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ASSESSMENT OF SURFACE WATER QUALITY DATA COLLECTED FROM FALL 2009 THROUGH FALL 2013 BY THE SURFACE WATER AMBIENT MONITORING PROGRAM

Colorado River Basin Region

Prepared by:

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Water Quality in the Colorado River Basin Region

Assessment of Surface Water Quality Data Collected from fall 2009 through fall 2013 by the Surface Water Ambient Monitoring Program

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Executive Summary

The Colorado River Basin Region covers about 13 million acres (20,000 square miles) in southeastern California and includes all of Imperial County and portions of San Bernardino, Riverside, and San Diego Counties. A significant feature in the Region is the Salton Trough, which contains the Salton Sea, the Coachella and Imperial Valleys. Geographically, the Region is a small portion of the total Colorado River drainage that includes parts of the states of Arizona, Nevada, Utah, Wyoming, Colorado and New Mexico from United States, and Republic of Mexico, Baja California.

The Lower Colorado River provides 95% of the Region's surface water supply. Water from the Colorado River is diverted via the All American Canal and the Colorado River Aqueduct for agricultural and municipal use. Ultimately, water drains into the Salton Sea through the New and Alamo Rivers, and agricultural drains in the Coachella and Imperial Valleys. Due to the agricultural, municipal and industrial uses this drainage contains some increased level of nutrients, salinity, trace elements, pesticides and their residues and suspended solids. The existence of some of these constituents leads to other water quality concerns such as low dissolved oxygen (DO), algae blooms, toxicity, and elevated specific conductance.

The Surface Water Ambient Monitoring Program (SWAMP) is a statewide effort to assess conditions of surface waters, by analyzing the status and trends in physical, chemical, and biological characteristics of the surface water environment. The SWAMP has two major components: statewide and regional monitoring. In the Colorado River Basin Region, the goal of SWAMP monitoring and assessment is to better characterize problem sites, maintain high quality waters, and restore priority watersheds. The Regional Board staff selected water bodies of major interest to the Region; the Lower Colorado, Alamo, and New Rivers, the Salton Sea, and the Coachella Valley Stormwater Channel. The selected water bodies are the focus of several Total Maximum Daily Loads (TMDLs) for sediment, nutrients, selenium, pesticides, and pathogens.

This report summarizes the Region's SWAMP-related data, collected biannually from the fall of 2009 through the fall of 2013. The report is organized into two sections, a general introduction to the Region and SWAMP followed by water or drain-shed discussions on the results of the reporting period. For each of the Region's water or drain-sheds there is a specific discussion about the area, and the results of the sampling efforts.

Information in this report represents a snapshot in time, reflecting water quality at the time of sampling. If spatial or temporal patterns are observed in the data then they are reported. SWAMP samples were collected for conventional constituents such as nitrates and alkalinity, sediment grain size, and trace metals and organics in both water and sediments. In addition, both sediment and water samples were subjected to toxicity testing. General parameters such as pH and DO were measured directly in the field.

Criteria used to assess the water quality in the Region include the Colorado River Basin Plan, the California Toxic Rule (CTR), USEPA Freshwater Sediment Policy and the California Code of Regulations. To benchmark the water quality in the Region, the Colorado River at the Nevada state line was used as a reference site for water entering the Basin (SWAMP, 2007).

Field measurements along with 225 unique sediment constituents and 334 unique water constituents were taken from 62 locations. These samples included, grab and integrated samples, field duplicates, and field blanks. None of the 55,111 samples were rejected however just over 20% were classified as "qualified" because they were not fully compliant with the SWAMP – Quality Assurance Project Plan (QAPP), typically this was due to exceedance of holding times. Additionally, 4.8% of the samples were labeled "screening", and 1.2% were considered "estimates", these samples are non-quantifiable.

Field measurements for DO, pH, specific conductivity, temperature, and turbidity were taken at all sampling locations. The majority of these measurements were with Basin criteria. Dissolved oxygen DO criteria were exceeded on single occasions in the Palo Verde Drain, and the Salton Sea. DO criteria were exceeded multiple times in the Alamo and New Rivers and in the Coachella Stormchannel. Salinity levels in the Salton Sea consistently exceeded the 35,000 ppm, Basin Plan objective.

Arsenic, mercury and selenium all exceed Basin Plan objectives at multiple locations. Arsenic was found primarily in the Alamo River, New River, and the Coachella Stormchannel. Mercury criterion was exceeded in all watersheds. Both the New and Alamo Rivers are listed as on the 303(d) list for impairment by mercury. Of the 225 selenium results, 101 (45%) were above the 5 ppb level that many wildlife biologists feel is unsafe for certain aquatic life uses. One selenium sample, from the Nevada state line had a value of 106 ppb which is above the Basin Plan objective of 50 ppb. Other than the single exceedance on the Colorado River, the highest levels of selenium were found on both the Alamo and New Rivers. Selenium is on the 303(d) list for the Lower Colorado, New and Alamo Rivers as well as the Imperial Valley Drains. Selenium monitoring should continue at all monitoring stations.

Ammonia criterion was exceeded in both the Coachella Valley Stormchannel and in the New River watershed. Samples from the New River Boundary station and Ave 52 in the Coachella Valley Stormchannel consistently exceeded the USEPA's Freshwater aquatic life 30 day continuous concentration criterion. Nitrate criterion was exceeded multiple times in the upper portion of the Alamo River and in the Coachella Valley Stormchannel.

The following 303(d) listed constituents were above available criterion (SWRCB 2015); *Chlorpyrifos, Diazinon, DDT, Dieldrin*. Other organic constituents consistently found in the Basin above criterion include; *Cyhalothrin, DDE, Disulfoton, Malathion*, and *Mirex*.

Analysis for bacterial indicators was completed for only the spring 2013 sampling period. Freshwater sources (Colorado and Whitewater Rivers) did not exceed criteria however, most drainages exceeded the REC I and REC II criteria.

Toxicity testing was completed on water and sediment samples from all watersheds. Overall, water samples exhibited lower toxicity than sediment samples. The Colorado River at the Nevada border site is assumed to be the "cleanest" in the Region. However, toxicity was observed on at least one sampling date for both sediment and water at either the Imperial Dam Gates or at the Nevada state line. Overall, toxicity is the most consistent impact to the Region's waters; however, the cause of toxicity is not certain.

There are analytes showing reportable concentrations that do not have established criteria to compare against the results. In addition, there are no established criteria available to evaluate the cumulative effects of the reportable results. In locations where there are fewer reportable results for organics, such as the Colorado River, analysis of toxicity data indicates that there is lower toxicity. Only two of the ten sampling dates showed for water at the New River Boundary showed toxicity, whereas all six of the sediment samples had toxicity. In general toxicity was greater in sediment samples from the Sea than in water samples.

Based on this assessment, the following actions are recommended:

- Continue with the SWAMP at the strategic sites including data analysis and reporting.

- Monitor selenium including speciation more frequently particularly for the New and Alamo River drainages. Update the Basin Plan to reflect selenium speciation and concentrations that are protective of beneficial uses.

- Prepare a Toxicity Identification for locations that had toxicity on a consistent basis. This would include sediments and water at the Nevada Boundary, Alamo and New River outlets, Coachella Stormwater Channel, and the Salton Sea sediments.

- Develop criteria for constituents that are above the reporting limit but have no established criteria to evaluate their impact to water quality. Constituents above the reporting limit without criteria for stated beneficial uses are listed in Appendix A.

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List of Abbreviations

AB	Assembly Bill
BOD	Biochemical Oxygen Demand
CDFG	California Department of Fish and Game
CRM	Certified Reference Material
CVSWC	Coachella Valley Stormwater Channel
CVWD	Coachella Valley Water District
CWA	Clean Water Act
DMT	Data Management Team
DNQ	Detect Not Quantifiable
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DQA	Data Quality Assessment
DQO	Data Quality Objective
DUP	Laboratory Duplicate
FIA	Flow Injection Analysis
IID	Imperial Irrigation District
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MQO	Measurement Quality Objective
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Non-Detect
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinate Biphenyl
PPM	Parts per million or mg L^{-1}
PPB	Parts per billion or ug L^{-1}
QA	Quality Assurance
QAMP	Quality Assurance Management Plan
QC	Quality Control
Region	Colorado River Basin Region
Regional Board	Regional Water Quality Control Board
RL	Reporting Limit
RPD	Relative Percent Difference
%R	Percent Recovery
State Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSS	Total Suspended Solids
WPCL	Water Pollution Control Laboratory

1. Introduction

1.1 Overview of the Surface Water Ambient Monitoring Program

Legislation and Administration

The Surface Water Ambient Monitoring Program (SWAMP) is a statewide effort to assess conditions of surface waters, by analyzing the status and trends in physical, chemical, and biological characteristics of the environment. SWAMP is based on a November 2000 State Board proposal to the California Legislature titled "Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program". SWAMP-related regulations are contained in California Water Code Sections 13160-13193. Additionally, the Porter-Cologne Water Quality Control Act and the federal Clean Water Act require efforts to protect and restore surface water integrity in the state of California.

SWAMP is administered by the State Water Resources Control Board (State Board) and implemented by nine Regional Water Quality Control Boards (Regional Boards) that have jurisdiction over specific areas of the state. SWAMP monitoring is conducted through California Department of Fish and Wildlife (CDFW) and U.S. Geological Survey (USGS) master contracts and through Regional Board local contracts. Other cooperating entities include the University of California, Davis - Granite Canyon Laboratory; San Jose State University - Moss Landing Marine Laboratories; Morro Bay Foundation; private contractors; and private laboratories.

Statewide Priorities and Goals

SWAMP has two major components: (1) statewide and regional monitoring, and (2) site-specific monitoring. However, current funding levels allow staff to implement only a portion of SWAMP. As a result, each Regional Board chose priority water bodies to meet Regional needs for Clean Water Act (CWA) 303(d) listing, Total Maximum Daily Loads (TMDLs), and other core regulatory programs. Government agencies, private contractors, and private laboratories coordinate their efforts so that generated data is comparable statewide. When additional funding is available, an analysis program will be developed to determine statewide status and trends of surface water quality.

SWAMP goals include:

- Creation of a comprehensive ambient monitoring program to provide information to effectively manage the state's water resources.
- Use of consistent sampling methods, analytical procedures, data quality assurance protocols, and centralized data management.
- Analysis of statewide spatial and temporal trends of surface water quality.
- Documentation of water quality in clean and polluted areas.
- Identification of specific water quality problems preventing the State Board, Regional Boards, and public from realizing beneficial uses of water in targeted watersheds.
- Evaluation of the effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the state.
- Development of water quality control policy, consistent with implementing CWA section 303(d) for listing and delisting of waterbodies.

1.2 Overview of SWAMP in the Colorado River Basin Region

Regional Priorities and Goals

In the Colorado River Basin Region, SWAMP monitoring and assessment is targeted at Regional priorities, including:

- Evaluate Protection Level/ Restoration Efforts
- Protection of Beneficial Uses
- Creation of TMDLs
- Enforcement Actions and Permitting
- Creation/ Updates of CWA 303(d) Impaired Waters List

Regional Board staff prepared a SWAMP Work Plan, in 2001 to address these priorities. This plan, updated in 2011 identifies a prioritized list of monitoring sites with site-specific or general water quality problems. The plan provides a general approach for addressing the priorities, including monitoring objectives, indicators, sampling schedule, and deliverables. The goals of Regional Board staff, for priority water bodies, are to; (1) better characterize problem sites, (2) maintain high quality waters, and (3) restore priority watersheds.

1.3 Scope of this Report

This report summarizes the Region's SWAMP-related data, collected biannually in the beginning of fall of 2009 and ending in fall of 2013. A previous report was prepared for this Region (Roberson, 2008) and covers data collected in the spring of 2002 through the spring of 2008. The report is available at www.waterboards.ca.gov.

Analysis

This report compares data with water quality objectives and established criteria to determine if beneficial uses are being attained. Whenever possible, the analysis will attempt to identify temporal or spatial trends. It should be stressed, however, that the frequency of data collection for the SWAMP is not designed to establish trends, but rather to indicate whether a trend may exist. The information represents snapshots in time, reflecting water quality at the time of sampling only. If the analysis indicates a trend, then it can be followed up with an appropriate level of monitoring.

2. Methods

2.1 Selection of Water bodies

Regional Context

The Colorado River Basin Region covers about 13 million acres (20,000 square miles) in southeastern California. The northeast portion is bordered by the state of Nevada; on the north by the New York, Providence, Granite, Old Dad, Bristol, Rodman, and Ord Mountain Ranges; on the west by the San Bernardino, San Jacinto, and Laguna Mountain Ranges; on the south by the Republic of Mexico; and on the east by the Colorado River and state of Arizona. Geographically, the Region is a small portion of the total Colorado River drainage area, which includes parts of Arizona, Nevada, Utah, Wyoming, Colorado, New Mexico, and the Republic of Mexico.

The Lower Colorado River is the main source of surface water for the Colorado River Basin Region, providing 95% of the Region's water supply. Water from the Colorado River is diverted via the All American Canal and the Colorado River Aqueduct for agricultural and municipal uses in the Region. Water ultimately drains into the New River, Alamo River, Coachella Valley Stormchannel, Salton Sea, and Coachella Valley. The Region contains 28 hydrologic units and water bodies of statewide, national, and international significance, such as the Salton Sea and Lower Colorado River. Other water sources in the Region include limited groundwater, local streams, and the Whitewater River.

Regional Board staff selected surface water bodies of major interest to the Region—the Lower Colorado River, the Alamo, New and Whitewater Rivers, and the Salton Sea. The selected water bodies are the focus of TMDLs for sediment, nutrients, selenium, pesticides, and pathogens. The Alamo River and New River are a priority, so staff could assess effectiveness of management practices implemented since the adoption of the Region's first TMDLs (Alamo River Sedimentation and Siltation TMDL, New River Pathogen TMDL, New River Sedimentation and Siltation TMDL). Figure 1 shows the Colorado River Basin Region and its planning areas. Table 1 shows selected water bodies, and the watershed areas and planning areas that they fall within. Details for each water body are provided in Section 3 of this report.

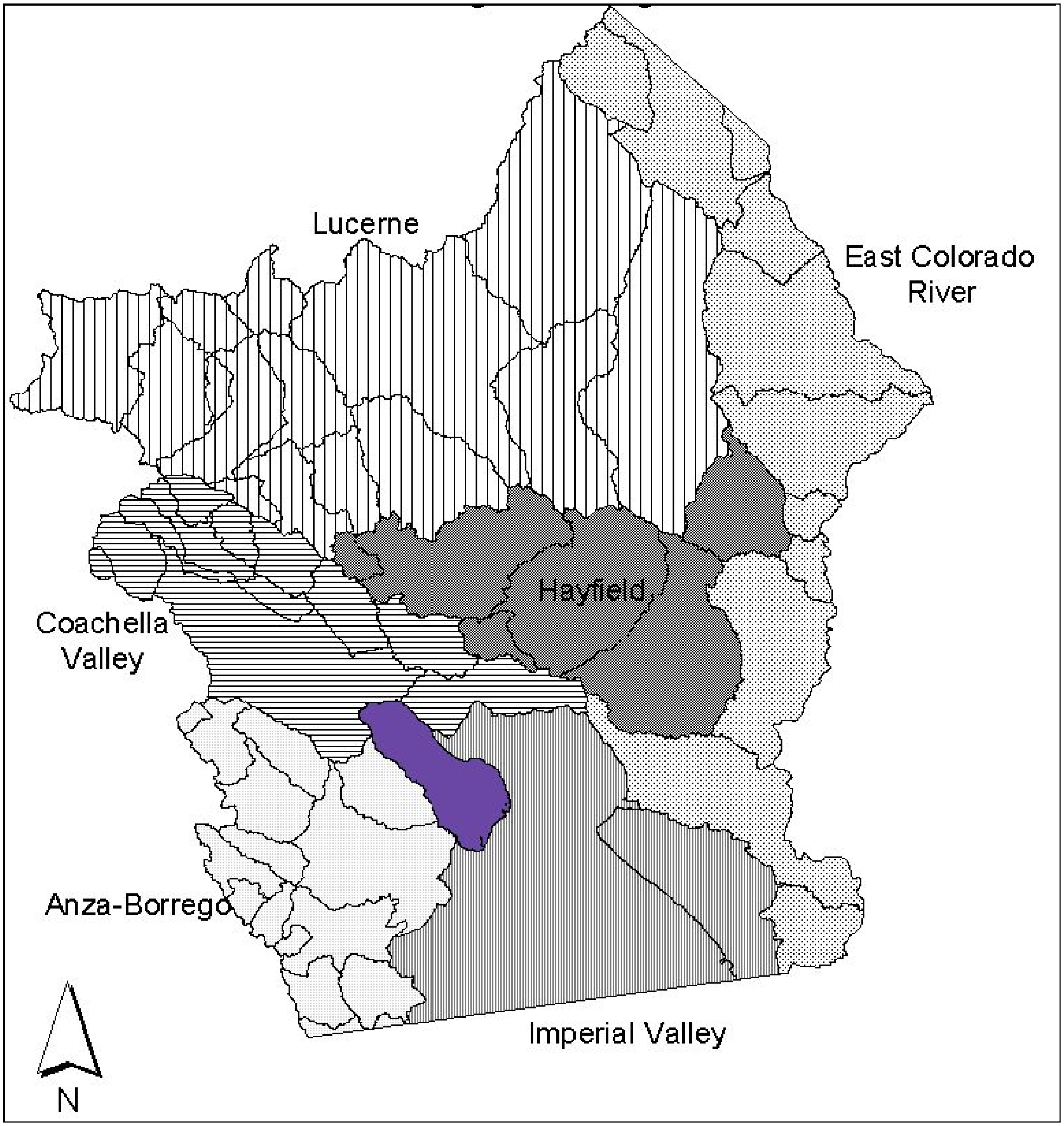

Figure 1. Colorado River Basin Region and Planning Areas

Table 1. Water bodies selected for SWAMP monitoring in the Colorado River Basin Region.

Water Body	**Watershed**	**Planning Area**
Lower Colorado River	Lower Colorado River	East Colorado River Basin
Alamo River	Salton Sea Transboundary	Imperial Valley
New River	Salton Sea Transboundary	Imperial Valley
Salton Sea	Salton Sea Transboundary	Salton Sea
Whitewater River	Coachella Valley	Coachella Valley

2.2 Selection of Monitoring Sites

Within targeted water bodies, Regional Board staff selected monitoring strategic sites. Due to their location along water bodies of major interest (CRRWQCB 2011). Staff selected sites based on (1) known or potential problems, and (2) potential suitability as a reference site that is considered the “cleanest” water in the Region. Refer to the 2011 SWAMP work plan for a complete discussion about the selection of the monitoring sites.

For this reporting period, samples were collected at 63 sites including the Board’s 26 strategic monitoring sites. This is an increase from the 13 that were sampled in the report covering from fall 2005 to fall 2008. Although there was an increase in the number of sites monitored the frequency of monitoring was not consistent. For example some sites were monitored in the spring and fall of each year and some sites were only monitored once during the reporting period.

Field crews used GPS coordinates to find the sites used in past fieldwork. For new sites, field crews collected GPS coordinates and used photographs to cross-reference site locations.

2.3 Selection of Water Quality Indicators

Regional Board staff selected water quality indicators based on the beneficial uses of selected water bodies. The status of beneficial uses helps determine if a water body is meeting a certain desirable quality. For example, if a water body is a source of water contact recreation such as swimming, Regional Board staff selected indicators such as E. coli bacteria for contact recreation that would determine if the water is safe for swimming. Another example would be if a water body is a source of municipal and domestic supply, Regional Board staff selected indicators such as nutrients that would determine if the water is safe to drink. Selected chemical, physical, and biological water quality indicators were applicable to the water column and sediments. Table 2 lists water quality indicators selected for the Colorado River Basin Region, as well as an indicators' relation to desirable quality to be monitored, beneficial uses, and indicator category. A full discussion on the process used to select the indicators given in Table 2 is available in the SWAMP Project Plan (CRRWQCB 2011).

Table 2. Selected water quality indicators from the 2011 SWAMP Project Plan (CRRWQCB 2011).

Beneficial Use	Desirable Quality to be Monitored	Category	Indicator
Water Contact Recreation	Is it safe to swim?	Contaminant exposure	Total coliform bacteria Fecal coliform bacteria Enterococcus bacteria E. coli bacteria
Municipal and Domestic Supply	Is it safe to drink the water?	Contaminant exposure	Inorganic water chemistry Nutrients Organic water chemistry Total coliform bacteria
Commercial and Sport Fishing	Is it safe to eat fish and other aquatic resources?	Contaminant exposure	Fish tissue chemistry Fecal coliform bacteria in water
Cold Freshwater Habitats Inland Saline Water Habitats Preservation of Rare, Threatened, or Endangered Species Warm Freshwater Habitat Wildlife Habitat Spawning, Reproduction and/or Early Development	Are aquatic populations, communities, and habitats protected?	Biological response	Water toxicity Sediment toxicity Toxicity identification evaluation Bioassessment
Same as above	Same as above	Pollutant exposure	Organic and inorganic sediment chemistry Total organic carbon Fish tissue chemistry Nutrients Turbidity

Beneficial Use	**Desirable Quality to be Monitored**	**Category**	**Indicator**
			Inorganic and organic water chemistry
Same as above	Same as above	Habitat	Dissolved oxygen Sediment grain size analysis Sediment organic carbon Electrical conductivity Salinity Hydrogen sulfide Ammonia
Non-Contact Water Recreation	Are aesthetic conditions of the water protected?	Pollutant exposure	Debris and trash

2.4 Method of Analysis for Samples

The methodology to determine the concentration, measurement, or other feature of water quality is based on generally accepted procedures that have been approved by SWAMP Roundtable members. There are unique procedures for each category of constituent and many unique procedures for individual constituents. The documentation procedure for sample collection, analysis and reporting is available through the SWAMP. Information is recorded for each collected sample, describing the collection and handling of a sample, its analysis, and the archiving of the analysis results. For further information on the specific procedure used for an analyte or measurement, please refer to the following documents:

- EPA Analytical Methods
- Quality Assurance Management Plan (QAMP), for the State of California's SWAMP 2002
- SWAMP Database Training Document, 2005 and
- SWAMP Information Management Plan, 2006

The QA/QC summary discussed below describes how each sample is processed and either directly or indirectly tracked to ensure that proper methods and procedures are followed. The primary function of the QA/QC process is to ensure that proper procedures and protocols are followed for sample collection and laboratory analysis and reporting.

2.5 Quality Assurance and Quality Control (QA/QC)

This section of the document presents the methods, results and discussion for the QA and QC of sample collection, analysis, and reporting. Combining the methods and results was done to avoid duplication of information that would be required to adequately explain the results. This section was independently prepared by the Moss Landing Marine Laboratory (MLML). This section does not attempt to determine whether or not data should be used for a specific purpose. Decisions regarding data use can only be made after data validation and comparison to project specific data quality objectives (DQOs) are performed. Data quality indicators include:

- Laboratory method blanks
- Surrogate spikes
- Matrix spikes and matrix spike duplicates
- Certified reference materials/laboratory control spikes
- Laboratory duplicates
- Field blind duplicates

Data for Region 7 SWAMP Funding Codes (03SW7001, 04SW7001, 05SW7001, and 06SW7001) were verified to be compliant with the individual measurement quality objectives (MQOs) specified in the SWAMP-QAMP Data is classified as compliant when all of the individual MQOs described in the SWAMP QAMP are met. Estimated data are non-compliant with all of the individual MQOs specified in the SWAMP QAMP, or rejected if the data are rejected by the reporting laboratory. Data labeled as “estimated” are measured data and not an approximated value or the result of a model. Data most often received the “estimated” label whenever holding time criteria was exceeded.

Quality Assurance and Quality Control Summary

Data that met all SWAMP MQOs as specified in the QAMP, are classified as “SWAMP-compliant” and considered usable without further evaluation. Data that failed to meet all program MQOs specified in the SWAMP QAMP, have analytes not covered in the SWAMP QAMP, or are insufficiently documented such that supplementary information is required for them to be used in reports are classified as estimated non-compliant with the SWAMP QAMP. Rejected data batches do not meet minimum requirements and have gross errors or omissions.

2.6 Water Quality Objectives and Established Criteria

Evaluation of the data was based on criteria and objectives contained in the Region’s

Basin Plan. The Basin Plan has both general and site-specific water quality objectives. General objectives apply to all surface waters in the Region with a specific beneficial use, or can be narrative statements about a condition to be maintained or achieved. Established criteria were applied when interpreting narrative objectives. Site-specific objectives are only applicable to a specific water body or time period. Chapter 3 of the Basin Plan provides general and specific water quality objectives for the region.

When using the water quality objectives in the Basin Plan to address findings, only criteria that can be supported by the SWAMP data are articulated. For example, in the Basin Plan, one set of bacteria objectives are based on collecting a statistically sufficient number of samples during a given time period - in this case it was suggested that that five samples be taken in equally spaced time periods over a 30 day period. Since the SWAMP only samples biannually, bacteria results cannot be evaluated using this criteria. Typically, only site-specific objectives have multiple criteria in the Basin Plan.

Where specific objectives are provided in the Basin Plan they were used to evaluate the data. For example, DO objectives are to be above 5.0 ppm and 8.0 ppm for WARM and COLD respectively, at all times. These objectives are applied to all sampling locations where DO was recorded.

Where general objectives are provided in the Basin Plan, an interpretation of the data is required. For example, the toxicity objective contained in the Basin Plan in part states that all water shall be maintained free of toxic substances in concentrations which are detrimental to or which produce detrimental physiological responses in humans, plants or indigenous aquatic life. To determine this, indicator species are used and their survival must be subjectively related to the water quality that they are exposed to at the time of sampling. Of all the general objectives, toxicity is perhaps the most difficult to analyze because there is generally no long-term monitoring of water quality, hydrology, and ambient conditions. Still, trends will appear over time that will indicate the relative direction that water toxicity is headed.

For Basin Plan objectives where no data was collected, or where field observations were not recorded, notations were made indicating the objective is not applicable. These objectives include tainting substances, aesthetic qualities, radioactivity, and bio-stimulatory substances.

Since each beneficial use may be evaluated by comparing analysis results with a set of water quality objectives, beneficial uses are a controlling factor in establishing water quality standards for a particular body of water. To determine if there is an impact to the beneficial uses of a water body, criteria established by various accepted publications, regulations and policies are applied. A summary of the beneficial uses taken from the Basin Plan is presented in Table 3, along with a reference for water quality criteria used to assess impacts to beneficial uses (Table 4).

Table 3. Listing of beneficial uses and water quality goals with criteria used to evaluate the impact to beneficial use.

Category	Code	Water Quality Goal[1]
Municipal and Domestic Supply	MUN	1, 3, 4, 5, 6, 10
Agriculture Supply	AGR	
Aquaculture	AQUA	2, 3, 8, 9, 10
Industrial Service Supply	IND	
Ground Water Recharge	GWR	1, 2, 3, 4, 5, 6, 7
Water Contact Recreation	REC I	10
Non-Contact Water Recreation	REC II	10
Warm Freshwater Habitat	WARM	2, 3, 4, 5, 9, 10
Cold Freshwater Habitats	COLD	2, 3, 4, 5, 9, 10
Wildlife Habitat	WILD	2, 3, 4, 5, 9, 10
Hydropower Generation	POW	
Freshwater Replenishment	FRSH	2, 3, 4, 7, 8
Rare, Threatened, or Endangered Species	RARE	2, 7, 8, 9

[1]See Table 4 for specific reference and associated water quality goals.

The water quality goal for some constituents varies, relative to the designated use. For example, *Acenapthene* has a maximum threshold of 1,200 ppb when evaluated against human health in freshwater and 2,700 ppb when evaluated against organisms in saltwater. The toxic effects of trace metals of Ag, Cd, Cu, Ni, Pb, Zn and Cr decrease as the hardness of water increases. When evaluating the beneficial uses of a water body, these variables are considered.

Table 4. Water quality goal description and reference used for numeric values. See Appendix B for numeric values for each reference.

Water Quality Criteria ID	Criteria Reference[1]
1	USEPA 2000, 2006 Drinking Water Criterion
2	CTR, freshwater acute (CMC)
3	CTR, Human Health-FW (water and organisms)
4	CTR, Human Health-SW (organisms only)
5	Title 22, CCR Drinking Water (MUNI), MCLs Title 22 Table 64431A Primary (inorganics) 64444A (organics)
6	Drinking Water (MUNI), SMCLs Title 22 Table 64449-A (limits) and 64449-B (ranges) Secondary,
7	Aquatic Life, CDFG Hazardous Assessment Criteria (water); USEPA 1987.
8	Aquatic Life, USFWS Biol. Effects,
9	Fojut et al. 2012; Freshwater Sediment (Policy), UC Davis; MacDonald 2000
10	Bacterial Criteria, USEPA Criteria (freshwater) 2000

[1] See the reference section of this document from citation of each goal.

2.7 Data Review Procedure

There is no established process for reviewing the SWAMP data. However, the methods described below are considered appropriate for providing a data assessment and an assessment of the water quality in the Basin. The SWAMP database includes many queries that are based on whether data was generated in the field or in a lab. These queries extract results along with sample information that can then be sorted, tallied, summarized etc. For this analysis, the queries were restricted to Region 7 data found on the permanent side of the database, from fall of 2009 to fall 2013. Once executed, all query results were imported to a spreadsheet for analysis. These files are very large (~10-50 mb). As such, all spreadsheets prepared for this report are only available through the Region 7 Office.

Database queries developed by the SWAMP Data Management Team were used for this report. These queries provided information on 1) field sampling for parameters such as pH, DO, turbidity and specific conductance, 2) lab results for constituents such as organics, conventional, trace metals, pathogens and sediment composition, and 3) toxicity results. Queried data were initially grouped into the following areas: Lower Colorado River and Associated Lakes; the Alamo River; the New River; the Salton Sea and the Coachella Valley. Once grouped by the data, they were further divided into like constituent categories such as organics in sediments, trace metals in water, pathogens, etc and parsed into separate worksheets within the spreadsheet.

Tables were added to each spreadsheet that contained Basin Plan objectives, water quality criterion and data labels to compare with sample results.

Data was processed using summary statistics, lookup tables, pivot tables and many reference formulas. Error checking was completed using formulas and manually checking formula results.

For field collected data and toxicity testing results, the data were organized into useful tables, arranged by location and time. This information was then analyzed and reported. For other samples, the results were compared to established criteria or objectives through the use of formulas and lookup tables in the Excel program.

Data from the spreadsheets were then summarized by results qualifiers. The result qualifier that is reported with each sample identifies the validity of the result. If there is no qualifier attached, and the sample result is above the reporting limit (RL), that sample is deemed acceptable for comparison with a basin objective or established criteria. Samples that have a "not detected" (ND) note indicate that the sample results are below the "method detection limit" (MDL) for a given constituent. Samples taken for "screening" (SCR) were not quantifiable. Another possible qualifying result was "detected not quantifiable" (DNQ), meaning that the concentration of the constituent exceeded the MDL but was below the RL required for the method.

The next step in the review process was to determine if a sample result was greater than an applicable objective or established criteria. Some Basin Plan objectives were straightforward because, although they may vary by location, there is typically just one objective for a given constituent. The narrative objectives were more complex because there are different values depending on the beneficial use of the water. Only samples with a result above the reporting limit were considered for comparison to the Basin Plan objectives or established criteria.

Under field measurements, DO was reported in mg/l, ammonia, the maximum allowable concentration was determined based on the field-measured pH and temperature (USEPA, 2006). This value was then evaluated against the sample result.

For samples with reportable results, the sample's concentration was compared to the lowest concentration limit for a given water quality criteria. For example, the criteria for *1,2-Dichlorobenzene* concentration limit ranges from 0.6 ppm to 17 ppm, depending on which quality criteria in Table 4 is used for evaluating the sample. As an initial screen, the minimal concentration limit was used for all constituents having established criteria. If the minimum limit was exceeded, then the sample result was further compared to the applicable beneficial use and the water quality criteria that were selected for evaluation. For example, if *1,2- Dichlorobenzene* was reported to be 1.5 ppm, then the formulas used to screen the data would have flagged this sample, because it was above 0.6 ppm. Next, the origin of the sample and the beneficial uses for the location are examined. After review, it would be concluded whether or not the constituent exceeded applicable criteria.

Each toxicity test is replicated at least eight times and the percent survival for either *Ceriodaphnia dubia* or *Hyalella azteca* when considering water toxicity or *Hyalella azteca* when determining sediment toxicity is recorded. The toxicity results were compared at three levels:

- SL: Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met).
- SG: Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met).
- NSG: Indicates that the sample shows no effects of toxicity.

Duplicate samples were collected and tested from some of the sites and treated as independent samples. As such, some of the reportable results may be duplicates. This approach was taken because the duplication of the result is still reportable.

3. Results and Discussion

The results and discussion section of this document presents the review of all data collected for the SWAMP for the Colorado River Region between the fall 2009 and the fall 2013. Given the vast amount of collected data, only a summary of results is being reported for each water quality category.

For each class or group of constituent in each watershed, the report describes the number of samples taken, presents an analysis of the data, and when appropriate lists results. The results are compared with the appropriate criteria based upon the designated beneficial uses of the water body. When the water quality of a sample exceeds applicable criteria or objectives for a given analyte (as described in section 2.9 above) such information is reported to the extent necessary to describe the issue. The sampling, laboratory methods, and the assessment of the overall quality of the data are presented in previous sections of this report.

The remainder of this section is divided into the sub-areas of the Region: Lower Colorado, Alamo River, New River, the Salton Sea and the Coachella Valley. Each of these sections includes a description of the area, the sampling locations, and beneficial uses of the water body. This is followed by the presentation of the results and a discussion on the findings.

3.1 Lower Colorado River and Associated Lakes

Area Description, Monitoring Sites and Beneficial Uses

The Lower Colorado River is in the East Colorado River Basin planning area, which is characterized by desert valleys and low mountains less than 4,000 feet. All drainage in the planning area flows to the Colorado River except for a minor amount that is diverted into the Colorado River aqueduct. The Lower Colorado River runs for 230 miles, forming the eastern boundary of the Region. Principal communities along the California section of river are urban centers at Needles, Blythe, and Winterhaven; agricultural areas in Palo Verde Valley and Bard Valley; and the Fort Mojave, Chemehuevi, Colorado River, and Yuma Indian Reservations. In the Colorado River, bed sediments are primarily sand whereas in the Palo Verde drainage area there is a higher level of silt.

The Lower Colorado River is the main agricultural water supply for the Imperial, Palo Verde and Coachella Valleys and the main drinking water supply for the

Imperial Valley and Mexico's Mexicali Valley. Also, Colorado River water is part of the drinking water supply for the Los Angeles and San Diego metropolitan areas.

Table 5 lists the SWAMP monitoring sites and beneficial uses from the Region's Basin Plan for the Lower Colorado River. The rationale for these monitoring sites is provided in the Project Plan (CVRWQCB 2011). Also listed are known and potential problems for each of the monitoring sites. There are several 303(d) listings in the watershed including selenium, pathogens, DDT, and Toxaphene. Figure 2 provides a general map of the region and the approximate location of the sampling stations. A general description of selected sites is provided to give geographical context.

The following provides geographical context for selected sites.

Colorado River at Nevada Border

This site is the northern-most station on the Lower Colorado River, on the California-Nevada state line, and yields information about the quality of water entering the watershed from the Upper Colorado River. This site is identified as the Region's reference site. This designation means that the water quality at this site is the best or cleanest in the Region.

Colorado River at Imperial Dam Gates

This site is located just downstream of, and shares many characteristics with, the site upstream of the Imperial Dam.

Palo Verde Lagoon

Palo Verde is an unincorporated community overlapping the border of Imperial and Riverside Counties; located about six miles west of the Colorado River. The community is small, and while its population fluctuates by season, it is comprised mainly of residential housing and two RV parks. The community's wastewater is treated by septic tanks and disposed of via a system of leach fields. The Palo Verde area has a lagoon that is used for recreation. The lagoon passes through the community of Palo Verde and is sustained principally by the agriculture return flows from the Palo Verde Drain located at the North end of the lagoon.

Palo Verde Outfall Drain

The Palo Verde Lagoon is connected to the Palo Verde Outfall Drain, which discharges its waters into the Colorado River at the Cibola National Wildlife Refuge.

Table 5. SWAMP monitoring sites, station code, beneficial uses, and known and potential problems in the Lower Colorado River watershed and associated lakes.

Site Name	Beneficial Uses[2]	Known Problems[3]	Potential Problems[3]
Colorado River at Nevada Border[1] Colorado River at Imperial Dam Gates[1] Colorado River u/s Imperial Dam[1]	AGR, COLD, GWR, POW, IND, MUN, RARE, WARM, WILD	Se	Perch O, P, M, Perch Perch
Palo Verde Lagoon[1] Palo Verde Outfall Drain[1]	REC I & II, WARM, WILD, RARE	B, P	P, N, M
Palo Verde Diversion Dam Squaw Lake Taylor Lake Ferguson Lake			

[1]These sites are included in the 13 strategic monitoring stations identified in the 2011 Project Plan (CVRWQCB 2011).

[2]Definitions for beneficial uses are provided in the Basin Plan.

[3,]B=bacteria, P=pesticides, O=organics, M= metals, N=nutrients, Se=selenium, Perch=perchlorate.

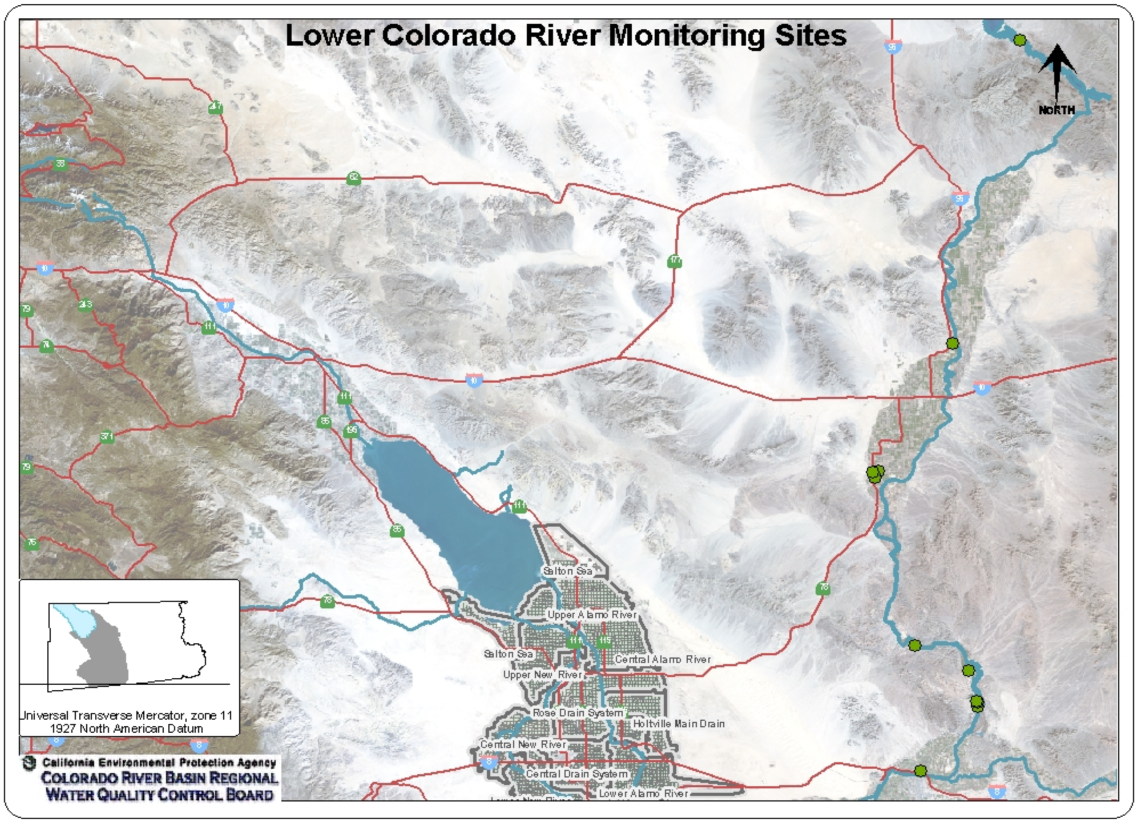

Figure 2. Monitoring Sites in the Lower Colorado River Watershed.

Water Quality in the Lower Colorado River Watershed

In addition to field measurements, water and sediment samples were collected and analyzed for organic constituents, indicator bacteria, trace elements and conventional constituents from the Lower Colorado River and locations in the Palo Verde area. Beneficial uses for each water body are given in Table 5. In some water bodies, it is assumed that REC I use occurs through occasional fishing or is unauthorized.

Field Measurements in Water:

DO, pH, Specific Conductivity (EC), Temperature, Turbidity, and Velocity

DO, pH, EC, temperature, and turbidity were measured in the field at each sampling station at the time of sampling (Table 6). This data, along with the conventional constituents, are used to describe the background water quality of a water body. Input to the Lower Colorado River includes direct precipitation, storm runoff, agricultural drainage and municipal discharge.

In general, the field measurements indicate that the watershed is alkaline with a somewhat elevated level of total dissolved solids (TDS) and sufficient oxygen to support aquatic life. With regard to pH and EC, the Colorado River appears is of steady quality. Oxygen concentrations were generally sufficient to support the designated aquatic life beneficial uses such as WARM and COLD; however, oxygen levels varied and the 8.0 mg/l COLD criteria was not met twice at the Imperial Dam Gates on 10/5/10 and 5/10/11. Salinity levels at the Imperial Dam Gates were below the Basin Plan salinity TDS objective of 879 mg/l at all times.

Table 6. Field measurements at various stations in the Colorado River watershed.

Colorado River at Nevada State Line (713CRNVBD)

	4/28/09	10/19/09	5/3/10	10/4/10	4/15/13	11/5/13
Oxygen (mg/l)	11.42	10.04	12.09	9.83	10.39	9.25
Oxygen (%)	119.2	115	129.8	105.8	105.7	94.4
pH	7.96	7.7	8.48	8.18	8.36	7.84
Salinity (ppt)	0.52	0.54	0.47	0.49	0.44	0.45
EC (µS/cm)	1,053	1,096	954	989	899	916
Temperature ^{o}C	17.06	21.65	18.7	21.28	16.11	16.24
Turbidity (NTU)	1.2	6.03	0.19	1.05	1.44	1.32

Palo Verde Lagoon (LG1) (715CPVLG1)

	4/29/09	10/20/09	5/4/10	10/5/10	5/9/11	10/10/11	4/16/13	11/6/13	11/18/13
Oxygen (mg/l)	9.31	6	6.37	5.53	7.49	9.55	6.93	7.95	7.39
Oxygen (%)	89.9	67.6	70.6	64.7	87.5	99.2	78.1	84.7	82
pH	7.62	7.35	7.69	7.71	7.66	7.11	7.76	7.78	7.62
Salinity (ppt)	1.04	1.06	1.04	1.09	1.06	1.12	1.03	1.05	1.05
EC (µS/cm)	2,042	2,069	2,035	2,133	2,082	2,186	2,023	2,051	2,041
Temperature oC	20.26	20.77	20.01	22.01	22.87	22.23	20.97	18.07	20.08
Turbidity (NTU)	11.2	11.9	10.3	7.77	9.19	7.49	11	8.76	14.9

Palo Verde Outfall Drain (PVOD2) (715CPVOD2)

	4/29/09	10/20/09	5/4/10	10/5/10	5/9/11	10/10/11	4/16/13	11/6/13	11/18/13
Oxygen (mg/l)	5.87	5.76	6.2	4.95	8.02	8.22	6.97	8.4	8.53
Oxygen (%)	66.3	64.5	68.6	57.8	93.7	96.6	77.6	89.7	85.9
pH	7.42	7.39	7.73	7.66	7.56	7.86	7.68	7.85	7.4
Salinity (ppt)	1.05	1.08	1.06	1.09	1.01	1.06	1.08	1.03	1.02
EC(µS/cm)	2,059	2,117	2,074	2,131	1,990	2,087	2,112	2,010	1,196
Temperature oC	19.94	20.63	20.02	22.03	22.78	21.99	20.39	18.27	19.7
Turbidity (NTU)	12.6	10.71	14.2	6.75	8.48	9.32	14.9	8.06	11.9

Colorado River at Imperial Dam Grates (715CRIDG1)

	4/29/09	10/20/09	5/4/10	10/5/10	5/10/11	10/11/11	4/17/13	11/19/13
Oxygen (mg/l)	8.79	8.27	9.38	7.5	7.54	8.35	8.88	8.95
Oxygen (%)	96.4	95.2	106.9	91.6	82.3	98.4	95.8	93.2
pH	7.85	7.83	7.97	8.16	7.83	10.12	8.06	7.8
Salinity (ppt)	0.58	0.64	0.55	0.6	0.52	0.57	0.51	0.56
Cond (uS/cm)	1,161	1,238	1,103	1,208	1,053	1,144	1,000	1,130
Temperature oC	20.31	22.18	21.13	25.31	19.53	21.34	18.9	17.17
Turbidity (NTU)	4.32	8.01	3.69	3.46	7.05	4.3	5.71	3.48

Constituents in Water and Sediment

Categories of constituents tested in water and sediment samples include conventional, metals, organics, and bacteria. In addition to testing for various constituents toxicity testing was performed on both water and sediment samples. The total number of water and sediment samples tested, and the breakdown of the results by data qualifier are listed in Table 7. All field and lab samples collected from this water body during this time period were reported as estimated or compliant with the QAPP.

Table 7. Summary of SWAMP samples collected from the Lower Colorado River watershed from fall 2009 to fall 2013.

Analysis Result Data Qualifier	Counts of Results	
	Sediment	Water
Above Reporting Limit	476	948
Detected Not Quantifiable	115	116
Not Detected	2,801	6,825
Totals	3,392	7,889

Conventional Constituents in Water

Ammonia, Nitrate+ Nitrite, Orthophosphate, Boron, Chloride, Sulfate, TDS, and Chlorophyll A

Chloride exceeded Basin Plan objectives on five dates for samples taken from the Palo Verde Lagoon. The basin objective is 250 mg/l and samples results ranged from 340-269 mg/l. Sulfate exceeded the objectives on four dates for samples taken from the Palo Verde Lagoon. The basin objective is 500 mg/l and samples results ranged from 514-762 mg/l. Nitrate levels were less than 1 ppm. There is some elevated hardness that may impact plumbing systems. In the 2008 Report, perchlorate was very close to the California Department of Health Services public health goal of 6 ppb for drinking water. For this sampling period no samples exceeded 1.8 ppb.

Metals in Water:

Total Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, and Zinc

Seventeen selenium samples had concentrations between two and four ppb with an average value of 2.5 ppb. Samples from the Palo Verde Lagoon and Drain were not much different than ones for the river. One sample taken on 10/19/09 from the Colorado River at the Nevada state line was reported at 106 ppb which is above the Basin's criteria of 50 ppb; however, other samples from the same location but at different dates ranged from 2.38 to 2.67 ppb. Sixteen samples for metals exceeded objectives for arsenic, copper, lead, and mercury. Dates and locations for exceedances are listed in Appendix B.

Metals in Sediment

Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc, and Grain Size

One sample for mercury and nine for manganese from the Lagoon and Outfall Drain exceed criteria. Dates and locations for exceedances are listed in Appendix B.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

For the six sampling dates a total of 6,653 individual trace organic analyses were conducted (Table 8). Of these, 45 samples, representing 30 unique constituents had reportable results. One sample for *Cyhalothrin* on 5/4/10 in the Palo Verde Lagoon exceeded available criteria.

Table 8. Breakdown of result qualifiers on trace organics in water for the Lower Colorado River Watershed and Associated Lakes.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	45
Detected Not Quantifiable	39
Not Detected	6,569
Total	6,653

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. For the six sampling dates a total of 3,174 individual trace organic analyses were conducted (Table 9). Of these, 292 samples, representing 53 unique constituents had reportable results. Five samples for *DDE(o,p')* exceeded established criteria. Dates and locations for exceedances are listed in Appendix B.

Table 9. Breakdown of result qualifiers on trace organics in sediment for the Lower Colorado River Watershed and Associated Lakes.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	292
Detected Not Quantifiable	91
Not Detected	2,791
Total Samples	3,174

Bacteria Indicators

Bacteria indicator organisms in the sampling routine included E. coli and Enterococcus. A total of 15 samples in April and May 2013 were taken during the reporting period in the Colorado River watershed. Samples at Palo Verde Lagoon, Palo Verde Outfall Drain, and Lake Cahuilla exceeded the REC I objective for Enterococcus. A sample taken at Taylor Lake exceeded the REC I objective for E. coli. Given the limited numbers of samples dates no evaluation of the result or trend is possible. It is recommended that sampling for pathogens be conducted as frequently as all other constituents.

Toxicity in Water and Sediment

Water and sediment toxicity analyses were performed on samples collected from the Lower Colorado River and from two drains in the Palo Verde area. Toxicity was not observed for sediment samples at the State Line station. The cause of the toxicity is not certain, but the additive effects of the organic constituents that are present in the water (Table 8) and sediments (Table 9) may be responsible for the observed toxicity.

Table 10. Toxicity testing in water and sediment in the Lower Colorado River Watershed.

Station Name	Matrix	S 09	F 09	S 10	F 10	S 11	F 11	S 13
Nevada State Line	Water	SL	NSG	SL	SL			
PV Lagoon	Water	NSG	NSG	NSG	NSG	NSG	NSG	SL
PV Lagoon	Sed	NSG	NSG	NSG	SL	NSG	NSG	
PV Outfall Drain	Water	NSG	NSG	NSG	SL	NSL	SG	SL
PV Outfall Drain	Sed	SG	NSG	NSG	NSG	NSG	NSG	NSG
Imperial Dam Grates	Sed	NSG	NSG	NSG	NSG	SL	NSG	
Imperial Dam Grates	Sed	SL	NSG	SL	NSG	NSG	SG	SL
Upstream of Imperial Dam	Water							
Upstream of Imperial Dam	Sed							SL

SL: Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met). SG: Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met). NSG: Indicates that the sample shows no effects of toxicity.

3.2 Alamo River

Area Description, Monitoring Sites and Beneficial Uses

The Alamo River is located in the Imperial Valley planning area and is characterized by heavy clay and is heavily influenced by agricultural drainage. The principal communities along the river are El Centro, and Holtville. The Alamo River sub-watershed drains 340,000 acres, through five major drains, including the Verde, South Central, Central, Holtville Main, and the Rose, as well as seventy-one minor drains. There are thirteen structures to control its flow to reduce flooding and erosion. The average height of these drop structures is about six feet, thus effectively reducing the slope of the river to about 2.9 feet per river mile, or about 0.05%.

The Alamo River's predominant water supply is the Colorado River, diverted via the All American Canal. The Alamo River flows through the Imperial Valley, from the river's headwaters at the International Boundary with Mexico to its terminus at the Salton Sea. The Alamo River is the main tributary to the Salton Sea, contributing 50% of the Sea's inflows, and transporting (1) agricultural irrigation drainage water from Imperial Valley farmlands, (2) surface runoff, and (3) a minor amount of treated municipal and industrial effluent waters from the Imperial Valley.

Over 50 miles of the Alamo River are on the state's 2010 303(d) list, as impaired by selenium, mercury, pathogens, silt, and pesticides. The Region's first Total Maximum Daily Load (TMDL) was developed for the Alamo River, for sedimentation and siltation. As part of TMDL implementation, Regional Board staff currently collects monthly water samples from the Alamo River to determine TMDL effectiveness.

Table 11 lists the 19 SWAMP monitoring sites along the Alamo River, their beneficial uses from the Region's Basin Plan, and known or potential water quality problems. The rationale for these monitoring sites is provided in the Project Plan (CVRWQCB 2011). Figure 3 provides a general map of the region and the approximate location of the sampling stations. A general description of selected sites is provided to give geographical context.

Table 11. SWAMP monitoring sites and beneficial uses in the Alamo River watershed.

Site Name[1]	Beneficial Uses[2]	Known Problems[3]	Potential Problems[3]
Alamo River at Drop 3[1] Alamo River at Drop 8[1] Alamo River at Drop 10[1] Central Drain Alamo River at Drop 6A[1] Holtville Drain Alamo River Outlet[1]	FRSH, REC I& II, POW, WARM, WILD	O, P, N, S	B, M
Alamo River at International Boundary Alamo River at Drop 6[1] Rose Drain Alamo River at Rositas Dam Alamo River Above Drop 3 American Cnl Drp E of Hwy 98 Bowker Rd C Drain I Drain N Drain Barbara Worth Drain Central Drain Holtville Drain Magnolia Drain Munyon Drain Nettle Drain			

1These sites are included in the 13 strategic monitoring stations identified in the 2011 Project Plan (CVRWQCB 2011).

[2]Definitions for beneficial uses are provided in the Basin Plan.

[3]B=bacteria, P=pesticides, O=organics, M= metals, N=nutrients, S=silt

The following provides geographical context for selected sites.

Alamo River at the International Boundary

The Alamo River has its headwaters about 0.6 river miles south of the International Boundary with Mexico and flows northward roughly 52-river miles trough the Imperial Valley. It flows from an elevation of approximately 10 feet above sea level to 228 feet below sea level at the Salton Sea. This site is the first station at the United States and its flow is very small, around 2-5 cfs.

Alamo River Outlet

This site is located in the southeast corner of the Salton Sea its flow averages 900 cfs, and is the last point of the river before it reaches the Salton Sea. The volume of inflow at this site has a major influence on the water quality of the Sea.

Figure 3. Monitoring Sites in the Alamo River and New River Watersheds

Water Quality in the Alamo River Watershed

In addition to field measurements, water and sediment samples were collected and analyzed for organic constituents, indicator bacteria, trace elements and conventional constituents from the Alamo River at the International Boundary and at the outlet to the Salton Sea for organics, pathogens, trace elements and for field and conventional parameters. Water and sediment from the Alamo River and associated drains were subjected to toxicity testing.

Field Measurements in Water:

DO, pH, EC, Temperature, Turbidity, and Velocity

DO, pH, EC, temperature, and turbidity were measured in the field at each sampling station at the time of sampling (Table 12). In addition to the sites listed in Table 12 field measurements were taken at 12 other locations in the watershed; however, this data is not shown because there were only one or two sample dates at each location. This data, along with the conventional constituents, are used to describe the background water quality of a water body. Input to the Alamo River includes direct precipitation, storm runoff, agricultural drainage and municipal discharge.

In general the field measurements indicate that a typical characterization of water in the watershed is alkaline with sufficient oxygen to support aquatic life and somewhat. The 5 mg/l DO criteria for WARM was exceeded three times at the International Boundary, once each at the Nettle Drain (data not shown) and the Outlet. Conductivity is somewhat elevated in the upper watershed (Boundary and Barbara Worth [not shown]) but does not exceed the maximum value of 7,031 mg/l (assumes 640 ppm = 1,000 µS/cm). Suspended sediments increase as the River flows to the Sea, this is most likely due to the inflow of suspended-sediment containing runoff from agriculture.

Suspended sediments concentrations increase between the Boundary station and the river's outlet to the Sea. The source of this loading is tailwater from agricultural fields. The Regional Board monitors this parameter for measuring the effectiveness of the silt TMDL. Suspended sediment measurements at the Boundary station ranged between 5.1 and 51.7 ppm measurements at the river's outlet range from 290 to 505 ppm which is a slight increase from the last reporting period.

Table 12. Field water quality measurements in the Alamo River Watershed from fall 2009 to fall 2013.

Alamo River at International Boundary (723ARINTL)

	4/28/09	10/19/09	5/4/10	10/5/10	5/10/11	10/11/11
Oxygen (mg/l)	8.57	6.83	4.04	2.09	7.27	2.68
Oxygen (%)	100.3	84.8	45.5	25.9	83.4	34.6
pH	7.95	8.05	8.08	7.73	7.46	7.69
Salinity (ppt)	2.12	1.75	3.1	1.94	2.43	1.73
EC (µS/cm)	4,000	3,345	5,698	3,706	4,554	3,279
Temp °C	23.09	25.57	20.29	25.58	21.42	24.32
Turbidity (NTU)	24.3	19		5.5	14.6	12.6

Alamo River at Drop 10 Central Drain (723ARDP10)

	10/6/10	4/21/11	5/10/11	10/11/11	5/8/12	10/17/12	4/24/13	10/23/13
Oxygen (mg/l)	9	8.9	8.09	8.6	7.9	8.86	8.1	9.2
Oxygen (%)	100.5	98	90.6	102.4	95.6	101.8	89.2	100.2
pH	8		8.09	7.62	7.95	7.81	7.55	7.79
Salinity (ppt)	2.17	1.3	1.3	1.74	1.68	1.62	1.44	1.64
Cond. (uS/cm)	4,075	2,560	2,515	3,328	3,213	3,110	2,760	3,125
Temp °C	20.23	19.7	20.53	22.76	24.43	21.72	19.58	19.05
Turbidity (NTU)	75.6		102.7	212	70.7	86.4	518	101

Alamo River Outlet (723ARGRB1)

	4/28/09	10/19/09	5/4/10	10/6/10	2/11/11	4/22/11	5/10/11	10/11/11
Oxygen (mg/l)	6.53	0.91	8.64	8.28	9.6	6.7	6.97	8.05
Oxygen (%)	73.5	10.4	97.8	95.7	90	77	77	98.5
pH	7.58	8.02	7.99	8			7.4	7.46
Salinity (ppt)	1.38	1.41	1.4	2.13	1.5	1.5	1.39	1.53
Cond. (uS/cm)	2,659	2,728	2,699	4,014	2,918	2,829	2,569	2,932
Temp °C	20.83	23.39	21.02	22	12.4	21.5	20.11	22.36
Turbidity (NTU)	140	170		145			204	256

Alamo River Outlet (723ARGRB1)- continued

	5/7/12	10/15/12	4/22/13	10/21/13
Oxygen (mg/l)	6.75	7.66	6.66	8.66
Oxygen (%)	81.5	90	78.1	96.6
pH	7.8	7.8	7.55	8.01
Salinity (ppt)	1.4	1.64	1.39	1.05
Cond. (uS/cm)	2,706	3,140	2,685	2,875
Temp °C	24.44	22.92	22.87	20.28
Turbidity (NTU)	144	173	233	186

Constituents in Water and Sediment

Categories of constituents tested in water and sediment samples include conventional, metals, organics, and bacteria indicators. In addition to testing for various constituents toxicity testing was performed on both water and sediment samples.

Table 13 lists the total number of samples, the purpose of the sampling and the breakdown of the result qualifier for sediment and water samples. All field and lab samples in this water body for this time period were reported as estimated or compliant with the QAMP.

Table 13. Sample counts and the breakdown of results for the Alamo River Watershed SWAMP sampling from fall 2009 to fall 2013.

Analysis Result Data Qualifier	Counts of Results	
	Sediment	Water
Above Reporting Limit	1,000	948
Detected Not Quantifiable	212	116
Not Detected	2,931	6,825
Totals	4,143	7,889

Conventional Constituents in Water

Ammonia, Nitrate+ Nitrite, Orthophosphate, Boron, Chloride, Sulfate, TDS, and Chlorophyll A

Five drain water samples exceeded 10 mg/l nitrate as N. Three of the five samples taken on 10/6/2013 at the Rose, Central, and Holtville Drains had values of 39.9, 55 and 46 mg/l respectively. The other two samples were just slightly over the standard. All samples from the Boundary station were less than 1 mg/l. The range of the remaining samples was between 5.28 and 9.96 mg/l.

Metals in Water:

Total Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, and Zinc

Selenium did not exceeded the Basin Plan objective of 50 ppb. However, 41 of the 58 samples analyzed were above the 5 ppb value that wildlife biologist feel is a proper standard. Since these values are close to what biologist feels is a maximum it would be best to continue monitoring to get a better understanding of the extent of the constituent. Arsenic, copper and mercury also exceeded criteria. The Alamo River is currently on the 303(d) list for impairment by selenium and mercury. All other metals concentrations in the River met the objectives given in the Basin Plan. Dates and locations for exceedances are listed in Appendix B.

Metals in Sediment

Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc, and Grain Size

Metals concentrations in sediments for cadmium, chromium, copper, lead, nickel, silver and zinc exceeded criteria on one or more dates at either the Boundary or Outlet stations. Dates and locations for exceedances are listed in Appendix B.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

For the six sampling dates a total of 7,456 individual trace organic analyses were conducted (Table 14). Of these, 205 samples, representing 38 unique constituents had reportable results. Thirty-six analyses representing 6 constituents (Table 15) exceeded available criteria. Two of these constituents; *Chloripyrifos* and *Diazinon* are on the 2010 303(d) list for the watershed. Dates and locations for exceedances are listed in Appendix B.

Table 14. Breakdown of result qualifiers on trace organics in water in the Alamo River Watershed.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	205
Detected Not Quantifiable	69
Not Detected	7,182
Total Samples	7,456

Table 15. Counts of trace organic constituents exceeding criteria in water in the Alamo River Watershed.

Constituent	Counts
Chlorpyrifos	13
Cyhalothrin	17
Diazinon	1
Disulfoton	1
Malathion	3
Mirex	1
Total	36

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. For the six sampling dates a total of 3,832 individual trace organic analyses were conducted (Table 16). Of these, 714 samples, representing 119 unique constituents had reportable results.

Table 16. Breakdown of result qualifiers on trace organics in sediment for the Alamo River.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	714
Detected Not Quantifiable	196
Not Detected	2,922
Total	3,832

For sediment samples with reportable results there were 29 unique compounds including *Dieldrin*, and *DDT* that are on the River's 303d list. Five constituents, representing 30 samples exceeded criteria (Table 17). Dates and locations for exceedances are listed in Appendix B.

Table 17. Counts of trace organic constituents exceeding criteria in sediment in the Alamo River Watershed.

Constituent	Counts
DDD(o,p')	1
DDD(p,p')	1
DDE(p,p')	23
DDT(p,p')	1
Dieldrin	4
Total	30

Bacteria Indicators

Bacteria indicator organisms in the sampling routine included E. coli and Enterococcus. A total of four samples on April 23, 2013 were taken during the reporting period in the Colorado River Watershed. Samples taken at Alamo River Drop 3 and Drop 6 (Rose Drain) exceeded the REC I & II objective for both E. coli and Enterococcus. Given the limited numbers of samples dates no evaluation of the result or trend is possible. It is recommended that sampling for pathogens be conducted as frequently as all other constituents.

Toxicity in Water and Sediment

Water and sediment toxicity tests were done for samples collected at the Boundary and Outlet stations on most sampling dates and for a few select stations in the fall of 2010. Toxicity (Table 18) was observed only once in sediments at the Boundary and none in the water samples. However as the river progresses towards the Sea, toxicity is observed more often than not.

Table 18. Toxicity in water and sediment in the Alamo River watershed.

Station Name	**Matrix**	**S 09**	**F 09**	**S 10**	**F 10**	**S 11**	**F 11**	**S 12**	**F 12**	**S 13**
International Boundary	Water	NSG	NSG	NSG	NSG	NSG	NSG			
International Boundary	Sed	SG	NSG	NSG	NSG	NSG	NSG			
Above Drop 3	Water				NSG					
Above Drop 3	Sed				SL					
Drop 6 Rose Drain	Water				SL					
Drop 6 Rose Drain	Sed				SL					
Drop 6A Holtville Drain	Water				SL					
Drop 6A Holtville Drain	Sed				SL					
Drop 10 Central Drain	Water				SL		SL			
Drop 10 Central Drain	Sed				SL					
Alamo River Outlet	Water	SL	NSG	SL	NSG	SL	SG		SL	SL
Alamo River Outlet	Sed		SL	NSG	SL	NSG	SL	NSG	SL	SG

SL: Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met). SG: Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met). NSG: Indicates that the sample shows no effects of toxicity.

3.3 New River

Area Description, Monitoring Sites and Beneficial Uses

The New and Alamo Rivers, are in the Imperial Valley planning area (Figure 3). The New River drainshed covers an area of 300,000 acres in Mexico and 200,000 acres in the United States. Inputs to the New River include direct precipitation, storm water runoff, agricultural drainage, and municipal discharge including un-disinfected wastes from the wastewater treatment lagoons from Mexicali, Mexico. At its outlet with the Salton Sea, the New River flow is around 600 cfs, which is approximately 30% of the inflow to the Sea. Bed sediment sampling in the New River indicates a high clay and silt content. This type of matrix will result in a greater amount of bound constituents such as trace organics.

Pollution in the New River has been identified since the late 1940s, mainly for the high counts of fecal coliforms bacteria reported at the International Boundary. The upstream section of the New River is heavily impacted by drainage originating primarily from municipal effluent from the Mexicali Valley. As the River flows north through the Imperial Valley, it receives agricultural drainage, storm runoff, discharge from several wastewater treatment plants, a geothermal plant, and nine known confined animal feeding operations.

Most of the water in the New River comes from agricultural runoff from Imperial Valley farmed lands irrigated with Colorado River water. The four major agricultural drain networks that discharge into the New River are Greeson, Rice 3, Fig and Rice. There are also about fifty minor agricultural drains that discharge into the River.

The New River is on the State's 303(d) list, as impaired by bacterial pathogens, silt, trash, copper, mercury, selenium nutrients, VOCs, DO and pesticides. The Region has adopted two TMDLs for the New River: One for pathogens in 2002 and another for sedimentation and siltation in 2003. As part of TMDL implementation, Regional Board staff currently collects monthly water samples for TSS and bacteria analysis. The purpose of this sampling is to monitor the effectiveness of management practices being implemented by farmers and other dischargers.

Table 19 lists the SWAMP monitoring sites, beneficial uses from the Region's Basin Plan, and known or potential water quality problems. The rationale for these monitoring sites is provided in the Project Plan (CVRWQCB 2011). Figure 3, in the Alamo River section of this document provides a general map of the region. A general description of selected sites is provided to give geographical context.

Table 19. SWAMP monitoring sites, beneficial uses, and known and potential problems in the New River sub-watershed and associated drain-shed.

Site Name[1]	Beneficial Uses[2]	Known Problems[3]	Potential Problems[3]
New River at Int. Boundary[1] New River at Drop 2[1] New River at Evan Hughes Hwy[1] New River at Rice Drain[1] New River at Rice Drain #3[1] New River Outlet[1]	FRSH REC I REC II WARM WILD RARE	B, O, P, M, N, S, V	None
New River at Fig Drain New River at Greeson Drain Oleander Drain Peach Drain Rice 3 Drain Rice Drain at Headgate 101 Rose Drain RWB7 South Central Drain RWB7 Spruce Drain P Drain Timothy 2 Drain Verde Drain RWB7			

[1]These sites are included in the 13 strategic monitoring stations identified in the 2011 Project Plan (CVRWQCB 2011).

[2]Definitions for beneficial uses are provided in the Basin Plan.

[3]B=bacteria, P=pesticides, O=organics, M= metals, N=nutrients, S=silt, Se=selenium, Perch=perchlorate, T=trash, V=volatile organic compounds.

The following provides geographical context for selected sites.

New River at the International Boundary

The New River headwaters are approximately 16 miles south of the international boundary with Mexicali, Mexico, within the United States, the New River flows approximately 60 miles before it reaches its outlet at the Salton Sea. The New River at International Boundary is known for high concentrations of bacteria indicators that indicate polluted conditions that threaten public health. The main source of this pollution at this specific site is the discharge of un-disinfected wastes from the wastewater treatment lagoons from Mexicali. In addition, this site is the first site taken as reference from the New River at the US side.

New River Outlet

This is the last station before the Salton Sea and is a key monitoring site for the United States Geological Service, IID, and the Regional Board. At this site the discharges from the Westmorland wastewater treatment plant and agriculture darinage are mixed.

Water Quality in the New River Watershed

In addition to field measurements water and sediment samples were collected and analyzed for organic constituents, indicator bacteria, trace elements and conventional constituents from the New River at the following locations; International Boundary, and at the Outlet to the Salton Sea

Field Measurements in Water:

Dissolved Oxygen, pH, Specific Conductivity, Temperature, Turbidity, and Velocity

Dissolved oxygen, pH, specific conductivity, temperature, and turbidity were measured in the field at each sampling station at the time of sampling (Table 20). In addition to the sites listed in Table 19, field measurements were taken at six other locations in the watershed; however, this data is not shown because there were only one or two sample dates at each location.

This data, along with the conventional constituents, are used to describe the background water quality of a water body. Input to the New River includes direct precipitation, storm runoff, agricultural drainage and municipal discharge including un-disinfected wastes from the wastewater treatment lagoons from Mexicali, Mexico.

In general the field measurements indicate that the watershed is alkaline with sufficient oxygen to support aquatic life and somewhat elevated salinity. The 5 mg/l dissolved oxygen criteria for WARM was exceeded five times at the Boundary station with values ranging from 1.53 mg/l on 10/19/09 to 4.88 mg/l on 10/16/12. Conductivity is somewhat elevated in the upper watershed (Boundary and Evan Hughes (not shown) but does not exceed the maximum value of 7,031 mg/l (assumes 640 ppm = 1,000 uS/cm). Turbidity is elevated and increases as the River flows to the Sea, this is most likely due to the inflow of suspended-sediment containing runoff from agriculture. Also, the Basin Plan requires monthly monitoring of the New River and the SWAMP sampling only occurs on a biannual basis.

Table 20. Field water quality measurements of the New River taken at the International Boundary and at the outlet to the Sea.

New River at Boundary (723NRBDRY)

	4/28/09	10/19/09	5/4/10	10/5/10	2/11/11	4/22/11	5/10/11	10/11/11
Oxygen (mg/l)	6.17	*1.53*	5.75	*2.72*	9.9	5.47	6.17	6.23
Oxygen (%)	72.6	16.1	68.4	33.2	99	66	69.5	75.3
pH	7.48	8.04	8.05	7.74			7.56	7.35
Salinity (ppt)	3.2	3.19	3.32	3.82	2.9	3.2	3.4	3.43
Cond. (uS/cm)	5,883	5,884	6,094	6,959	5,330	5,850	6,218	6,279
Temperature ºC	22.6	25.2	22.78	24.38	14.5	23.8	20.18	22.06
Turbidity (NTU)	33.1	48		30.5			34.3	22.9

New River at Boundary (723NRBDRY) - continued

	5/8/12	10/16/12	4/23/13	10/22/13
Oxygen (mg/l)	5.66	*4.88*	*4.05*	*3.03*
Oxygen (%)	70.9	59.2	49.1	35.5
pH	7.74	7.62	7.51	7.67
Salinity (ppt)	3.34	3.29	2.98	3.11
Cond. (uS/cm)	6,150	6,062	5,514	5,738
Temperature ºC	25.86	21.42	24.49	21.73
Turbidity (NTU)	27.6	19.6	79	56.8

New River Outlet (723NROTWM)

	4/28/09	10/19/09	5/4/10	10/6/10	2/11/11	4/22/11	5/10/11	10/11/11
Oxygen (mg/l)	6.65	6.91	8.24	6.38	9.11	5.92	5.72	7.11
Oxygen (%)	76	82	94.3	76	88	66	64.9	88.1
pH	7.67	8.1	7.86	7.83			7.59	7.61
Salinity (ppt)	1.91	2.09	2.17	2.1	2.4	2	1.98	2.23
Cond. (uS/cm)	3,622	3,947	4,082	3,965	4,393	3,846	3,736	4,189
Temperature ºC	21.38	23.41	20.67	23.15	13.2	20.6	20.98	22.81
Turbidity (NTU)		81		188			198.5	112

New River Outlet (723NROTWM) - continued

	5/7/12	10/16/12	4/23/13	10/22/13
Oxygen (mg/l)	6.3	7.77	5.59	7.89
Oxygen (%)	76.9	91	63.6	86.6
pH	7.83	7.72	7.42	7.85
Salinity (ppt)	1.87	1.78	1.98	1.49
Cond. (uS/cm)	3,565	3,369	3,736	2,862
Temperature ºC	24.76	22.69	21.19	19.14
Turbidity (NTU)	63	138	110	330

Constituents in Water and Sediment

Categories of constituents tested in water and sediment samples include conventional, metals, organics, and bacteria. In addition to testing for various constituents toxicity testing was performed on both water and sediment samples.

Table 21 lists the total number of samples, the purpose of the sampling and the breakdown of the result qualifier for sediment and water samples. All field and lab samples in this water body for this time period were reported as estimated or compliant with the QAMP.

Table 21. Sample counts and the breakdown of results for the New River watershed SWMAP sampling from fall 2009 to fall 2013.

Analysis Result Data Qualifier[1]	**Counts of Results**	
	Sediment	Water
Above Reporting Limit	1,203	1,532
Detected Not Quantifiable	393	216
Not Detected	2,556	10,986
Totals	4,152	12,734

[1] See Section 2.7 for descriptions of the Result Data Qualifiers.

Conventional Constituents in Water

Ammonia, Nitrate+ Nitrite, Orthophosphate, Boron, Chloride, Sulfate, TDS, and Chlorophyll A

Assuming the sampled values represent an average value ammonia concentration at the Boundary station consistently exceeded the USEPA's Freshwater aquatic life 30 day continuous concentration criteria (Table 22). Nitrate samples exceeded the 10 mg/l nitrates as N criteria twice, one at 11.8 mg/l and once at 18.

Suspended sediments concentrations were extremely high at the Boundary station during the spring of 2006 (395 mg/l) and the fall of 2007 (823 mg/l). All samples taken at the Sea were elevated and ranged from 190-378 mg/l. The source of the loading at the Boundary station is Mexico; however, as the river flows north it picks up sediment from tailwater discharged from agricultural fields. The Regional Board monitors this parameter for measuring the effectiveness of the silt TMDL.

Table 22. Ammonia exceedance in the New River watershed.

Location and Date	Ammonia	
	Result	Criteria
New River at Boundary	mg/l	
4/28/09	3.6	2.6
10/19/09	6.8	1.2
5/4/10	6.0	1.3
10/5/10	7.6	1.8
5/10/11	7.3	2.9
10/11/11	8.2	3.0
10/16/12	6.1	2.5
4/23/13	9.5	2.3
10/22/13	10.0	2.3
New River at Evan Hughes Hwy		
10/6/10	5.1	2.8
10/22/13	2.1	1.9
New River at Rice Drain		
10/22/13	3.17	1.37

Metals in Water:

Total Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, and Zinc

Dissolved selenium concentrations did not exceeded the Basin Plan objective of 50 ppb. However, 56 samples, 96 of the samples exceeded five ppb. Since these values are close to what biologist feels is a maximum it would be best to continue monitoring to get a better understanding of the extent of the constituent. The Boundary station did show a reduction in concentration from 15 ppb in the fall 2009 to one ppb in the fall of 2013. A similar pattern is seen at the Outlet station. The New River is currently on the 303(d) list for impairment by selenium and nutrients. All other metals concentrations in the River met the objectives given in the Basin Plan. Dates and locations for exceedances are listed in Appendix B.

Metals in Sediment

Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc, and Grain Size

Samples tested for mercury at the Boundary exceeded the criteria of 2 ppb at the Boundary and Outlet station in the spring and fall of 2009. A feasible source for mercury at this location would be industrial discharges that originate upstream. No other mercury samples at these or any other sites in the watershed were above the water quality goal. The New River is currently on the 303(d) list for impairment by mercury. Arsenic and copper exceeded criteria at sampling locations all along the river. Dates and locations for exceedances are listed in Appendix B.

Trace Organics in Water:

Organic Pesticides, PAHs, PCB

For the six sampling dates a total of 11,203 individual trace organic analyses were conducted (Table 23). Of these, 264 samples, representing 68 unique constituents had reportable results. Thirty-six analysis representing 6 constituents (Table 24) exceeded available criteria. Two of these constituents; *Chloripyrifos* and *Diazinon* are on the 2010 303d list for the watershed.

Table 23. Breakdown of result qualifiers on trace organics in water in the New River.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	264
Detected Not Quantifiable	124
Not Detected	10,815
Total	11,203

Table 24. Counts of trace organic constituents exceeding criteria in water in the New River Watershed.

Constituent	Counts
Chlorpyrifos	9
Cyhalothrin	8
Diazinon	5
Disulfoton	12
Malathion	2
Totals	36

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. For the six sampling dates a total of 3,797 individual trace organic analyses were conducted (Table 25). Of these, 851 samples, representing 115 unique constituents had reportable results.

Table 25. Breakdown of result qualifiers on trace organics in New River sediment.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	851
Detected Not Quantifiable	391
Not Detected	2,555
Total	3,797

For sediment samples with reportable results there were 48 unique compounds including *Dieldrin*, and *DDT* that are on the 303d list for the watershed. Twelve constituents, representing 42 samples exceeded criteria (Table 26). Dates and locations for exceedances are listed in Appendix B.

Table 26. Counts of trace organic constituents exceeding criteria in water in the New River Watershed.

Constituent	Counts
Benzo(a)pyrene	1
Chrysene/Triphenylene	1
Chrysenes, C1-	1
Chrysenes, C2-	1
Chrysenes, C3-	1
DDD(o,p')	1
DDD(p,p')	5
DDE(p,p')	24
DDT(p,p')	1
Dibenz(a,h)anthracene	1
Dieldrin	4
Pyrene	1
Total	42

Bacteria Indicators

Bacteria indicator organisms in the sampling routine included E. coli and enterococcus. A total of 12 samples were taken along during the reporting period in the New River watershed. Sample locations were at the international boundary, midpoints along the river and at the outlet to the Salton Sea. Eight of the 12 samples exceeded the REC I & II objective for both E. coli and Enterococcus. Given the limited numbers of samples dates no evaluation of the result or trend is possible. It is recommended that sampling for pathogens be conducted as frequently as all other constituents. Also, the Basin Plan requires more frequent sampling for bacteria than what is designed for through SWAMP. In addition, there is a TMDL for bacteria in the New River that would be more supported through additional monitoring.

Toxicity in Water and Sediment

Water and sediment toxicity tests were done for samples collected at the Boundary, and the Outlet to the Sea (Table 27) on each sampling date. In addition sediment toxicity tests were conducted at three additional locations for a single time point. The majority of toxicity testing shows little water toxicity particularly at the Boundary station. Conversely sediment toxicity is nearly always significant at both the Boundary and Outlet stations.

Table 27. Toxicity in water and sediment in the New River.

Station Name	Matrix	S 09	F 09	S 10	F 10	S 11	F 11	S 12	F 12	S 13
New River at Boundary	Water	NSG	NSG	NSG	NSG	NSG	NSG	NSG	SG	NSG
New River at Boundary	Sed	SL	NSG	SG	SL	SL	SL			
New River at Drop 2	Sed									SL
Evan Hughes Hwy	Sed				NSG					
New River at Rice Drain	Sed									NSG
New River Outlet	Water	NSG	SL	SL	SL	SL	SG		SL	
New River Outlet	Sed	NSG	SL	NSG	SL	NSG	SL	NSG	SL	NSG

SL: Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met). SG: Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met). NSG: Indicates that the sample shows no effects of toxicity.

3.4 Salton Sea

Area Description, Monitoring Sites and Beneficial Uses

Based on surface area, the Salton Sea is California's largest lake. It is a terminal desert lake, or sink. The Sea is a 35- mile long, 12 mile wide, 40 foot-deep, saline body of water, recognized by the federal government in 1924 as a depository for agricultural drainage waters, for lands lying 227 below sea level in and around the sea in a public water reserve. In 1968, California enacted a statute declaring that the primary use of the Salton Sea is for the collection of agricultural drainage water, seepage, leachate, and control waters. Its salinity reaches concentrations of around 47,000 ppm, saltier than the Pacific Ocean, which averages 35,000 ppm. Since the sea has no outlet, its salinity increases over time due to concentration of salts through evaporation.

The Salton Sea Trans-boundary Watershed encompasses about 8,360 square miles of the Colorado River Basin Region and contains five (out of a total of six) of the Region's impaired surface water bodies. Most of the watershed corresponds to the Imperial County, but it also receives drainage from Coachella Valley in Riverside County and the Mexicali Valley in Mexico.

For the purpose of water quality issues, the Salton Sea watershed can be divided into four main areas: the Coachella Valley, the Salton Sea, the Imperial Valley and the Mexicali Valley. The most significant water quality problems within the U.S. portion of the watershed are associated with the Salton Sea and its major tributaries: The Whitewater, New and Alamo Rivers, and agricultural drains that discharge directly into the Sea. The present sea is sustained mainly by agricultural runoff from Imperial and Coachella Valleys.

The main tributaries to the Salton Sea are the Alamo, New, and Whitewater Rivers (in descending order of annual flow), and account for about 85% of total inflow to the Sea (Michel and Schroeder, 1994). Deposition from high loads of suspended sediment delivered by the rivers has resulted in the formation of broad regions of shallow water deltas at the mouth of the rivers, especially the Alamo and New Rivers. These shallow areas are ecologically important as they harbor large numbers of fish and birds, including endangered or threatened species. These shallow areas also include, or are adjacent to, federal and state wildlife refuges. Depth of the Salton Sea increases with increasing distance from the shoreline to a maximum of about 45 feet. Bathymetric contours still exhibit some evidence of deposition from the rivers where the water depth is almost 15 feet With the exception of the Alamo and New River deltas the bottom sediments in the Sea are characterized by clay and silt whereas the deltas have a higher proportion of sand. The presence of the finer sediments should translate into a higher proportion of organic constituents.

Land use in the area surrounding the sea is predominantly agricultural. There are some recreational areas, such as Salton Sea State Recreation Area and the Torres Martinez Indian Reservation are located at the northern end of the sea; the Sonny Bono Salton Sea National Wildlife Refuge located at the southern end.

Table 28 lists the SWAMP monitoring sites and beneficial uses from the Region's Basin Plan. The rationale for these monitoring sites is provided in the Project Plan (CVRWQCB 2011). Also listed are known and potential problems for each of the monitoring sites. The Salton Sea is on the State's 303(d) list, as impaired by pathogens, arsenic, nutrients, *Chlorpyrifos*, *DDT*, and salinity. Figure 3 provides a general map of the region showing the Sea's location in context to the basin. The USGS stations are located in the Sea, the other locations are as described in their site name (Table 28). A general description of selected sites is provided to give geographical context.

Table 28. SWAMP monitoring sites, beneficial uses, and known and potential problems in the Salton Sea.

Site Name[1]	Beneficial Uses[2]	Known Problems[3]	Potential Problems[3]
American Canal at Bridge South of Quechan Casino			
Salton Sea Drain S11 (W Drain) Salton Sea Drain SW2 (Salt Creek, Mouth) 1 Salton Sea Drain S3 (Trifolium TD1) 1 Salton Sea Drain S2 (Niland 4) 1	REC I & II, WARM, WILD, RARE	Se, M, TDS, O, P, N	None
Salton Sea USGS2 Salton Sea USGS7 Salton Sea USGS9			

[1]These sites are included in the 13 strategic monitoring stations identified in the 2011 Project Plan (CVRWQCB 2011).

[2]Definitions for beneficial uses are provided in the Basin Plan.

[3]B=bacteria, P=pesticides, O=organics, M= metals, N=nutrients, Se=selenium

The following provides geographical context for selected sites.

USGS 2

This site is located in the southeast part of the Salton Sea. At this station, there is mixing of waters coming from the New and Alamo outlets. The site is situated within the Salton Sea National Wildlife Refuge near the Salton Sea Test Base.

USGS 7

This site is centrally located in the Salton Sea where depths average 30 feet.

USGS 9

This site is located in the northwest part of the Salton Sea where depths are less than 30 feet.

Water Quality in the Salton Sea Watershed

Samples were taken in the Salton Sea watershed at the locations listed in Table 28. Complete site information is provided in the Region's Basin Plan. The time period for this report is from fall of 2009 through spring of 2013. The Basin Plan designates AQUA, IND, WARM, WILD REC I and II, and RARE as the authorized uses of the water body.

Field Measurements in Water:

Do, pH, EC, Temperature, Turbidity, and Velocity

Field measurements were taken on each sampling data as presented in Table 29. This data, along with the conventional constituents, are used to describe the background water quality of a water body. Input to the Salton Sea drainage includes direct precipitation, storm runoff, agricultural drainage and municipal discharge. This region of the watershed is unique because of the elevated level of salinity in the Salton Sea.

The DO criterion of 5 mg/l was not met on 5/11/11 in the Salton Sea (USGS9). EC in the Sea is very high due to the high salt load in the agricultural drainage along with a high evaporation rate. The Basin Plan objective for salinity in the Sea is 35,000 ppm. All Sea samples exceeded this value.

Table 29. Field water quality measurements along the Salton Sea watershed from spring 2009 to spring 2011.

Salton Sea USGS2 (728SSGS02)

	4/29/09	10/21/09	5/4/10	5/11/11
Oxygen (mg/l)	7.98	6.09	9.98	6.32
Oxygen (%)	116.3	76.7	154.1	96.3
pH	7.98	7.88	8.18	8
Salinity (ppt)	42.09	43.81	41.72	42.32
Conductivity (uS/cm)		65,677	62,028	62,747
Temperature °C	22.46	23.13	25.7	24.25
Turbidity (NTU)	6.59	7.84	2.63	

Salton Sea USGS7 (728SSGS07)

	4/29/09	10/21/09	5/4/10	5/11/11
Oxygen (mg/l)	10.13	6.39	9.98	8.3
Oxygen (%)	147.5	86.7	155.2	127.8
pH	7.85	7.93	8.19	8.01
Salinity (ppt)	41.71	44.74	42.36	42.27
Conductivity (uS/cm)		66,834	62,835	62,670
Temperature °C	22.34	23.33	25.6	23.56
Turbidity (NTU)	6	7.01	3.35	3.94

Salton Sea USGS9 (728SSGS09)

	4/29/09	10/21/09	5/4/10	5/11/11
Oxygen (mg/l)	7.68	5.42	12.06	3.31
Oxygen (%)	111.2	71.6	187.8	48.7
pH	8	7.95	8.27	7.73
Salinity (ppt)	42.01	44.71	42.09	42.26
Conductivity (uS/cm)		66,889	62,395	62,629
Temperature °C	21.6	23.61	25.84	22.49
Turbidity (NTU)	6.68	8	4.48	9.86

Constituents in Water and Sediment

Categories of constituents tested in water and sediment samples include conventional, metals, organics, and bacteria indicators. In addition to testing for various constituents toxicity testing was performed on both water and sediment samples.

Table 30 lists the total number of samples, the purpose of the sampling and the breakdown of the result qualifier for sediment and water samples. All field and lab samples collected from this water body during this time period were reported as estimated or compliant with the QAMP.

Table 30. Sample counts and the breakdown of results for the Salton Sea SWAMP sampling from fall 2009 to fall 2013.

Analysis Result Data Qualifier[1]	Counts of Results	
	Sediment	Water
Above Reporting Limit	361	470
Detected Not Quantifiable	101	78
Not Detected	1,574	2498
Totals	2,036	3,046

[1] See Section 2.7 for descriptions of the Result Data Qualifiers.

Conventional Constituents in Water

Ammonia, Nitrate+ Nitrite, Orthophosphate, Boron, Chloride, Sulfate, TDS, and Chlorophyll A

Samples exceeded criteria for boron, chloride, and sulfate; however, given the composition of the Sea these results are as expected. All other results for conventional constituents in water were below criteria.

Metals in Water:

Total Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, and Zinc

Samples exceeded criteria for aluminum, arsenic, copper, and mercury. Although Salton Sea is no longer listed on the 303d list for selenium, two samples from the C Drain exceeded 5 ppb; one for 7.95 and the other for 10.4 ppb. And while the concentration of selenium coming into the Sea is between 5 and 10 ppb (see Alamo and New River sections) the concentration of selenium in the Sea (stations USGS 2, 7 and 9) ranged from 0.68 to 1.5 ppb. It is possible that the selenium (as selenate) entering the Sea from the New and Alamo Rivers is chemically reduced to selenite or elemental selenium and is no longer in the water column but rather within or adsorbed to the Sea's sediment. Dates and locations for exceedances are listed in Appendix B.

Metals in Sediment

Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc, and Grain Size

One sample exceeded the criteria for arsenic and 12 samples exceeded selenium criteria. Dates and locations for exceedances are listed in Appendix B.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

For the six sampling dates a total of 2,509 individual trace organic analyses were conducted (Table 31). Of these, 66 samples, representing 18 unique constituents had reportable results. One constituent, *Chloripyrifos*, in the C Drain, exceeded criteria in the spring and fall of 2012. In addition *Chloripyrifos* is on the 2010 303d list.

Table 31. Breakdown of result qualifiers on trace organics in water in the Salton Sea.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	66
Detected Not Quantifiable	30
Not Detected	2,413
Total	2,509

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. For the six sampling dates a total of 1,889 individual trace organic analyses were conducted (Table 32). Of these, 223 samples, representing 40 unique constituents had reportable results. For sediment samples with reportable results five constituents, representing 24 samples exceeded criteria (Table 33). Dates and locations for exceedances are listed in Appendix B.

Table 32. Breakdown of result qualifiers on trace organics in Salton Sea sediments.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	223
Detected Not Quantifiable	97
Not Detected	1,569
Total	1,889

Table 33. Counts of trace organic constituents exceeding criteria in sediment in the Salton Sea.

Constituent	Counts
DDD(o,p')	1
DDD(p,p')	4
DDE(o,p')	1
DDE(p,p')	12
Dieldrin	6

Total	24

Bacteria Indicators

Bacteria indicator organisms in the sampling routine included E. coli and Enterococcus. Two samples were taken at two separate dates in April 2013 during the reporting period in the Salton Sea, neither sample exceeded the bacterial objectives. Given the limited numbers of samples dates no evaluation of the result or trend is possible. It is recommended that sampling for pathogens be conducted as frequently as all other constituents.

Toxicity in Water and Sediment

Water toxicity tests were conducted on samples collected from three locations in the Salton Sea (Table 34). All sites showed some level of toxicity with no real distinction between the sediment and water samples. There is no apparent seasonal or temporal trend.

Table 34. Toxicity in water and sediment in the Salton Sea watershed.

Station Name	Matrix	S 09	F 09	S 10	F 10	S 11
Salton Sea USGS2	Water	SL	SL	SL		SL
Salton Sea USGS2	Sed	NSG	NSG	NSG	SL	SL
Salton Sea USGS7	Water	NSG	NSG	NSG	SL	
Salton Sea USGS7	Sed	SL	SL	SL	NSG	NSG
Salton Sea USGS9	Water	NSG	SG	NSG	SL	
Salton Sea USGS9	Sed	SL	SL	SL		SL

SL: Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met). SG: Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met). NSG: Indicates that the sample shows no effects of toxicity.

3.5 Coachella Valley Watershed

Area Description, Monitoring Sites and Beneficial Uses

The Coachella Valley Stormwater Channel (CVSC) is located in the Coachella Valley of Riverside County in California. The Coachella Valley is bounded by the San Bernardino and Little San Bernardino Mountains to the north, and the San Jacinto and Santa Rosa Mountains and the Salton Sea to the south. The CVSC is a constructed extension of the Whitewater River. The channel is unlined and extends approximately 17 miles from Indio to the Salton Sea. The Basin Plan lists FRSH, WARM and RARE, RECI, and RECII as existing uses. The FRSH, WARM and RARE are authorized uses of the water body and REC I and II are noted as unauthorized uses of the water body.

The CVSC is maintained by the Coachella Valley Water District for flood protection and serves as a master drain for the area from Indio to the Salton Sea (CVWD 2008). Potential input to the storm water channel includes local runoff from precipitation, agricultural drainage and effluent discharge from sewage treatment plants. The average annual flow from the channel outlet to the Salton Sea is approximately 100,000 acre-feet (Montgomery 1989). Flows are decreasing in recent years due to changes in agriculture practices and suburban development.

The land in the Coachella Valley has been heavily farmed since the early 1900's. Agricultural lands are irrigated by groundwater and Colorado River water from the All-American Canal. Although agriculture return water dominates CVSC flows to the Salton Sea, three municipal wastewater treatment plants (Valley Sanitary District Plant, the Coachella Sanitary District Wastewater Treatment Plant No. 2, and the CVWD Mid-Valley Plant) discharge to the channel as well. The CVSC is currently listed on the 303(d) list as impaired by pathogens, *Dieldrin*, *PCBs*, *DDT*, and *Toxaphene*. A general description of selected sites is provided to give geographical context.

Table 35 lists the SWAMP monitoring sites and beneficial uses from the Region's Basin Plan. The rational for these monitoring sites is provided in the Project Plan (CVRWQCB 2011). Also listed are known and potential problems for each of the monitoring sites. Figure 4 provides a general map of the region and the approximate location of the sampling stations. A general description of selected sites is provided to give geographical context.

Table 35. SWAMP monitoring sites, beneficial uses, and known and potential problems in the Coachella Valley Watershed.

Site Name [1]	Beneficial Uses[2]	Known Problems[3]	Potential Problems[3]
Coachella Valley Stormchannel (Ave 52) (719CVSC52)[1] Coachella Valley Stormwater Channel at Dillon Rd (719CVSCDR) Coachella Valley Stormwater Channel Outlet[1] (719CVSCOT)	FRSH, REC I, & II, WARM, WILD, RARE	B, P	N

[1]These sites are included in the 13 strategic monitoring stations identified in the 2011 Project Plan (CVRWQCB 2011).

[2]Definitions for beneficial uses are provided in the Basin Plan.

[3]B=bacteria, P=pesticides, O=organics, M= metals, N=nutrients, Se=selenium, Perch=perchlorate, T=trash, V=volatile organic compounds.

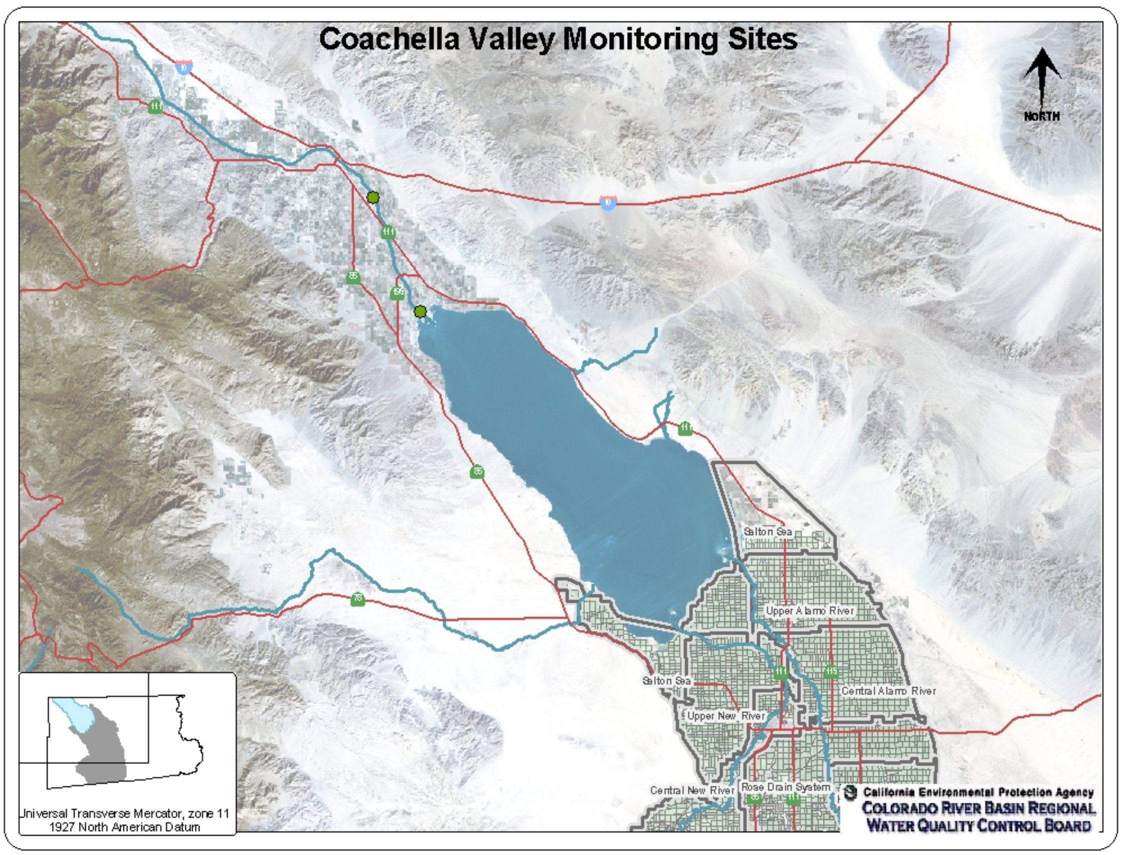

Figure 4. Monitoring Sites in the Coachella Valley Watershed.

The following provides geographical context for selected sites.

Coachella Valley Storm water Channel Outlet

Two sites, were selected in this watershed the Coachella Valley Stormwater Channel 52 (719 CVSC52) at 52 Avenue, and the Coachella Valley Stormwater Channel Outlet (719 CVSCOT). The Channel is maintained by the Coachella Valley Water District for flood protection in the valley and serves as a master drain for the area from Indio to the Salton Sea (CVWD 2001). The average annual flow from the channel outlet to the Salton Sea is approximately 100,000 acre-feet (Montgomery 1989). Flows are decreasing in recent years due to changes in agriculture practices and suburban development.

Water Quality in the Coachella Valley Watershed

In addition to field measurements water and sediment samples were collected and analyzed for organic constituents, indicator bacteria, trace elements and conventional constituents from AVE 52 in the Coachella Valley Storm Channel and at the Channel outlet for conventional water quality information, metals, organics and bacteria indicators. In addition, water and sediment from these sites were subjected to toxicity testing. This data, along with the conventional constituents are used to describe the background water quality of a water body.

Water supply in the Coachella Valley includes Colorado River water, the Whitewater River, and local groundwater. The field water quality measurements and conventional sampling results indicate that these waters are typical of the region. Like the Colorado River it is characterized as alkaline with a somewhat elevated level of TDS. Conductivity is somewhat elevated but may be due to the sewage plant discharges. The DO criterion of 5.0 mg/l for WARM was not met four times at the Ave 52 station (Table 36). Although not shown in Table 36, the Whitewater River was sampled in May 2013 with all values meeting basin standards.

Table 36. Field water quality measurements in the Coachella Valley watershed.

Coachella Valley Stormchannel (Ave 52) (719CVSC52)

	5/4/10	10/7/10	5/11/11	10/12/11	4/22/13	10/21/13
Oxygen (mg/l)	4.68	5.18	5.8	3.88	2.44	3.72
Oxygen (%)	57.6	61.1	71.3	47.7	29	44.1
pH	6.33	7.32	7.64	7.61	6.98	7.12
Salinity (ppt)	0.18	0.49	0.5	0.5	0.62	0.7
Cond. (uS/cm)	982	989	1026	1019	1239	1397
Temperature oC	25.02	23.76	25.7	23.51	24.27	23.73
Turbidity (NTU)		6.43	21.8	18	6.01	49.1

Coachella Valley Stormwater Channel Outlet (719CVSCOT)

	4/29/09	10/20/09	5/4/10	10/7/10	5/11/11	10/11/11	4/22/13	10/21/13
Oxygen (mg/l)	6.81	6.2	8.14	10.27	8.75	5.52	6.63	6.19
Oxygen (%)	72.6	69.2	96.6	115.9	105.2	66.1	79.3	70.6
pH	7.69	7.65	6.44	7.8	8.75	8.42	7.17	7.47
Salinity (ppt)	0.95	0.84	0.87	0.87	0.76	0.76	0.86	0.72
Cond. (uS/cm)	1845	1654	1730	1709	1518	1516	1704	1428
Temperature oC	18.16	20.85	23.62	21.17	24.45	23.37	24.11	21.7
Turbidity (NTU)	33	24.1		43.8	36.8	48.1	18	66

Constituents in Water and Sediment

Categories of constituents tested in water and sediment samples include conventional, metals, organics, and bacteria indicators. In addition to testing for various constituents toxicity testing was performed on both water and sediment samples.

Table 37 lists the total number of samples, the purpose of the sampling and the breakdown of the result qualifier for sediment and water samples. All field and lab samples in this water body for this time period were reported as estimated or compliant with the QAPP.

Table 37. Sample counts and the breakdown of results for the Coachella Valley watershed SWMAP sampling from fall 2009 to fall 2013.

Analysis Result Data Qualifier[1]	Counts of Results	
	Sediment	Water
Above Reporting Limit	554	698
Detected Not Quantifiable	158	74
Not Detected	2,025	3,944
Totals	2,737	4,716

Conventional Constituents in Water

Ammonia, Nitrate+ Nitrite, Orthophosphate, Boron, Chloride, Sulfate, TDS, and Chlorophyll A

Assuming the sampled values represent an average value, ammonia concentration at the Storm Channel station (Table 38) consistently exceeded the USEPA's Freshwater aquatic life 30 day continuous concentration criteria. In addition to ammonia, nitrate as N criteria (10 mg/l) were exceeded at each sampling event with values ranging from 11.9 to 15.3 mg/l.

Table 38. Ammonia exceedances in the Coachella Valley watershed.

Location and Date	Ammonia	
	Result	**Criteria**
Coachella Valley Stormchannel (Ave 52)	mg/l	
5/4/10	9.9	3.5
10/7/10	13.1	2.8
5/11/11	14.3	1.9
10/12/11	19.8	2.2
4/22/13	12.0	3.2
10/21/13	12.0	3.1
Dillion Road		
4/24/13	11.5	1.8
10/23/13	16.5	1.7
Channel Outlet		
5/11/11	0.6	0.4
10/11/11	1.8	0.7

Metals in Water:

Total Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, and Zinc

Copper and mercury exceeded criteria for all sampling periods at Ave 52 and at the outlet. In addition selenium was 5.15 ppb in the fall of 2009. Dates and locations for exceedances are listed in Appendix B.

Metals in Sediment

Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc, and Grain Size

Chromium, copper, and nickel exceeded criteria for all sampling periods. Zinc exceeded criteria on four sampling periods, and both manganese and silver exceeded criteria during one sampling period. Dates and locations for exceedances are listed in Appendix B.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

For the six sampling dates a total of 3,531 individual trace organic analyses were conducted (Table 39). Of these, 96 samples, representing 47 unique constituents had reportable results. Twelve analyses representing 2 constituents; *Disulfoton and Cyhalothrin* exceeded available criteria.

Table 39. Breakdown of result qualifiers on trace organics in water in the Coachella Valley.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	96
Detected Not Quantifiable	49
Not Detected	3,386
Total	3,531

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. For the six sampling dates a total of 2,518 individual trace organic analyses were conducted (Table 40). Of these, 358 samples, representing 82 unique constituents had reportable results. Eleven samples, representing *DDD, DDE,* and *Dieldrin* exceeded criteria. In addition *Dieldrin* is on 303d list for the Stormchannel.

Table 40. Breakdown of result qualifiers on trace organics in Coachella Valley Watershed sediments.

Analysis Result Data Qualifier	Count of Results
Above Reporting Limit	358
Detected Not Quantifiable	140
Not Detected	2,020
Total	2,518

Bacteria Indicators

Bacteria indicator organisms in the sampling routine included E. coli and enterococcus. A total of 12 samples were taken during the reporting period in the Coachella Valley watershed. Samples were taken on two dates in April and May

2013. Three samples exceeded the REC I objective for Enterococcus and three samples exceeded the objective for REC I & II. Given the limited numbers of samples dates no evaluation of the result or trend is possible. It is recommended that sampling for pathogens be conducted as frequently as all other constituents.

Toxicity in Water and Sediment

Water and sediment toxicity tests were performed on samples collected from the watershed (Table 41). These results indicate the lowest level of toxicity in the entire Basin

Table 41. Toxicity in water and sediment at the Coachella Valley Storm Channel Outlet to the Salton Sea.

Station Name	Matrix	S 09	F 09	S 10	F 10	S 11	F 11	S 12	F 12	S 13
Ave 52	Water			NSG	NSG	NSG	NSG			
Ave 52	Sed			SL	SL	SL	SL			NSL
Dillon Rd	Water									
Dillon Rd	Sed									
Channel Outlet	Water	SG	SG	NSG	NSG	NSG	NSG			
Channel Outlet	Sed	NSG	NSG	NSG		NSG	NSG		NSG	
Lake Cahuilla	Water									NSG
Lake Cahuilla	Sed									NSG

SL: Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met). SG: Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met). NSG: Indicates that the sample shows no effects of toxicity.

4. Summary

This assessment reviewed the results of analysis on water and sediment samples collected between fall 2009 and fall 2013 in the Colorado River Basin Region under the SWAMP. Sampling was conducted at 62 discrete sites including 26 strategic monitoring locations.

Field measurements were collected for DO, pH, EC, temperature, turbidity, and sparingly for velocity. In the laboratory, samples were analyzed for conventional constituents, metals and trace organics in both sediment and water. Water samples were cultured for bacteria indicators and both water and sediments were subjected to toxicity testing. All sampling and analysis were conducted based on the SWAMPQAPP. All results were entered into the SWAMP database. There were 55,111 sample results, including; field measures, grab and integrated samples, field duplicates, and field blanks. No samples were rejected. However, just over 20% were classified as "qualified" because they were not fully compliant with the SWAMP QAPP, typically this was due to exceedance of holding times. Additionally, 4.8% of the samples were labeled "screening", and 1.2% were considered "estimates", these samples are non-quantifiable.

Field measurements for DO, pH, EC, temperature, and turbidity were taken at all sampling locations. The majority of these measurements were with Basin criteria. DO criteria was exceeded on single occasions in the Palo Verde Drain, and the Salton Sea. DO criteria were exceeded multiple times in the Alamo and New Rivers and in the Coachella Stormchannel. However, there is no spatial or temporal pattern to the results. Salinity levels in the Salton Sea consistently exceeded the 35,000 ppm, Basin Plan objective. Turbidity was consistently elevated at the Boundary stations on both the Alamo and New Rivers.

Arsenic, mercury and selenium all exceed Basin Plan objectives at multiple locations. Arsenic was found primarily in the Alamo River, New River, and the Coachella Stormchannel. Mercury criterion was exceeded in all watersheds. Both the New and Alamo Rivers are listed as on the 303(d) list for impairment by mercury. Of the 225 selenium results, 101 were above the 5 ppb level that many wildlife biologists feel is unsafe for certain aquatic life uses. One selenium sample, from the Imperial Dam Gates had a value of 106 ppb which is above the Basin Plan objective of 50 ppb. Other than the single exceedance on the Colorado River, the highest levels of selenium were found on both the Alamo and New Rivers. Selenium is on the 303(d) list for the Colorado, New and Alamo Rivers as well as the Imperial Valley Drains. Selenium monitoring should continue at all monitoring stations.

Nitrate criterion was exceeded multiple times in the upper portion of the Alamo River and in the Coachella Valley Stormchannel. Ammonia criterion was exceeded in both the Coachella Valley Stormchannel and in the New River watershed.

Samples from the New River Boundary station and Ave 52 in the Coachella Valley Stormchannel consistently exceeded the USEPA's Freshwater aquatic life 30 day continuous concentration criterion. No waters are currently listed for impairment on the 303(d) by ammonia.

The percentage of all water samples for organics with reportable results was approximately equal (between 2.3-3.1%) for the New and Alamo Rivers, Coachella Valley and the Salton Sea. The Colorado River was lower at 0.6% having reportable results. The percentage of all sediment samples with reportable results was approximately equal for the New (21%) and Alamo (18%) Rivers and lower for the other subwatersheds; Salton Sea (11%), Coachella (14%) and Colorado (9%).

Analysis for bacterial indicators was completed for only the spring 2013 sampling period. Freshwater sources (Colorado and Whitewater Rivers) did not exceed criteria however, most drainages exceeded the REC I and REC II criteria.

Toxicity testing was completed on water and sediment samples from all watersheds. Overall, water samples exhibited lower toxicity than sediment samples. The Colorado River at the Nevada border site is assumed to be the "cleanest" in the Region; however, toxicity was observed on at least one sampling date for both sediment and water at either the Imperial Dam Gates or at the Nevada state line. Overall, toxicity is the most consistent impact to the Region's waters; however, the cause of toxicity is not certain. Few of the analytes exceeded established criteria for organics in either sediment or water. However, there were many analytes showing reportable concentrations that do not have established criteria to compare against the results. In addition, there are no established criteria available to evaluate the cumulative effects of the reportable results. In locations where there are fewer reportable results for organics, such as the Colorado River, analysis of toxicity data indicates that there is lower toxicity. Only two of the ten sampling dates at the New River Boundary showed water toxicity, whereas all six of the sediment samples had toxicity. In general toxicity was greater in sediment samples from the Sea than in water samples.

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Appendix A: Constituents above their Reporting Limit without Criteria for Stated Beneficial Uses

A.1 Water Samples

Acenaphthylene
Atraton
Atrazine-Desisopropyl-2-Hydroxy
Bifenthrin
Biphenyl
Caffeine
Carbamazepine
Chrysenes, C1-
Chrysenes, C2-
Desethyl-Atrazine
Desisopropyl-Atrazine
Dimethylnaphthalene, 2,6-
Erythromycin-H2O
Esfenvalerate/Fenvalerate, Total
Fenitrothion
Fluorenes, C1-
Fluorenes, C2-
Gemfibrozil
Hydroxyatrazine, 2-
Ibuprofen
Lincomycin
Methylnaphthalene, 1-
Methylphenanthrene, 1-
Naphthalenes, C1, C2, C3, & C4 -
Oxychlordane
Phenanthrene/Anthracene, C1-
Phenanthrene/Anthracene, C2-
Sulfamethoxazole
Sulfathiazole
Terbuthylazine
Triclosan
Trimethoprim
Trimethylnaphthalene, 2,3,5-

A.2 Sediment Samples

Acenaphthene
Acenaphthylene
Aluminum
Benz(a)anthracene
Benzo(a)fluoranthene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(j/k)fluoranthene
Benzo(k)fluoranthene
Biphenyl
Chlordane, cis-
Chlordane, trans-
Chrysene
Cyhalothrin, Total lambda-
Dacthal
Deltamethrin/Tralomethrin
Dibenzothiophene
Dibenzothiophenes, C1-
Dibenzothiophenes, C2-
Dibenzothiophenes, C3-
Dimethylnaphthalene, 2,6-
Dimethylphenanthrene, 3,6-
Endosulfan I
Esfenvalerate/Fenvalerate, Total
Fluoranthene/Pyrenes, C1-
Fluorenes, C1-
Fluorenes, C2-
Fluorenes, C3-
Hexachlorobenzene
Indeno(1,2,3-c,d)pyrene
Methyldibenzothiophene, 4-
Methylfluoranthene, 2-
Methylfluorene, 1-
Methylnaphthalene, 1-
Methylnaphthalene, 2-
Methylphenanthrene, 1-
Naphthalenes, C1, C2, C3, & C4 -

Nonachlor, trans-
Oxadiazon

Appendix B: Trace Metals and Organic Constituents in Water and Sediment Above Reporting Limit

Constituents Above Criteria[1] by Matrix, Type, Watershed, Constituent, and Date

B.1 Water Samples – Trace Metals

Alamo River			
Station Name	**Date**	**Constituent**	**Result (µg/L)**
International Boundary	4/28/09	Arsenic	12
International Boundary	10/19/09	Arsenic	12.9
International Boundary	10/5/10	Arsenic	11
International Boundary	10/5/10	Arsenic	10.6
Alamo River Outlet	5/10/11	Arsenic	11.4
International Boundary	5/10/11	Arsenic	14
Alamo River Outlet	10/11/11	Arsenic	10.2
International Boundary	10/11/11	Arsenic	13.3
I Drain	10/15/12	Arsenic	11.9
Nettle Drain	10/15/12	Arsenic	16.3
Magnolia Drain	10/16/12	Arsenic	10.4
Munyon Drain	10/16/12	Arsenic	20.4
Alamo River Outlet	10/21/13	Arsenic	20.3
Drop 3	10/22/13	Arsenic	19.4
Drop 6 Rose Drain	10/22/13	Arsenic	19.7
Drop 8	10/23/13	Arsenic	14.7
Drop 10 Central Drain	10/23/13	Arsenic	16.7
Drop 6A Holtville Drain	10/23/13	Arsenic	21
Alamo River Outlet	4/28/09	Copper	5.94
International Boundary	4/28/09	Copper	9
Alamo River Outlet	10/19/09	Copper	5.41
International Boundary	10/19/09	Copper	4.78
Alamo River Outlet	5/4/10	Copper	2.93
Alamo River Outlet	5/4/10	Copper	2.84

International Boundary	10/5/10	Copper	1.52
International Boundary	10/5/10	Copper	1.48
Drop 6 Rose Drain	10/6/10	Copper	2.47
Drop 10 Central Drain	10/6/10	Copper	2.74
Alamo River Above Drop 3	10/6/10	Copper	2.12
Drop 6A Holtville Drain	10/6/10	Copper	1.46
Drop 6A Holtville Drain	10/6/10	Copper	1.48
Alamo River Outlet	10/6/10	Copper	2.26
Alamo River Outlet	10/6/10	Copper	2.25
Alamo River Outlet	5/10/11	Copper	6.77
International Boundary	5/10/11	Copper	4.27
Alamo River Outlet	10/11/11	Copper	3.94
Alamo River Outlet	10/11/11	Copper	3.94
International Boundary	10/11/11	Copper	2.1
Alamo River Outlet	5/7/12	Copper	3.9
I Drain	5/7/12	Copper	5.75
N Drain	5/7/12	Copper	4.13
Drop 10 Central Drain	5/8/12	Copper	4.11
Barbara Worth Drain	5/8/12	Copper	5.39
Central Drain	5/8/12	Copper	3.51
Holtville Drain	5/8/12	Copper	4.29
Magnolia Drain	5/8/12	Copper	4.1
Munyon Drain	5/8/12	Copper	4.03
Nettle Drain	5/8/12	Copper	3.54
Alamo River Outlet	10/15/12	Copper	3.81
I Drain	10/15/12	Copper	6.8
N Drain	10/15/12	Copper	4.14
Nettle Drain	10/15/12	Copper	6.23
Holtville Drain	10/16/12	Copper	3.51
Magnolia Drain	10/16/12	Copper	4.05
Munyon Drain	10/16/12	Copper	4.14
Drop 10 Central Drain	10/17/12	Copper	3.12
Barbara Worth Drain	10/17/12	Copper	2.83
Central Drain	10/17/12	Copper	3.13
Alamo River Outlet	4/22/13	Copper	2.91
Drop 3	4/23/13	Copper	2.64
Drop 6 Rose Drain	4/23/13	Copper	2.34
Drop 8	4/24/13	Copper	2.82
Drop 10 Central Drain	4/24/13	Copper	2.93
Drop 10 Central Drain	4/24/13	Copper	2.86
Drop 6A Holtville Drain	4/24/13	Copper	3.13

Alamo River Outlet	10/21/13	Copper	3.57
Drop 3	10/22/13	Copper	2.73
Drop 6 Rose Drain	10/22/13	Copper	3.44
Drop 8	10/23/13	Copper	2.47
Drop 10 Central Drain	10/23/13	Copper	3.32
Drop 6A Holtville Drain	10/23/13	Copper	3.39
Alamo River Outlet	4/28/09	Mercury (ng/l)	8.45
International Boundary	4/28/09	Mercury (ng/l)	2.28
Alamo River Outlet	10/19/09	Mercury (ng/l)	7.14
International Boundary	10/19/09	Mercury (ng/l)	1.18
Alamo River Outlet	5/4/10	Mercury (ng/l)	0.795
International Boundary	5/4/10	Mercury (ng/l)	1
International Boundary	10/5/10	Mercury (ng/l)	0.998
International Boundary	10/5/10	Mercury (ng/l)	1.12
Drop 6 Rose Drain	10/6/10	Mercury (ng/l)	0.776
Drop 10 Central Drain	10/6/10	Mercury (ng/l)	0.972
Drop 10 Central Drain	10/6/10	Mercury (ng/l)	0.896
Alamo River Above Drop 3	10/6/10	Mercury (ng/l)	0.814
Alamo River Outlet	5/10/11	Mercury (ng/l)	1.7
International Boundary	5/10/11	Mercury (ng/l)	0.992
Alamo River Outlet	10/11/11	Mercury (ng/l)	0.788
International Boundary	10/11/11	Mercury (ng/l)	1.01
Alamo River Outlet	10/15/12	Mercury (ng/l)	0.8
Alamo River Outlet	4/28/09	Selenium	8.51
International Boundary	4/28/09	Selenium	5.98
Alamo River Outlet	10/19/09	Selenium	11.6
International Boundary	10/19/09	Selenium	6.06
Alamo River Outlet	5/4/10	Selenium	6.24
Alamo River Outlet	5/4/10	Selenium	6.4
Alamo River Outlet	5/10/11	Selenium	7.2
Alamo River Outlet	10/11/11	Selenium	7.63
Alamo River Outlet	10/11/11	Selenium	8.15
Alamo River Outlet	5/7/12	Selenium	6.51
I Drain	5/7/12	Selenium	5.23
N Drain	5/7/12	Selenium	6.65
Drop 10 Central Drain	5/8/12	Selenium	9.28
Barbara Worth Drain	5/8/12	Selenium	22.2
Central Drain	5/8/12	Selenium	6.3
Holtville Drain	5/8/12	Selenium	6.65
Munyon Drain	5/8/12	Selenium	9.12
Alamo River Outlet	10/15/12	Selenium	7.49

I Drain	10/15/12	Selenium	6.29
N Drain	10/15/12	Selenium	8.78
Nettle Drain	10/15/12	Selenium	6.64
Holtville Drain	10/16/12	Selenium	7.23
Magnolia Drain	10/16/12	Selenium	9.74
Munyon Drain	10/16/12	Selenium	6.43
Drop 10 Central Drain	10/17/12	Selenium	8.07
Central Drain	10/17/12	Selenium	6.38
Alamo River Outlet	4/22/13	Selenium	6.58
Drop 3	4/23/13	Selenium	6.46
Drop 8	4/24/13	Selenium	5.68
Drop 10 Central Drain	4/24/13	Selenium	6.71
Drop 10 Central Drain	4/24/13	Selenium	6.43
Drop 6A Holtville Drain	4/24/13	Selenium	6.21
Alamo River Outlet	10/21/13	Selenium	9.39
Drop 3	10/22/13	Selenium	9.6
Drop 6 Rose Drain	10/22/13	Selenium	8.29
Drop 8	10/23/13	Selenium	7.65
Drop 10 Central Drain	10/23/13	Selenium	10.3
Drop 6A Holtville Drain	10/23/13	Selenium	8.41
Coachella Valley			
Channel Outlet	4/29/09	Copper	4.34
Channel Outlet	10/20/09	Copper	3.26
Channel Outlet	5/4/10	Copper	1.8
Stormchannel (Ave 52)	10/7/10	Copper	2.31
Channel Outlet	10/7/10	Copper	1.84
Stormchannel (Ave 52)	5/11/11	Copper	3.46
Channel Outlet	5/11/11	Copper	2.35
Channel Outlet	10/11/11	Copper	2.93
Stormchannel (Ave 52)	10/12/11	Copper	1.46
Stormchannel (Ave 52)	4/22/13	Copper	1.46
Channel Outlet	4/22/13	Copper	2.21
Stormchannel (Ave 52)	10/21/13	Copper	1.86
Channel Outlet	10/21/13	Copper	1.96
Channel Outlet	10/21/13	Copper	2.08
Channel at Dillon Rd	10/23/13	Copper	2.44
Channel Outlet	4/29/09	Mercury (ng/l)	4.25
Channel Outlet	10/20/09	Mercury (ng/l)	219
Channel Outlet	10/20/09	Mercury (ng/l)	2.1
Stormchannel (Ave 52)	5/4/10	Mercury (ng/l)	1.08

Stormchannel (Ave 52)	10/7/10	Mercury (ng/l)	1.36
Channel Outlet	10/7/10	Mercury (ng/l)	0.907
Stormchannel (Ave 52)	5/11/11	Mercury (ng/l)	1.21
Channel Outlet	10/11/11	Mercury (ng/l)	0.806
Channel Outlet	10/11/11	Mercury (ng/l)	0.934
Stormchannel (Ave 52)	10/12/11	Mercury (ng/l)	1.66
Stormchannel (Ave 52)	4/22/13	Mercury (ng/l)	1.11
Stormchannel (Ave 52)	4/22/13	Mercury (ng/l)	1.17
Stormchannel (Ave 52)	4/22/13	Mercury (ng/l)	1.17
Stormchannel (Ave 52)	10/21/13	Mercury (ng/l)	1.4
Channel at Dillon Rd	10/23/13	Mercury (ng/l)	2.74
Channel Outlet	4/29/09	Selenium	5.15
Colorado River			
Nevada State Line	10/19/09	Arsenic	105
Nevada State Line	4/28/09	Copper	1.4
Lagoon (LG1)	4/29/09	Copper	2.62
Outfall Drain (PVOD2)	4/29/09	Copper	2.6
Imperial Dam Grates	4/29/09	Copper	1.48
Nevada State Line	10/19/09	Copper	13.1
Lagoon (LG1)	10/20/09	Copper	2.13
Outfall Drain (PVOD2)	10/20/09	Copper	2.12
Imperial Dam Grates	10/20/09	Copper	1.34
Lagoon (LG1)	5/9/11	Copper	9.59
Outfall Drain (PVOD2)	5/9/11	Copper	3.4
Lagoon (LG1)	10/10/11	Copper	1.37
Outfall Drain (PVOD2)	10/10/11	Copper	1.42
Nevada State Line	10/19/09	Lead	24.2
Nevada State Line	4/28/09	Mercury (ng/l)	2.53
Outfall Drain (PVOD2)	4/29/09	Mercury (ng/l)	0.813
Nevada State Line	10/19/09	Selenium	106
New River			
Boundary	4/28/09	Arsenic	18.9
Outlet	4/28/09	Arsenic	11.1
Outlet	4/28/09	Arsenic	11.3
Boundary	10/19/09	Arsenic	17.4
Boundary	10/19/09	Arsenic	17.8
Outlet	10/19/09	Arsenic	13.2
Outlet	10/19/09	Arsenic	13.1
Outlet	5/10/11	Arsenic	10.9

Outlet	10/11/11	Arsenic	14.7
Greeson Drain	5/9/12	Arsenic	14.2
P Drain	10/15/12	Arsenic	10.6
Rice 3 Drain	10/16/12	Arsenic	12.4
Rice 3 Drain	10/16/12	Arsenic	12.5
Boundary	4/23/13	Arsenic	12.7
Drop 2	4/23/13	Arsenic	10.3
Evan Hughes Hwy	4/23/13	Arsenic	12.3
Rice Drain #3	4/23/13	Arsenic	10.7
Rice Drain	4/23/13	Arsenic	11.2
Drop 2	10/22/13	Arsenic	24.8
Evan Hughes Hwy	10/22/13	Arsenic	22.9
Outlet	10/22/13	Arsenic	21.3
Rice Drain #3	10/22/13	Arsenic	23.3
Rice Drain	10/22/13	Arsenic	13.1
Boundary	4/28/09	Copper	13.7
Outlet	4/28/09	Copper	9.66
Outlet	4/28/09	Copper	10.3
Boundary	10/19/09	Copper	8.42
Boundary	10/19/09	Copper	8.2
Outlet	10/19/09	Copper	6.82
Outlet	10/19/09	Copper	6.62
Outlet	5/4/10	Copper	3.34
Outlet	5/4/10	Copper	3.39
Outlet	10/6/10	Copper	2.46
Boundary	5/10/11	Copper	4.64
Outlet	5/10/11	Copper	4.73
Outlet	5/10/11	Copper	6.88
Outlet	10/11/11	Copper	4.96
Outlet	5/7/12	Copper	4.59
Outlet	5/7/12	Copper	4.51
Drain S2 (Niland 4)	5/7/12	Copper	1.31
Drain S3 (Trifolium TD1)	5/7/12	Copper	3.23
P Drain	5/7/12	Copper	3.71
Timothy 2 Drain	5/7/12	Copper	6.44
Fig Drain	5/8/12	Copper	2.82
Oleander Drain	5/8/12	Copper	4.57
Peach Drain	5/8/12	Copper	2.19
Rice 3 Drain	5/8/12	Copper	4.5
Rice Drain at Headgate 101	5/8/12	Copper	3.79
Rose Drain RWB7	5/8/12	Copper	3.24

Rose Drain RWB7	5/8/12	Copper	3.26
South Central Drain RWB7	5/8/12	Copper	3.48
Spruce Drain	5/8/12	Copper	2.54
Spruce Drain	5/8/12	Copper	2.81
Verde Drain RWB7	5/8/12	Copper	4.12
Greeson Drain	5/9/12	Copper	5.68
Spruce Drain	10/15/12	Copper	3.86
P Drain	10/15/12	Copper	6.61
Fig Drain	10/16/12	Copper	1.77
Greeson Drain	10/16/12	Copper	2.14
Outlet	10/16/12	Copper	3.61
Outlet	10/16/12	Copper	3.46
Oleander Drain	10/16/12	Copper	3.82
Rice 3 Drain	10/16/12	Copper	3.17
Rice 3 Drain	10/16/12	Copper	3.25
Rice Drain at Headgate 101	10/16/12	Copper	3.4
Rose Drain RWB7	10/16/12	Copper	3.34
Drain S3 (Trifolium TD1)	10/16/12	Copper	3.31
Timothy 2 Drain	10/16/12	Copper	4.17
Verde Drain RWB7	10/16/12	Copper	3.88
Peach Drain	10/17/12	Copper	4.1
South Central Drain RWB7	10/17/12	Copper	3.29
South Central Drain RWB7	10/17/12	Copper	3.46
Boundary	4/23/13	Copper	3.08
Drop 2	4/23/13	Copper	3.16
Evan Hughes Hwy	4/23/13	Copper	2.95
Outlet	4/23/13	Copper	3.25
Rice Drain #3	4/23/13	Copper	3.15
Rice Drain	4/23/13	Copper	3.29
Drop 2	10/22/13	Copper	2.51
Evan Hughes Hwy	10/22/13	Copper	2.37
Outlet	10/22/13	Copper	2.56
Rice Drain #3	10/22/13	Copper	2.77
Rice Drain	10/22/13	Copper	5.13
Boundary	4/28/09	Mercury (ng/l)	13.3
Boundary	4/28/09	Mercury (ng/l)	11.3
Outlet	4/28/09	Mercury (ng/l)	10.1
Outlet	4/28/09	Mercury (ng/l)	8.34
Boundary	10/19/09	Mercury (ng/l)	10.5
Outlet	10/19/09	Mercury (ng/l)	12.6
Boundary	5/4/10	Mercury (ng/l)	1.1

Boundary	5/4/10	Mercury (ng/l)	1.03
Boundary	10/5/10	Mercury (ng/l)	1.52
Evan Hughes Hwy	10/6/10	Mercury (ng/l)	1.16
Outlet	10/6/10	Mercury (ng/l)	0.951
Boundary	5/10/11	Mercury (ng/l)	0.885
Boundary	5/10/11	Mercury (ng/l)	0.795
Boundary	10/11/11	Mercury (ng/l)	0.882
Boundary	5/8/12	Mercury (ng/l)	1.64
Boundary	5/8/12	Mercury (ng/l)	1.53
Boundary	10/16/12	Mercury (ng/l)	0.951
Boundary	4/23/13	Mercury (ng/l)	1.27
Boundary	10/22/13	Mercury (ng/l)	2.4
Rice Drain	10/22/13	Mercury (ng/l)	1.74
Boundary	4/28/09	Selenium	15
Outlet	4/28/09	Selenium	10.5
Outlet	4/28/09	Selenium	10.5
Boundary	10/19/09	Selenium	15.1
Boundary	10/19/09	Selenium	15.3
Outlet	10/19/09	Selenium	12.2
Outlet	10/19/09	Selenium	11.4
Outlet	5/4/10	Selenium	6.4
Outlet	5/4/10	Selenium	6.23
Outlet	5/10/11	Selenium	7.51
Outlet	5/10/11	Selenium	7.65
Outlet	10/11/11	Selenium	8.94
Outlet	5/7/12	Selenium	6.06
Outlet	5/7/12	Selenium	6.43
Drain S3 (Trifolium TD1)	5/7/12	Selenium	5.48
P Drain	5/7/12	Selenium	5.16
Timothy 2 Drain	5/7/12	Selenium	6.78
Oleander Drain	5/8/12	Selenium	8.17
Peach Drain	5/8/12	Selenium	21
Rice 3 Drain	5/8/12	Selenium	5.44
Rose Drain RWB7	5/8/12	Selenium	5.22
South Central Drain RWB7	5/8/12	Selenium	9.08
Verde Drain RWB7	5/8/12	Selenium	7.56
Greeson Drain	5/9/12	Selenium	10.6
Spruce Drain	10/15/12	Selenium	5.54
P Drain	10/15/12	Selenium	11.7
Outlet	10/16/12	Selenium	5.96
Outlet	10/16/12	Selenium	5.94

Oleander Drain	10/16/12	Selenium	5.61
Rice 3 Drain	10/16/12	Selenium	5.57
Rice 3 Drain	10/16/12	Selenium	5.63
Rice Dr Headgate 101	10/16/12	Selenium	6.01
Rose Drain RWB7	10/16/12	Selenium	6.28
Drain S3	10/16/12	Selenium	5.69
Timothy 2 Drain	10/16/12	Selenium	10.3
Verde Drain RWB7	10/16/12	Selenium	11.1
South Central Drain	10/17/12	Selenium	8.28
South Central Drain	10/17/12	Selenium	7.66
Boundary	4/23/13	Selenium	7.03
Drop 2	4/23/13	Selenium	5.93
Evan Hughes Hwy	4/23/13	Selenium	6.98
Outlet	4/23/13	Selenium	5.55
Rice Drain #3	4/23/13	Selenium	7.08
Rice Drain	4/23/13	Selenium	6.24
Drop 2	10/22/13	Selenium	7.56
Evan Hughes Hwy	10/22/13	Selenium	7.31
Outlet	10/22/13	Selenium	6.42
Rice Drain #3	10/22/13	Selenium	7.28
Rice Drain	10/22/13	Selenium	6.75
Salton Sea			
C Drain	10/15/12	Aluminum	2103
Salton Sea USGS2	4/29/09	Arsenic	21.1
Salton Sea USGS7	4/29/09	Arsenic	21
Salton Sea USGS9	4/29/09	Arsenic	21
Salton Sea USGS9	4/29/09	Arsenic	20.9
Salton Sea USGS2	10/21/09	Arsenic	19.7
Salton Sea USGS7	10/21/09	Arsenic	20.3
Salton Sea USGS9	10/21/09	Arsenic	19.7
Salton Sea USGS9	10/21/09	Arsenic	19.2
Salton Sea USGS2	5/4/10	Arsenic	18.2
Salton Sea USGS7	5/4/10	Arsenic	17.6
Salton Sea USGS7	5/4/10	Arsenic	20
Salton Sea USGS9	5/4/10	Arsenic	17.4
Salton Sea USGS2	5/11/11	Arsenic	16.4
Salton Sea USGS2	5/11/11	Arsenic	16.4
Salton Sea USGS7	5/11/11	Arsenic	17.3
Salton Sea USGS9	5/11/11	Arsenic	17.1
C Drain	5/7/12	Arsenic	10.1

Salton Sea USGS2	5/11/11	Copper	1.69
C Drain	5/7/12	Copper	4.89
C Drain	10/15/12	Copper	4.43
Salton Sea USGS2	4/29/09	Mercury (ng/l)	0.893
Salton Sea USGS7	4/29/09	Mercury (ng/l)	0.902
Salton Sea USGS9	4/29/09	Mercury (ng/l)	0.805
Salton Sea USGS2	5/11/11	Mercury (ng/l)	0.921
Salton Sea USGS2	5/11/11	Mercury (ng/l)	0.83
Salton Sea USGS7	5/11/11	Mercury (ng/l)	0.903
Salton Sea USGS9	5/11/11	Mercury (ng/l)	0.864
C Drain	5/7/12	Selenium	7.95
C Drain	10/15/12	Selenium	10.4

B.2 Water Samples – Trace Organics

Alamo River			
Station Name	**Date**	**Constituent**	**Result (µg/L)**
Outlet	10/19/09	Chlorpyrifos	0.266
Drop 6A Holtville Drain	10/6/10	Chlorpyrifos	0.053
Outlet	10/6/10	Chlorpyrifos	0.12
Outlet	5/7/12	Chlorpyrifos	0.058
Drop 10 Central Drain	5/8/12	Chlorpyrifos	0.043
Central Drain	5/8/12	Chlorpyrifos	0.055
Holtville Drain	5/8/12	Chlorpyrifos	0.045
Magnolia Drain	5/8/12	Chlorpyrifos	0.162
Nettle Drain	5/8/12	Chlorpyrifos	0.047
Outlet	10/15/12	Chlorpyrifos	0.049
Holtville Drain	10/16/12	Chlorpyrifos	0.119
Drop 10 Central Drain	10/17/12	Chlorpyrifos	0.294
Outlet	10/21/13	Chlorpyrifos	0.135
Above Drop 3	10/6/10	Cyhalothrin	0.003
Drop 10 Central Drain	10/6/10	Cyhalothrin	0.002
Drop 6 Rose Drain	10/6/10	Cyhalothrin	0.005
Drop 6A Holtville Drain	10/6/10	Cyhalothrin	0.005
Outlet	10/6/10	Cyhalothrin	0.003
International Boundary	5/10/11	Cyhalothrin	0.006
Outlet	4/22/13	Cyhalothrin	0.0058
Drop 3	4/23/13	Cyhalothrin	0.0045
Drop 6 Rose Drain	4/23/13	Cyhalothrin	0.0077
Drop 10 Central Drain	4/24/13	Cyhalothrin	0.0024
Drop 6A Holtville Drain	4/24/13	Cyhalothrin	0.0047

Drop 8	4/24/13	Cyhalothrin	0.0031
Outlet	10/21/13	Cyhalothrin	0.004
Drop 3	10/22/13	Cyhalothrin	0.002
Drop 6 Rose Drain	10/22/13	Cyhalothrin	0.009
Drop 6A Holtville Drain	10/23/13	Cyhalothrin	0.004
Drop 8	10/23/13	Cyhalothrin	0.004
Outlet	10/19/09	Diazinon	0.362
Central Drain	5/8/12	Disulfoton	0.176
Outlet	2/11/11	Malathion	0.166
Drop 10 Central Drain	5/10/11	Malathion	0.16
Drop 10 Central Drain	4/24/13	Malathion	0.121
Outlet	5/4/10	Mirex	0.008
New River			
South Central Drain RWB7	5/8/12	Chlorpyrifos	0.04
Outlet	10/16/12	Chlorpyrifos	0.051
Rose Drain RWB7	10/16/12	Chlorpyrifos	0.108
South Central Drain RWB7	10/17/12	Chlorpyrifos	0.58
South Central Drain RWB7	10/17/12	Chlorpyrifos	0.598
Evan Hughes Hwy	10/22/13	Chlorpyrifos	0.066
Rice Drain #3	10/22/13	Chlorpyrifos	0.073
Drop 2	10/22/13	Chlorpyrifos	0.114
Rice Drain	10/22/13	Chlorpyrifos	0.162
Outlet	5/4/10	Cyhalothrin	0.005
Evan Hughes Hwy	10/6/10	Cyhalothrin	0.003
Outlet	10/11/11	Cyhalothrin	0.011
Outlet	4/23/13	Cyhalothrin	0.0029
Outlet	10/22/13	Cyhalothrin	0.004
Drop 2	10/22/13	Cyhalothrin	0.007
Rice Drain #3	10/22/13	Cyhalothrin	0.008
Evan Hughes Hwy	10/22/13	Cyhalothrin	0.023
Outlet	10/19/09	Diazinon	0.1
Outlet	10/16/12	Diazinon	0.143
Greeson Drain	10/16/12	Diazinon	1.15
South Central Drain RWB7	10/17/12	Diazinon	0.132
South Central Drain RWB7	10/17/12	Diazinon	0.133
Boundary	10/19/09	Disulfoton	0.06
Boundary	10/19/09	Disulfoton	0.06
Boundary	10/5/10	Disulfoton	0.184
Outlet	10/6/10	Disulfoton	0.058
Evan Hughes Hwy	10/6/10	Disulfoton	0.13

Boundary	10/11/11	Disulfoton	0.095
Outlet	5/7/12	Disulfoton	0.172
Outlet	5/7/12	Disulfoton	0.173
Boundary	5/8/12	Disulfoton	0.197
Greeson Drain	5/9/12	Disulfoton	0.198
Boundary	10/16/12	Disulfoton	0.11
Boundary	4/23/13	Disulfoton	0.127
Outlet	2/11/11	Malathion	0.426
Rice Drain #3	10/22/13	Malathion	0.149
Coachella Valley			
Stormchannel (Ave 52)	10/12/11	Cyhalothrin	0.021
Stormwater Channel Outlet	10/21/13	Cyhalothrin	0.002
Stormwater Channel Outlet	10/20/09	Disulfoton	0.086
Stormwater Channel Outlet	10/20/09	Disulfoton	0.082
Stormchannel (Ave 52)	5/4/10	Disulfoton	0.212
Stormwater Channel Outlet	5/4/10	Disulfoton	0.114
Stormchannel (Ave 52)	10/7/10	Disulfoton	0.314
Stormwater Channel Outlet	10/7/10	Disulfoton	0.202
Stormwater Channel Outlet	10/11/11	Disulfoton	0.103
Stormchannel (Ave 52)	10/12/11	Disulfoton	0.183
Stormchannel (Ave 52)	4/22/13	Disulfoton	0.214
Stormwater Channel Outlet	4/22/13	Disulfoton	0.125

B.3 Sediment Samples – Trace Metals

Alamo River			
Station Name	**Date**	**Constituent**	**Result**
International Boundary	10/5/10	Cadmium	1.15
Outlet	10/19/09	Chromium	48.8
International Boundary	10/5/10	Chromium	47.9
International Boundary	10/5/10	Copper	102
International Boundary	10/5/10	Lead	69.2
Outlet	10/19/09	Nickel	24.2
International Boundary	10/5/10	Nickel	33.4
International Boundary	10/5/10	Silver	8.08
International Boundary	10/5/10	Zinc	426
Coachella Valley			
Channel Outlet	10/20/09	Chromium	53.1
Channel Outlet	10/20/09	Chromium	61.1
(Ave 52)	10/7/10	Chromium	54.6

Channel Outlet	10/7/10	Chromium	53.4
(Ave 52)	5/11/11	Chromium	51
Channel Outlet	10/11/11	Chromium	61.5
Channel Outlet	10/17/12	Chromium	49.2
Channel Outlet	10/21/13	Chromium	64.5
Channel Outlet	10/20/09	Copper	43.7
Channel Outlet	10/20/09	Copper	50.8
(Ave 52)	10/7/10	Copper	34
Channel Outlet	10/7/10	Copper	32.9
Channel Outlet	10/7/10	Copper	48.1
(Ave 52)	5/11/11	Copper	36.5
Channel Outlet	10/11/11	Copper	46
Channel Outlet	10/17/12	Copper	47.1
Channel Outlet	10/21/13	Copper	60.1
Channel Outlet	10/21/13	Manganese	1406
Channel Outlet	10/20/09	Nickel	27.1
Channel Outlet	10/20/09	Nickel	29.8
(Ave 52)	10/7/10	Nickel	25
Channel Outlet	10/7/10	Nickel	29.3
(Ave 52)	5/11/11	Nickel	24.6
Channel Outlet	10/11/11	Nickel	30.1
Channel Outlet	10/17/12	Nickel	24.4
Channel Outlet	10/17/12	Nickel	28.6
Channel Outlet	10/21/13	Nickel	52.4
Lake Cahuilla	4/24/13	Silver	2.05
Channel Outlet	10/20/09	Zinc	133
Channel Outlet	10/20/09	Zinc	128
Channel Outlet	10/11/11	Zinc	151
Channel Outlet	10/17/12	Zinc	126
Channel Outlet	10/21/13	Zinc	160
Colorado River			
Lagoon (LG1)	4/29/09	Manganese	1423
Outfall Drain (PVOD2)	4/29/09	Manganese	2000
Lagoon (LG1)	10/20/09	Manganese	5186
Outfall Drain (PVOD2)	10/20/09	Manganese	2954
Lagoon (LG1)	5/4/10	Manganese	1216
Outfall Drain (PVOD2)	5/4/10	Manganese	2482
Lagoon (LG1)	5/9/11	Manganese	1911
Outfall Drain (PVOD2)	5/9/11	Manganese	1496
Outfall Drain (PVOD2)	10/10/11	Manganese	1694
Lagoon (LG1)	4/29/09	Mercury	0.273
New River			
Boundary	10/5/10	Cadmium	1.21
Boundary	10/5/10	Chromium	49.7
Boundary	4/28/09	Copper	39.5

Boundary	10/19/09	Copper	37.4
Boundary	10/19/09	Copper	36.7
Boundary	10/5/10	Copper	93.9
Boundary	5/10/11	Copper	35.5
Boundary	5/10/11	Copper	40
Boundary	10/11/11	Copper	49.3
Boundary	5/8/12	Copper	32.2
Boundary	4/23/13	Copper	47.7
Boundary	4/28/09	Lead	47.8
Boundary	10/19/09	Lead	37.2
Boundary	10/5/10	Lead	70.2
Boundary	10/11/11	Lead	52
Boundary	5/8/12	Lead	50.7
Boundary	4/23/13	Lead	36.6
Boundary	10/19/09	Mercury	0.3
Boundary	10/5/10	Mercury	1.09
Boundary	10/11/11	Mercury	0.536
Boundary	10/5/10	Nickel	32.2
Boundary	10/5/10	Selenium	2.09
Boundary	10/5/10	Selenium	2.14
Boundary	4/28/09	Silver	2.46
Boundary	10/19/09	Silver	2.36
Boundary	10/19/09	Silver	2.07
Boundary	10/5/10	Silver	8.17
Boundary	5/10/11	Silver	1.68
Boundary	10/11/11	Silver	1.16
Boundary	5/8/12	Silver	1.36
Boundary	4/23/13	Silver	2.1
Boundary	4/28/09	Zinc	175
Boundary	10/19/09	Zinc	157
Boundary	10/5/10	Zinc	428
Boundary	10/11/11	Zinc	189
Boundary	5/8/12	Zinc	122
Boundary	4/23/13	Zinc	183
Salton Sea			
Salton Sea USGS2	5/4/10	Arsenic	14.1
Salton Sea USGS2	4/29/09	Selenium	8.85
Salton Sea USGS7	4/29/09	Selenium	8.28
Salton Sea USGS9	4/29/09	Selenium	10.2
Salton Sea USGS2	10/21/09	Selenium	6.36
Salton Sea USGS7	10/21/09	Selenium	4.92
Salton Sea USGS9	10/21/09	Selenium	4.69
Salton Sea USGS2	5/4/10	Selenium	9.11
Salton Sea USGS7	5/4/10	Selenium	15
Salton Sea USGS9	5/4/10	Selenium	12.4
Salton Sea USGS2	5/11/11	Selenium	7.62

Salton Sea USGS7	5/11/11	Selenium	7.87
Salton Sea USGS9	5/11/11	Selenium	14.2

B.4 Sediment Samples – Trace Organics

Alamo River			
Station Name	**Date**	**Constituent**	**Result (ng/g dw)**
Drop 10 Central Drain	4/24/13	Dieldrin	1.95
Drop 10 Central Drain	4/24/13	Dieldrin	2.05
Drop 10 Central Drain	4/24/13	Dieldrin	2.25
International Boundary	10/5/10	DDE(p,p')	3.22
International Boundary	10/11/11	DDE(p,p')	3.26
International Boundary	10/5/10	DDE(p,p')	3.4
International Boundary	10/5/10	DDE(p,p')	3.46
Outlet	5/4/10	Dieldrin	4.91
International Boundary	5/10/11	DDE(p,p')	5.14
Outlet	5/4/10	DDD(o,p')	5.9
Drop 10 Central Drain	10/6/10	DDE(p,p')	6.89
International Boundary	10/19/09	DDE(p,p')	8.07
Outlet	10/19/09	DDE(p,p')	12.8
Outlet	5/4/10	DDD(p,p')	14.2
Above Drop 3	10/6/10	DDE(p,p')	18.1
Outlet	5/4/10	DDT(p,p')	22.6
International Boundary	4/28/09	DDE(p,p')	24.3
Drop 6 Rose Drain	10/6/10	DDE(p,p')	25.2
Outlet	10/11/11	DDE(p,p')	27.1
Outlet	10/11/11	DDE(p,p')	29.7
Outlet	10/21/13	DDE(p,p')	30.3
Outlet	10/11/11	DDE(p,p')	32.4
Drop 6A Holtville Drain	10/6/10	DDE(p,p')	35.1
Outlet	10/6/10	DDE(p,p')	37.8
Outlet	4/28/09	DDE(p,p')	43
Outlet	5/10/11	DDE(p,p')	45.8
Drop 10 Central Drain	4/24/13	DDE(p,p')	66.1
Outlet	5/4/10	DDE(p,p')	67
Drop 10 Central Drain	4/24/13	DDE(p,p')	68.1
Drop 10 Central Drain	4/24/13	DDE(p,p')	68.2
Coachella Valley			
(Ave 52)	5/11/11	DDE(p,p')	4.31
(Ave 52)	5/11/11	DDE(p,p')	4.32

(Ave 52)	5/4/10	Dieldrin	7.06
Channel Outlet	4/29/09	DDE(p,p')	10.3
Channel Outlet	10/7/10	DDE(p,p')	10.4
Channel Outlet	5/11/11	DDE(p,p')	10.6
(Ave 52)	5/4/10	DDD(p,p')	12.6
Channel Outlet	10/21/13	DDE(p,p')	12.7
Channel Outlet	10/20/09	DDE(p,p')	15.5
Channel Outlet	5/4/10	DDE(p,p')	34.8
(Ave 52)	5/4/10	DDE(p,p')	80.3
Colorado River			
Lagoon (LG1)	10/5/10	DDE(p,p')	3.78
Outfall Drain (PVOD2)	10/20/09	DDE(p,p')	4.1
Outfall Drain (PVOD2)	4/29/09	DDE(p,p')	4.23
Outfall Drain (PVOD2)	5/9/11	DDE(p,p')	7.72
Lagoon (LG1)	10/20/09	DDE(p,p')	8.41
New River			
Outlet	5/10/11	Dieldrin	1.94
Outlet	5/4/10	Dieldrin	2.02
Boundary	4/28/09	Dieldrin	2.94
Boundary	10/5/10	Dieldrin	3.2
Boundary	10/5/10	DDD(o,p')	5.46
Evan Hughes Hwy	10/6/10	DDE(p,p')	6.89
Boundary	10/19/09	DDD(p,p')	7.17
Boundary	10/19/09	DDD(p,p')	7.18
Boundary	10/19/09	DDD(p,p')	8.46
Boundary	5/10/11	DDE(p,p')	8.61
Rice Drain	4/23/13	DDE(p,p')	9.17
Boundary	4/28/09	DDD(p,p')	9.55
Outlet	10/11/11	DDE(p,p')	9.99
Boundary	10/5/10	DDT(p,p')	11.1
Outlet	10/6/10	DDE(p,p')	11.8
Outlet	10/22/13	DDE(p,p')	13.2
Boundary	5/4/10	DDE(p,p')	13.5
Boundary	10/11/11	DDE(p,p')	13.5
Boundary	10/19/09	DDE(p,p')	14.2
Boundary	10/19/09	DDE(p,p')	14.2
Boundary	5/4/10	DDE(p,p')	14.4
Boundary	10/5/10	DDD(p,p')	17.1
Outlet	4/28/09	DDE(p,p')	17.6
Outlet	4/28/09	DDE(p,p')	18.3

Boundary	5/4/10	DDE(p,p')	21.1
Boundary	10/19/09	DDE(p,p')	21.2
Boundary	4/28/09	DDE(p,p')	26
Outlet	5/10/11	DDE(p,p')	28.2
Outlet	5/10/11	DDE(p,p')	29.7
Outlet	5/10/11	DDE(p,p')	34.3
Outlet	10/19/09	DDE(p,p')	36.2
Rice Drain	10/22/13	DDE(p,p')	41.9
Rice Drain	10/22/13	DDE(p,p')	49.5
Boundary	10/5/10	DDE(p,p')	50.6
Outlet	5/4/10	DDE(p,p')	75
Boundary	10/5/10	Dibenz(a,h)anthracene	131
Boundary	10/5/10	Benzo(a)pyrene	157
Boundary	10/5/10	Pyrene	325
Boundary	10/5/10	Chrysenes, C3-	375
Boundary	10/5/10	Chrysene/Triphenylene	462
Boundary	10/5/10	Chrysenes, C1-	490
Boundary	10/5/10	Chrysenes, C2-	533
Salton Sea			
Salton Sea USGS7	4/29/09	Dieldrin	2.02
Salton Sea USGS2	5/11/11	Dieldrin	2.41
Salton Sea USGS7	5/11/11	Dieldrin	2.79
Salton Sea USGS2	4/29/09	Dieldrin	2.8
Salton Sea USGS9	5/11/11	Dieldrin	2.84
Salton Sea USGS9	4/29/09	DDE(o,p')	3.87
Salton Sea USGS9	4/29/09	Dieldrin	5.04
Salton Sea USGS9	4/29/09	DDD(o,p')	5.1
Salton Sea USGS9	5/4/10	DDD(p,p')	5.24
Salton Sea USGS2	4/29/09	DDD(p,p')	5.51
Salton Sea USGS9	5/11/11	DDD(p,p')	5.84
Salton Sea USGS2	5/4/10	DDE(p,p')	11.1
Salton Sea USGS9	4/29/09	DDD(p,p')	14.2
Salton Sea USGS9	10/21/09	DDE(p,p')	17.4
Salton Sea USGS7	5/4/10	DDE(p,p')	17.8
Salton Sea USGS7	10/21/09	DDE(p,p')	18.8
Salton Sea USGS2	10/21/09	DDE(p,p')	24.8
Salton Sea USGS9	5/4/10	DDE(p,p')	26.4
Salton Sea USGS7	5/11/11	DDE(p,p')	36.8
Salton Sea USGS2	5/11/11	DDE(p,p')	39.2
Salton Sea USGS7	4/29/09	DDE(p,p')	60.5
Salton Sea USGS2	4/29/09	DDE(p,p')	63

Salton Sea USGS9	5/11/11	DDE(p,p')	63.1
Salton Sea USGS9	4/29/09	DDE(p,p')	105