramento, Placer, El Dorado, Yolo, Sutter, Yuba, and Colusa

Att D: Spills Reported to OES in Near Intake Zone
January - December 2014

#	Incident Date [1]	Location	County	Agency Notifying	Type of Spill	Amount Spilled	Contained Before Enter Waterway?	Waterway Entered	Tributary to
January									
1	1/5/2013	Intersection of Cliffwood Way and Terilyn Street, Sacramento	Sacramento County	Sacramento City Fire Department	PETROLEUM	25-50 Gal(s)	No	Storm Drain	American River
2	1/5/2014	2501 Edison Ave, Sacramento	Sacramento County	Sacramento City Fire	SEWAGE	2400 Gal(s)	No	Storm Drain	Sacramento River
3	1/6/2014	7776 Twin Oaks Ave., Citrus Heights	Sacramento County	Private Citizen	OTHER	Unknown	No	Unnamed Creek	Sacramento River
4	1/16/2014	5716 San Juan Ave, Citrus Heights	Sacramento County	Sacramento Area Sewer District	SEWAGE	111 Gal(s)	No	Brooktree Creek	Sacramento River
5	1/18/2014	Corner of South Auburn and Witcum Ave, Colfax	Placer County	City of Colfax	SEWAGE	1000-2000 Gal(s)	Unknown	Bunch Creek	American River
6	1/21/2014	7724 Elvyra Wy	Sacramento County	Sac Area Sewer Dist	SEWAGE	556 Gal(s)	No	Chicken Ranch Slough	American River
7	1/22/2014	Sunrise/ Sunset Area, Citrus Heights	Sacramento County	Carmichael Water	PETROLEUM	1 Gal(s)	No	American River	American River
February									
8	2/1/2014	3141 OREGON TRAIL RD, Georgetown	El Dorado County	NRC	OTHER	Unknown	No	Oregon Creek	American River
9	2/5/2014	Southbound Interstate 5 at Seamas Road, Sacramento	Sacramento County	CalTrans District 3 Comm Center	PETROLEUM	100 Gal(s)	No	Storm Drain/ Unknown Waterway	Sacramento River
10	2/8/2014	567 Hidebrand Cir x Kavine Way, Folsom	Sacramento County	City of Folsom	SEWAGE	1 Gal(s)	No	Willow Creek	American River
11	2/9/2014	102 Toyon Dr, Auburn	Placer County	City of Auburn	SEWAGE	300 Gal(s)	No	Storm Drain	American River
12	2/9/2014	135 Hidden Creek Dr, Auburn	Placer County	City of Auburn	SEWAGE	100 Gal(s)	No	Auburn Ravine Creek	Sacramento River
13	2/9/2014	8200 Fair Oaks Blvd., Carmichael	Sacramento County	Sacramento Area Sewer District	SEWAGE	200 Gal(s)	No	Unnamed Creek	American River
14	2/10/2014	Lake of the Pines Marina, Magnolia Road, the report indicates Nevada County - but Auburn is in Placer County	Placer County	NRC	PETROLEUM	Unknown	No	Lake Of The Pines	Sacramento River
15	2/11/2014	Sacramento River, North of Knights Landing 10 ft wide along the bank for 5 miles, Knights Landing	Yolo County	Fishbio	PETROLEUM	5 miles x 10 ft Sheen	No	Sacramento River	Sacramento River
16	2/11/2014	4362 East Garryana Dr, Beale Air Force Base	Yuba County	Beale AFB	SEWAGE	1000 Gal(s)	No	Dry Creek	Sacramento River
17	2/12/2014	B St. and Boyd, Yuba City	Sutter County	City of Yuba City	SEWAGE	1000 Gal(s)	Unknown	Feather River	Sacramento River
18	2/12/2014	Aldena St & Dalhart Way, Sacramento	Sacramento County	Sacramento County HazMat	PETROLEUM	5 Gal(s)	No	Storm Drain	Sacramento River
19	2/13/2014	Clements Road JSO McClatchy, near Robbins	Sutter County	CHP Dispatch	PETROLEUM	"A few gallons"	No	Wet drainage irrigation ditch	Sacramento River
20	2/14/2014	Roseville Yard, West yard 1, track 1, Roseville	Placer County	UPRR	PETROLEUM	50-100 Gal(s)	No	Dry Creek	Sacramento River
21	2/27/2014	Facility 1025, Arnold St., Beale Air Force Base	Yuba County	Beale AFB	CHEMICAL	2 Qt.(s)	No	Storm Drain, Reeds Creek	Sacramento River
22	2/28/2014	Discovery Park, JWO Jiboom Bridge, Sacramento	Sacramento County	Sacramento FD	PETROLEUM	5 Gal(s)	Unknown	American River	American River
March									
23	3/1/2014	5845 Horseshoe Bar Rd, Loomis	Placer County	Loomis FD	SEWAGE	25-50 Gal(s)	No	Storm Drain	Sacramento River
24	3/1/2014	American River Discovery Park, Sacramento	Sacramento County	Concerned Citizen	PETROLEUM	Unknown	No	American River	American River
25	3/4/2014	2974 Joerger Street, Rancho Cordova	Sacramento County	NRC	PETROLEUM	3 Qt.(s)	No	Storm Drain	American River
26	3/7/2014	NW of Richards Blvd. and I-5 North, Sacramento	Sacramento County	NRC	OTHER	Unknown	No	Sacramento River	American River
27	3/10/2014	Ponderosa Park Resort, closest city is Coloma	El Dorado County	Private Citizen	OTHER	10 ft by 3 ft	No	American River	American River
28	3/10/2014	Roseville Rail Yard, 9391 Atkinson St, Roseville	Placer County	UPRR	CHEMICAL	Unknown	No	Dry Creek	Sacramento River
29	3/12/2014	760 Devonshire Ln, Lincoln	Placer County	City of Lincoln	SEWAGE	100 Gal(s)	No	Storm Drain	Sacramento River
30	3/14/2014	6737 Lakewood Way, Orangevale	Sacramento County	Sac Fire Dispatch	UNKNOWN	10 Gal(s)	No	Sundance Creek	Sacramento River
31	3/21/2014	6671 Lindbergh Drive	Sacramento County	Sacramento County Airport System	UNKNOWN	Unknown	No	Storm drain	Sacramento River
32	3/27/2014	1040 Marshal Way, Placerville	El Dorado County	City of Placerville	OTHER	7130 Gal(s)	No	Storm drain, Cedar Ravine Creek	American River

Att D: Spills Reported to OES in Near Intake Zone
January - December 2014

#	Incident Date [1]	Location	County	Agency Notifying	Type of Spill	Amount Spilled	Contained Before Enter Waterway?	Waterway Entered	Tributary to
33	3/28/2014	4391 Arden Way, Sacramento	Sacramento County	Sacramento Area Sewer District	SEWAGE	160 Gal(s)	No	Open Creek / Drainage Area to Chicken Ranch Slough	American River
34	3/30/2014	3464 Southport Dr, Sacramento	Sacramento County	Sacramento Area Sewer Dist	SEWAGE	486 Gal(s)	No	Storm Drain	Sacramento River
35	3/31/2014	1040 Marshall Way, Placerville	El Dorado County	City of Placerville	SEWAGE	1700 Gal(s)	No	Storm Drain, Cedar Ravine Creek	American River
				April					
36	4/7/2014	State Route 20 West of Hunter Rd.	Colusa County	CHP	CHEMICAL	0.5 Gal(s)	No	Hopkins Slough	Sacramento River
37	4/12/2014	3680 Foster Court, Sacramento	Sacramento County	Citizen	UNKNOWN	Unknown	No	Storm Drain	American River
38	4/15/2014	2150 Auburn Blvd., Sacramento	Sacramento County	Sacramento Area Sewer District	SEWAGE	11840 Gal(s)	No	Storm Drain	Sacramento River
39	4/17/2014	3215 United Dr, Cameron Park	El Dorado County	El Dorado Co Env Health	CHEMICAL	5 Gal(s)	No	Cameron Park Lake	American River
40	4/17/2014	Corner of Burilne St and Palm Grove, Rancho Cordova	Sacramento County	Sac Regional Dispatch	PETROLEUM	6 Gal(s)	No	Storm Drain	American River
				May					
41	5/4/2014	6944 Caleta Ln, Citrus Heights	Sacramento County	Sacramento Environmental Management	SEWAGE	800 Gal(s)	No	Arden-Arcade Creek	Sacramento River
42	5/7/2014	Elkhorn Boat Ramp @ 5865 Garden Hwy., Sacramento	Sacramento County	Sacramento City FD	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
43	5/13/2014	Chili Bar Dam at the end of Rafter Lane. Latitude: 38° 46' 18" N, Longitude: 120° 48' 46" W, 3 miles north of Placerville.	El Dorado County	PG&E	PETROLEUM	2 Oz.	No	South Fork of the American River	American River
44	5/14/2014	I Street at Sacramento River crossing, Sacramento	Sacramento County	NRC	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
45	5/18/2014	12210 Fair Oaks Blvd, Fair Oaks Meadows, Near Apt. 55	Sacramento County	Sac Fire	SEWAGE	Unknown	No	Storm Drain	Sacramento River
46	5/22/2014	3939 Walnut Ave, Sacramento	Sacramento County	Sacramento Area Sewer Dist	SEWAGE	6000 Gal(s)	No	Arcade Creek	American River
47	5/24/2014	1263 Franklin Ave., Yuba City	Sutter County	Circle K Stores Env. Group	PETROLEUM	5 Gal(s)	Unknown	Storm Drain	Sacramento River
				June					
48	6/1/2014	6757 Iowa Ct, Granite Bay	Placer County	Citizen	UNKNOWN	Unknown	No	Miners Ravine	Sacramento River
49	6/8/2014	7835 Hampton Ln., Citrus Heights	Sacramento County	SAS	SEWAGE	500-5,000 Gal(s)	Unknown	Storm Drain	Sacramento River
50	6/8/2014	California State Prison Sacramento, Women's Facility 300 Prison Rd, Represa	Sacramento County	Folsom Prison Water Treatment	SEWAGE	300 Gal(s)	No	Storm drain Bypass	American River
51	6/12/2014	39° 13.500N, 121° 23.995W	Yuba County	Cal Fire Grass Valley	CHEMICAL	40 Gal(s)	No	Yuba River	Sacramento River
52	6/13/2014	End of Paradise Rd., Princeton	Colusa County	Colusa Sheriff's Office	PETROLEUM	3 Gal(s)	No	Drainage Ditch	Sacramento River
53	6/13/2014	Sacramento River approx 1/2 mile SO Confluence of Feather River	Sacramento County	Citizen	CHEMICAL	Unknown	No	Sacramento River	Sacramento River
54	6/15/2014	Varney East of State Route 113	Sutter County	CHP Chico Comm Center	PETROLEUM	400 Gal(s)	No	Irrigation Ditch	Sacramento River
55	6/21/2014	5341 Walnut Ave, Sacramento	Sacramento County	Sacramento Area Sewer District	SEWAGE	1008 Gal(s)	No	Storm Drain	Sacramento River
56	6/26/2014	Hwy 99, 0.2 miles north of Powerline Rd, Nicholas	Sutter County	Montgomery & Associates	PETROLEUM	1 Qt.(s)	No	Feather River	Sacramento River
57	6/29/2014	MP 144 of the Sacramento Sub Division. Intersection of Main Ave and Western Ave., Sacramento	Sacramento County	UPRR	PETROLEUM	1000 Gal(s)	Unknown	Unknown Creek	Sacramento River
58	6/30/2014	7631 Sly Park Road, Placerville	El Dorado County	Private Citizen	SEWAGE	Unknown	No	Clear Creek	American River
				July					
59	7/2/2014	135 Blakeslee Dr, Folsom	Sacramento County	Folsom Fire Dept	PETROLEUM	10 Gal(s)	No	Storm Drain	American River
60	7/5/2014	1455 Eureka Rd, Suite 100, Roseville	Placer County	Roseville Fire Department	SEWAGE	500 Gal(s)	No	Storm Drain	Sacramento River
61	7/6/2014	6981 Garden Hwy, Sacramento	Sacramento County	Homeowner	PETROLEUM	30 Gal(s)	No	Sacramento River	Sacramento River
62	7/9/2014	601 Newcastle Rd, Newcastle	Placer County	Flyers Energy	PETROLEUM	5-10 Gal(s)	No	Storm Drain	Sacramento River
63	7/14/2014	200-300 yds down stream of the Tower Bridge, Sacramento	Sacramento County	Private Citizen	PETROLEUM	3-4' x 50'	No	Sacramento River	Sacramento River
64	7/18/2014	1755 34th St, Sacramento	Sacramento County	Sacramento City Fire Dept	PETROLEUM	15 Gal(s)	No	Storm Drain leading to water treatment plant	Sacramento River
65	7/19/2014	10890 Coloma Rd., Rancho Cordova	Sacramento County	SASD	SEWAGE	1212 Gal(s)	No	Storm Drain	American River
66	7/26/2014	4100 Krpnsano Way, El Dorado Hills	El Dorado County	El Dorado Irrigation District	OTHER	150 Gal(s)	No	Storm Drain	American River

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#	Incident Date [1]	Location	County	Agency Notifying	Type of Spill	Amount Spilled	Contained Before Enter Waterway?	Waterway Entered	Tributary to
August									
67	8/5/2014	O St and Front St, Sacramento	Sacramento County	Citizen	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
68	8/6/2014	7795 Antelope Rd., Citrus Heights	Sacramento County	Sacramento Area Sewer District	SEWAGE	2625 Gal(s)	No	Unknown Creek	Sacramento River
69	8/14/2014	Franklin Rd and Brown Ave, Yuba City	Sutter County	City of Yuba City	SEWAGE	1000 Gal(s)	No	Storm Drain / Gilsizer Slough	Sacramento River
70	8/21/2014	3776 Northgate Blvd, Sacramento	Sacramento County	Sacramento City Fire	CHEMICAL	2.5 Gal(s)	No	storm drain	Sacramento River
71	8/21/2014	18019 County Road 117, West Sacramento	Yolo County	NRC	PETROLEUM	100 ft x 20 ft Sheen	No	Sacramento River	Sacramento River
72	8/27/2014	6960 Auburn Folsom Rd, Granite Bay	Placer County	Private Citizen	UNKNOWN	Unknown	No	Miners Ravine	Sacramento River
September									
73	9/3/2014	Sacramento River near 6521 Garden Hwy, near Elk Horn, Sacramento	Sacramento County	Private Citizen	PETROLEUM	500 yards x 25 yards Sheen	No	Sacramento River	Sacramento River
74	9/4/2014	100 Prison Road, Folsom	Sacramento County	California State Prison - Sacramento	SEWAGE	100 Gal(s)	No	Storm Drain, holding pond and Tule Bed	American River
75	9/7/2014	6900 Airport Blvd, Sacramento	Sacramento County	Sacramento International Airport	SEWAGE	7 Gal(s)	No	Storm Drain	Sacramento River
76	9/10/2014	Locust St at Hwy 113, Knights Landing	Yolo County	CHP-Sacramento	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
77	9/20/2014	San Juan Rd. and Garden Hwy., 5 Miles upstream of Chevy's restaurant, Sacramento	Sacramento County	Concerned Citizen	PETROLEUM	1 Ft by 1 Ft Sheen	No	Sacramento River	Sacramento River
78	9/23/2014	2335 Sierra Madre Ct (Cordova Meadows Apartments), Rancho Cordova	Sacramento County	Sacramento Co Hazmat	SEWAGE	2000 Gal(s)	No	Storm Drain	American River
79	9/23/2014	5656 Auburn Blvd., Sacramento	Sacramento County	NRC	SEWAGE	Unknown	No	Storm Drain	Sacramento River
October									
80	10/1/2014	3333 Garden Hwy	Sacramento County	Citizen	PETROLEUM	Unknown	No	Sacramento River	Sacramento River
81	10/5/2014	Christian Valley and Dry Creek Rd, Auburn	Placer County	CHP, Auburn	PETROLEUM	20 Gal(s)	No	Dry Creek	Sacramento River
82	10/5/2014	6900 Airport Blvd West, Sacramento	Sacramento County	Southwest Airlines	PETROLEUM	5 Gal(s)	No	Storm Drain	Sacramento River
83	10/6/2014	Knollwood Rd x Country Club Rd, Cameron Park	El Dorado County	Private Citizen, Neighborhood Watch	OTHER	Unknown	No	Storm Drain	American River
84	10/6/2014	Parker St Near Stockton St, Oak Park Dist, Sacramento	Sacramento County	NRC	PETROLEUM	Unknown	No	Storm Drain	Sacramento River
85	10/15/2014	4954 Ferigo Lane, Carmichael	Sacramento County	Sacramento Sewer District	SEWAGE	1740 Gal(s)	No	Storm Drain	Sacramento River
86	10/22/2014	4980 Watt Ave x Roseville Rd, Sacramento	Sacramento County	Sacramento Suburban Water Dist	OTHER	Unknown	No	Magpie Creek	Sacramento River
87	10/23/2014	Latitude: 38° 46' 18" N, Longitude: 120° 48' 46" W	El Dorado County	NRC	PETROLEUM	6' x 4' Sheen	No	South Fork American River	American River
88	10/24/2014	I-80 at Sacramento River, West Sacramento	Yolo County	Private Citizen	PETROLEUM	80' x 20' Sheen	No	Sacramento River	Sacramento River
89	10/28/2014	Adjacent to 5840 Pony Express Trail, Pollock Pines	El Dorado County	Citizen	OTHER	Unknown	No	Drainage Ditch	American River
90	10/29/2014	Main Street and Turner Street, Placerville	El Dorado County	Public Works	OTHER	30 Gal(s)	No	Hangtown Creek	American River
November									
91	11/1/2014	1701 Nimbis Rd, Gold River	Sacramento County	Concerned Citizen	PETROLEUM	drips	No	Lake Natoma	American River
92	11/3/2014	7136 Terrel, Citrus Heights	Sacramento County	Sacrameto Area Sewer District	SEWAGE	1640 Gal(s)	No	Brooktree Creek	Sacramento River
93	11/10/2014	10706 Sunrise Ridge Cir, Auburn	Placer County	City of Auburn	SEWAGE	1000 Gal(s)	No	Unnamed Creek	Sacramento River
94	11/10/2014	4739 Pasadena Avenue, Sacramento	Sacramento County	Sacramento Area Sewer District	SEWAGE	1500 Gal(s)	No	Storm Drain, runs to Arcade Creek	Sacramento River
95	11/13/2014	7156 Seay Lane, Penryn	Placer County	N/A	PETROLEUM	10' x 6' Sheen	No	No Name Creek	Sacramento River
96	11/13/2014	4840 Vista Park Dr, Sacramento	Sacramento County	NRC	PETROLEUM	30 Gal(s)	No	Storm Drain	Sacramento River
97	11/20/2014	south of the I-5 Bridge at the Elkhorn Boat Ramp, Sacramento	Sacramento County	Sacramento County Environmental Management	PETROLEUM	1 Gal(s)	No	Sacramento River	Sacramento River
98	11/24/2014	7000 Sunrise Blvd, Citrus Heights	Sacramento County	Sacramento Area Sewer Distrcit	SEWAGE	600 Gal(s)	No	Arcade Creek	Sacramento River
99	11/29/2014	6851 Lindbergh Dr. Gate B7, Sacramento	Sacramento County	Sacramento International Airport	PETROLEUM	240 Gal(s)	No	Storm Drain	Sacramento River
100	11/30/2014	3600 Karl Dr, North Highlands	Sacramento County	Sac Area Sewer Dist	SEWAGE	720 Gal(s)	No	Unnamed drainage Channel	Sacramento River

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December									
101	12/1/2014	728 Colusa Ave, Yuba City	Sutter County	Broadbent and Associates	PETROLEUM	10-13 Gal(s)	No	Storm Drain	Sacramento River
102	12/3/2014	11755 Joeger, Auburn	Placer County	Placer County	SEWAGE	4000 Gal(s)	No	Rock Creek	Sacramento River
103	12/6/2014	7711 Juan Way	Sacramento County	Sacramento Area Sewer District	SEWAGE	1208 Gal(s)	No	Storm Drain	Sacramento River
104	12/11/2014	1601/1709 S. Ridge Blvd, Sutter	Sutter County	Sutter Co. Development Services	CHEMICAL	300 Cu.Ft.	No	Sutter Bypass	Sacramento River
105	12/11/2014	17th St and B Street, Marysville	Yuba County	City of Marysville	SEWAGE	1000 Gal(s)	No	Feather River	Sacramento River
106	12/15/2014	6330 McNair Circle, Sacramento	Sacramento County	Alamo Rental Car	PETROLEUM	1 Pt.(s)	Unknown	Storm Drain	Sacramento River
107	12/20/2014	2614 Bravado Drive, Rancho Cordova	Sacramento County	Sacramento Area Sewer District	SEWAGE	200 Gal(s)	No	Storm Drain	American River
108	12/22/2014	3600 Karl Dr, North Highlands	Sacramento County	Sacramento Area Sewer Dist	SEWAGE	2106 Gal(s)	No	Storm Drain	Sacramento River
109	12/22/2014	Connie Dr x Roseville Rd, Sacramento	Sacramento County	Sacramento Regional Fire	PETROLEUM	2-3 Qt(s)	No	Arcade Creek	Sacramento River

[1] Date incident occurred, not date reported

DEPARTMENT
OF UTILITIES

ENGINEERING
SERVICES DIVISION

CITY OF SACRAMENTO
CALIFORNIA

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November 15, 2012
120298:EC

Anne Littlejohn
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114
Allttlejohn@waterboards.ca.gov

Subject: Comments on the CEQA Scoping for Evaluation of the Municipal and Domestic Supply Beneficial Use in Agriculturally Dominated Water Bodies

Dear Ms. Littlejohn:

This letter provides comments from the Sacramento River Source Water Protection Program on the California Environmental Quality Act (CEQA) Scoping for Evaluation of the Municipal and Domestic Supply Beneficial Use (MUN) in Agriculturally Dominated Water Bodies. The City of Sacramento and Sacramento County Department of Water Resources sponsor the Sacramento River Source Water Protection Program. This program is coordinated with other agencies that draw their drinking water from the River, including the City of West Sacramento and East Bay Municipal Utility District (EBMUD). The Sacramento River Source Water Protection Program seeks to preserve and protect the source water quality of the Sacramento River drinking water supply for current and future generations.

As municipal water suppliers using the Sacramento River we believe we have a significant interest in the proposed Basin Plan amendment scope. We respectfully request to be added to the list of stakeholders in the continued development of this policy. We also believe that stakeholder participation for the MUN de-designation should include the US EPA Region 9 and California Department of Public Health drinking water programs, as well as other potentially impacted downstream water agencies.

The Central Valley watershed provides drinking water for more than half the population of the State of California. Seemingly small impacts to a large number of water bodies in the Sacramento and San Joaquin river watersheds could result in cumulatively considerable changes to source water pollutant loading. Agriculturally dominated water bodies can contribute large amounts of water to the main stem of the Sacramento River, and these can be sources of organic carbon, pathogens, and pesticides, which are some of the constituents of interest to the local Sacramento River water utilities. The four proposed case study areas included in this

project are not likely to result in significant impacts to the Sacramento River source water quality. However, if this effort results in a broader de-designation process for agriculturally dominated water bodies for MUN and all beneficial uses, then this would be a major process with significant implications for cumulative water quality impacts to the Sacramento River.

While we support the efforts of Water Board staff to streamline regulation, clarify existing policy, and provide reasonable and protective programs for municipal compliance with discharge requirements, we have the following concerns regarding the CEQA scoping information provided for comment:

- A de-designation framework could conflict with other policies currently existing or in development at the Water Board, such as the Drinking Water Policy, the Irrigated Lands Regulatory Program, Total Maximum Daily Loads, and the Rice Pesticides Program. We request that the Water Board specifically and thoroughly evaluate the implications of individual and cumulative de-designation on these programs.

- As the Water Board notes, the MUN beneficial use is specifically protected by the Sources of Drinking Water Policy (Resolution 88-63). This requires a complete analysis prior to de-designation and implementation of a monitoring program to ensure that downstream water bodies continue to be protected. We request that the Water Board ensure that all de-designations of MUN beneficial use are completely evaluated and assessed, including; detailed monitoring requirements for all applicable listed Title 22 constituents, regulatory controls to assess the impacts, and a mechanism for response and action if impacts are detected subsequent to de-designation. Any water quality monitoring program would need to be designed to be able to identify the cause of potential water quality deterioration in downstream water bodies. Also, the special requirements for MUN de-designation (downstream monitoring requirements) do not currently fully protect the MUN beneficial use for all drinking water regulated constituents, such as microbial constituents and organic carbon and by-products.

- The regulation of drinking water constituents can change periodically at both the federal and state level. We request that the Water Board regularly review any de-designation monitoring program to identify any newly regulated drinking water constituents or revised drinking water standards.

- The Central Valley is a large and variable area that represents many types of water bodies. We acknowledge the potential benefit of a "template" process in streamlining effective regulation. However, we are concerned that the narrow focus of the four archetypes or case studies will not adequately protect MUN or other future beneficial use de-designations and impacts from other sources. We request that the Water Board consider expanding the archetypes to include other types of dischargers in more varied geographic conditions.

- We agree with the Water Board's assessment that "more data needs to be collected before determining if a basin plan amendment is needed. The data needs noted include: characterization of the receiving waters, water quality data for the effluent and all receiving waters, flow data for all of the receiving waters, an anti-degradation analysis, and an environmental analysis." Because of the site-specific nature of the impacts of removing the MUN designation, we request that these studies be conducted for each

individual water body proposed for de-designation and that downstream impacts be specifically addressed.

- We request a description from the Water Board on the specific differences between the individual Basin Plan Amendment process and the potential development of a "template" process for de-designation in the next phase of the larger effort. We are specifically interested in any differences in technical evaluations and the opportunity for public review and input. We hope that any de-designation of the MUN beneficial use, however streamlined, would allow for the same level of public input as an individual Basin Plan Amendment.

We do not have a preferred alternative at this time, but we request that the Water Board examine an additional alternative that would provide limited exceptions for site-specific water quality standards based on the MUN beneficial use (e.g., conductivity, iron), rather than removal of the MUN use entirely, to specific categories of agriculturally dominated water bodies.

The proposed alternatives should include the following specific considerations in order to comprehensively and clearly analyze de-designation impacts to drinking water protection:

- Develop maps or lists which identify other water bodies in the Central Valley, in addition to the four archetypes, which may have the MUN beneficial use de-designated under each alternative in order to quantitatively compare the impacts. If a template will be developed for other beneficial uses or dischargers, then that should be prepared and presented as well.

- Determinations of natural waterways, constructed waterways, and converted waterways needs to be very clear if the intent is to use water body categorizations.

- Definitions and categories need to consider variations over time, such as seasonal effects, range of conditions over wet and dry years, variations in agricultural operations, and potential for changes due to climate change.

- Determination of the application of the tributary rule to the various types of water bodies if intending to use that application.

- A quantitative cumulative impact analysis of the impacts on drinking water quality, specifically examining the fraction of flow, under all seasons and flow conditions including low flow periods, that would be from non-MUN designated waters under each alternative. Cumulative analysis will assist with identifying the available dilution of water flows not meeting MUN water quality criteria.

- Specify monitoring requirements for MUN de-designation, including a constituent list and frequency, as well as the process for analysis and response. We would also suggest that the list include constituents that will be included in the Drinking Water Policy currently under development, such as total organic carbon, *Giardia*, *Cryptosporidium*, or bacterial surrogates. This will be a necessary component to understand the potential cost of the alternatives.

We seek to work cooperatively with the Water Board and the other stakeholders to help ensure a process that reasonably protects Sacramento River source water quality. If you have any questions on the above, please do not hesitate to contact Elissa Callman at (916) 808-1424. Thank you for the opportunity to provide our comments on the CEQA scoping.

Sincerely,

Sherill Huun
Supervising Engineer

cc:
Joe Karkoski, CVRWQCB
Jeanne Chilcott, CVRWQCB
Betty Yee, CVRWQCB
Jason Gambatese, EPA Region 9
Jamelya Curtis, EPA Region 9
Richard Hinrichs, CDPH
Dave Brent, City of Sacramento
Bill Busath, City of Sacramento
Michael Malone, City of Sacramento
Forrest Williams, Sacramento County DWR
Dave Underwood, Sacramento County DWR
Dan Gwaltney, Sacramento County DWR
Dan Mount, City of West Sacramento
Eileen White, EBMUD
Hubert Lai, EBMUD

City of
SACRAMENTO
Department of Utilities

December 19, 2013
130283:BS:EC

Jeanne Chilcott
California Regional Water Quality Control Board
Central Valley Region
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670
Email: jchilcott@waterboards.ca.gov

Subject: Comments on CEQA Scoping for Development of Central Valley Wide Salt and Nitrate Management Plan for Incorporation into the Sacramento-San Joaquin and Tulare Lake Basin Plans

Dear Ms. Chilcott:

The purpose of this letter is to provide stakeholder input from the Sacramento River Source Water Protection Program (SRSWPP) on the CEQA scoping for the Central Valley Wide Salt and Nitrate Management Plan (SNMP), based on the Regional Board staff report and presentation. The SRSWPP seeks to maintain the high quality of the Sacramento River drinking water supply for the current and future generations. The stakeholder input provided in this letter also relates to protection of the high quality of the American River water supply. It is our responsibility as water utilities to ensure that our water is both healthful and free of any unpleasant taste, odor, or other aesthetic effects. Protecting the quality of the raw water supply is key to ensuring that treated water quality not only meets the primary and secondary drinking water standards, but moreover is the best quality that we can reasonably provide to protect public health.

We recognize the need for a comprehensive plan to address salt and nitrate management in the Central Valley, but we are concerned that some of the broader-scale components outlined in the Staff Report for the California Environmental Quality Act (CEQA) scoping may result in unintended consequences to the quality of the Sacramento River and American River surface water supplies that we use for our municipal drinking water supply. Although we do not currently have a direct concern with source water levels of salinity or nitrate in our surface water supplies, we are

providing general input related to our interest as a municipal surface water user for potential application of concepts developed during preparation of the Salt and Nitrate Management Plan to water quality management in the overall watershed.

Source water protection is the first step in a "multi-barrier" approach to providing safe drinking water. This approach is acknowledged and supported in the Board's Central Valley Drinking Water Policy for Surface Waters of the Delta and its Upstream Tributaries (Drinking Water Policy). It is further stated that, "While source water protection is the first barrier, it is not intended to provide pristine water that does not require treatment but rather, to prevent source degradation from requiring additional treatment and placing more reliance on the treatment process. High quality source waters minimize public health risk if there is a breakdown in the treatment process." Drinking water treatment is constituent-specific and does have the potential for breakthrough. Even in cases where treatment is an option, treatment can be substantially more costly than source water protection. We rely on management programs, including the very important programs of the Board, as an essential part of the source water protection for the high quality of the Sacramento and American River watersheds. The Sacramento River watershed, including the American River watershed, is nearly 25,000 square miles and includes many types of activities and dischargers, most of which are regulated by permits from the Board. The Board, supported by other regulatory agencies, regulated communities, and educational organizations, has made substantial strides in implementing programs that are protective of the many beneficial uses of our State Waters, including drinking water. The Irrigated Lands Regulatory Program (ILRP) is an example of the progress in our region in protecting surface water quality.

Our key areas of interest on the SNMP CEQA Scoping Staff Report can be grouped into the following six categories, further discussed in the attachment to this email:

- provisions and clarifications for antidegradation evaluation
- applicability of beneficial use designations, including definition of any new designations
- applicability of water quality objectives, especially non-salinity secondary maximum contaminant levels (MCLs)
- water body categorizations
- variations in implementation plans, revisions to point of compliance
- consistency with the intents and requirements of other policies

We appreciate the opportunity to provide constructive input towards planning solutions for this complex issue. Please do not hesitate to contact me at 916-808-1455 or Elissa Callman at 916-808-1424 if you would like to discuss the above.

Sincerely,

Sherill Huun
Supervising Engineer

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ATTACHMENT 1
SRSWPP INPUT ON CV-SALTS
SALT AND NITRATE MANAGEMENT PLAN
CEQA SCOPING STAFF REPORT
December 19, 2013

The Sacramento River Source Water Protection Program (SRWSPP) has been participating in the Regional Board's MUN De-Designation of Agriculturally-Dominated Water Bodies Program and provided information and input to that program that may be useful in several of the key elements of the CV-SALTS Salt and Nitrate Management Plan (SNMP). We hereby reference the handouts and materials provided by the SRSWPP as part of the August 14, 2013 coordination meeting with Board staff, SRSWPP and the California Urban Water Agencies, as well as the official input email submitted to the Regional Board on October 3, 2013.

We anticipate that the Regional Water Board will ensure that the requirements of the SNMP will meet all legal obligations to ultimately assess whether or not changes are resulting in any impacts to MUN designated supplies and will be able to implement actions to cease and reverse any identified impacts caused.

Provisions and Clarifications for Antidegradation Evaluation

State Board Resolution No. 68-16 is the Antidegradation Policy in California. It applies to high quality waters (such as the Sacramento and American Rivers) and requires that they be maintained to the maximum extent possible. It has been interpreted as allowing lowering water quality if that change is consistent with the maximum benefit to the people of California and will not unreasonably affect present and potential beneficial uses, and will not result in water quality lower than applicable standards. In addition, waste discharge requirements for proposed discharge must result in the best practicable treatment and control of discharge to assure no pollution or nuisance and the highest water quality consistent with the maximum benefit to the people of California. We request that this evaluation process specifically include cost impacts of advanced levels of drinking water treatment if changes to water quality objectives for existing MUN designated waters are proposed.

We understand that the AGUA decision may revise the interpretation and has highlighted the need to provide specific tools for the Regional Boards to conduct an appropriate analysis, consistent with the interpretation of the Antidegradation Policy in the AGUA decision. The State Board is expected to convene an Expert Panel to provide a more thorough analysis and long-term statewide recommendations regarding many of the issues implicated in agricultural orders, including indicators and methodologies for determining risk to surface and groundwater quality, targets for measuring reductions in risk, and the use of monitoring to evaluate practice effectiveness. We request that the SNMP include a reference to this effort and a specific means for re-opening and addressing the Antidegradation analysis with these new tools.

Applicability of Beneficial Use Designations, Including Definition of Any New Designations

A concern of the SRSWPP is that the changes to beneficial use designations, or associated water quality objectives, may cause or contribute to a degradation of the Sacramento or American River source water quality. If the Regional Board determines to include a reassessment of the applicability or definition of existing beneficial use designations, or definition of a new beneficial use category, we believe that process needs to include a broad evaluation including factors such as actual and potential users and consideration of impacts to downstream water quality for existing users.

As defined and supported by the Regional Board in the Drinking Water Policy for the Delta (Drinking Water Policy), the multi-barrier approach includes source water protection as part of providing safe water to the people of the State. A beneficial use definition based on assuming that water treatment removes all constituents to just meet the drinking water standards would essentially remove the first barrier. Degradation of source water quality could result in significant increases in the cost to treat the source water. Conventional filtration is effective at removing solids, microbials, and many other related constituents, but it is not identified by the Department of Public Health (DPH) as a best available technology for any of the regulated organic compounds and many other constituents with either a primary or secondary drinking water standard.

MUN beneficial use designations should not be defined based on water treatment requirements or capabilities. We do not believe that a narrative definition for the MUN beneficial use could be translated in any meaningful or consistent way by Board staff to assess if discharges are causing or contributing to an exceedence of a water quality objective in MUN designated water bodies. We are unaware of any other existing translation of narrative standards based on management practices of the impacted beneficial use (i.e. drinking water treatment). We have researched the requirements of three other western states (Colorado, Nevada, and Oregon), which have connected their MUN beneficial use descriptions to references to drinking water treatment. Although the definitions include those references, the numeric water quality objectives that actually apply to discharges to the MUN designated water bodies are set at or below the drinking water standards in those states. There is no attempt to narratively translate the drinking water standards to different limits in the discharge permits or omit those objectives.

Any process developed by the Regional Board for determining the Limited MUN beneficial use should include an assessment of any characteristics related to the definition. We recommend that the Board staff make certain that the definition for any new beneficial use category reflects the process used to obtain the use classification. Water bodies that contribute to, or are tributary to, downstream MUN designated water bodies should be protected in a manner that prevents degradation of those downstream supplies.

Applicability of Water Quality Objectives, Especially Non-Salinity Secondary MCLs

The SNMP may propose to include removal of secondary MCLs, including those not related to salinity or nitrate. We do not see why the non-salinity secondary MCLs should be addressed as part of a salinity and nitrate management plan and we request clarification from the Regional Board on why these are potentially being included in this plan. We would suggest that the non-salinity secondary MCLs not be included in the proposed SNMP. Conventional filtration has limited effectiveness at removal of many secondary MCL constituents, and the use of a narrative nuisance water quality objective may be difficult to implement and identify the causes of those types of impacts.

The Sacramento River is currently the highest quality water supply for a large portion of California, including local and Southern California users. The source water supply currently meets many of the water quality objectives related to the MUN beneficial use as designated in the Basin Plan. These objectives are based on the primary and secondary drinking water standards set by the DPH, which the water utilities are required to comply with. There are several key regulated water quality constituents which were not specifically included in the Basin Plan, so they were addressed as part of the Drinking Water Policy; organic carbon, *Giardia*, and *Cryptosporidium*.

Existing watershed and discharger management programs have been very successful at minimizing the persistent detection of many constituents of concern in our source water and preventing increasing trends for most regulated drinking water constituents, including both primary and secondary regulated constituents. Increasing concentrations in the source water of any other DPH regulated constituents, or presence of newly regulated constituents in the future, could result in risk to public health in the case of primary regulated constituents, taste and odor impacts in the case of secondary regulated constituents, loss of consumer confidence, or redirected costs to our water treatment and residual management systems.

We believe that any new beneficial use categories for drinking water will need to have numeric, as well as narrative water quality objectives in order to assess impacts to the use and prevent variable interpretations of a general narrative. We anticipate that the Board will provide guidance on how any narrative objectives would be applied, evaluated, and acted upon.

We understand that for a new Limited MUN beneficial use there may be a desire to define new water quality objectives, higher than the existing MUN water quality objectives. However, this process needs to be considered carefully to determine how to define those alternative numeric objectives (e.g., trigger levels calculated after applying minimum rates of reduction through conventional treatment, performance standards developed to protect downstream uses through a site-specific load allocation-type analysis, etc.). It needs to continue to include the primary and secondary drinking water standards identified in the Basin Plan, as well as reflect the Drinking Water Policy. If the Board determines to go through this process, we expect that they would engage the

California Department of Public Health (DPH) and a broad-scale water utility group to participate in the development of any alternative numeric objectives.

Water Body Categorizations/Classifications

If the Regional Board determines to categorize/classify water bodies in order to more broadly apply beneficial uses, and associated water quality objectives, then we request that Board staff develop clear and specific processes for such categorizations.

We believe that the process needs to include a certification step to ensure that all information used to support categorizations is validated. Since water bodies have the potential to be engineered and managed in the Central Valley and may change in the future, we believe that these categorizations would need to be periodically reviewed and updated to ensure that appropriate uses are associated with them.

Variations in Implementation Plans, Revisions to Point of Compliance

The SRWSPP has submitted detailed comments to the MUN De-Designation Program to provide input and support our suggestions on the monitoring/surveillance requirements of that program, and hereby reference those comments dated October 3, 2013. We support the Regional Board developing clarifications for compliance evaluations to ensure consistency in implementation. Since this will be a permanent change in the management structure, it is critical that the program be designed for adaptive management and response action if issues are identified.

We understand from the Sources of Drinking Water Policy that monitoring to support de-designations through that program must be conducted in the discharge of the de-designated water body. We would support a monitoring location upstream of the current MUN users, where the de-designated discharge comes into the downstream MUN water body. We also are open to the use of "sentinel" monitoring sites when there are a group of de-designated water bodies in a geographic region. We do not believe that the point of compliance should be moved downstream to the location of an existing user (i.e. an existing drinking water intake). Identification of degradation of water quality at upstream locations serves as an early indicator of potential treatment concerns and can be evaluated to identify the potential causes. Upstream monitoring closer to the source should be more effective in identifying and addressing a water quality problem if it occurs. We understand that this is the approach utilized in the Irrigated Lands Regulatory Program (ILRP).

We would like to note that neither the Surface Water Ambient Monitoring Program (SWAMP) nor the ILRP monitoring currently includes the constituents, frequency, and locations that could be required as part of an overall MUN designation program, so these programs would need to be modified if they will be solely used to provide monitoring for this effort. The ILRP monitoring programs are designed to provide representative monitoring information, to evaluate water quality and to inform each coalition ILRP group on whether additional management practices may be needed for

their specific activities. The monitoring programs were not designed to provide sufficient monitoring data to ensure that de-designation of water bodies or changes in water quality objectives are not causing or contributing to degradation.

Consistency with the Intents and Requirements of Other Policies

We look forward to the continued review of the specific requirements of the de-designation allowed by Section 2 of the Sources of Drinking Water Policy. We believe that developing a process for identifying "relevant" water quality objectives will be necessary due to the variability in the water bodies and their potential discharge characteristics, both current and future (i.e. agriculture waters, wastewater, stormwater, industrial waters).

Any modifications to the Tributary Rule must be consistent with the ruling from USEPA in May 2000 when they disapproved State Board Resolution 95-12. The proposed change included deletion of the footnote to Table II-1 (Tributary Rule) and replacement with a statement that the designations would be set by staff judgment for unidentified water bodies in specific orders.