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Water Quality in the Colorado River Basin Region

Assessing surface water data collected from 2002 to 2005 through the Surface Water Ambient Monitoring Program (SWAMP)

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Assessing Surface Water Data Collected from 2002 to 2005 Through 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. Geographically, the Region is a small portion of the total Colorado River drainage that includes parts of Arizona, Nevada, Utah, Wyoming, Colorado, New Mexico, and Mexico

The Lower Colorado River provides 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 use in the Region. Ultimately water drains into the Salton Sea through the New and Alamo Rivers, the Coachella Valley Stormwater Channel (CVSC), and agricultural drains in the Coachella and Imperial Valleys. Due to the agricultural, municipal, and industrial uses, this drainage contains some increased levels of nutrients, pathogens, salinity, trace elements, pesticide residues, and suspended solids. The existence of some of these contaminants leads to other water quality concerns such as low dissolved oxygen, toxicity, algae blooms, and elevated specific conductance.

The Surface Water Ambient Monitoring Program (SWAMP) regional 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 regional 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 River and associated lakes, Alamo River, New River, Salton Sea and associated drains, and the Coachella storm water 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 spring of 2002 through spring of 2005. The report is organized into two sections – the first section contains a general introduction of the Region and SWAMP and the second section contains more detailed descriptions of specific waters or drain-shed and discussions of the results of the 2002-2005 SWAMP sampling efforts.

Although the information represents snapshots in time, reflecting water quality at the time of sampling, an attempt is made to report spatial and temporal patterns and to compare the data with established water quality criteria. Water and sediment samples were collected and analyzed for conventional constituents, trace metals and organics in both water and sediment. Water samples were cultured to detect bacteria indicators of pathogenicity. Both sediment and water samples were collected and subjected to toxicity testing. General parameters such as pH and dissolved oxygen were measured directly in the field.

Criteria used to assess the water quality in the Region came from the Colorado River Basin Region's Water Quality Control Plan (Basin Plan), the USEPA, the California Department of Fish and Game, and the California Department of Public Health.

Over 37,000 analyses were completed on water samples representing 289 unique organic compounds, 56 inorganic compounds and 5 bacterial indicators. Of these, 4,696 samples results had reportable levels of organic compounds and in ten sample results, three constituents exceeded criteria for the California Toxics Rule (CTR) for Human Health protection when consuming water and organisms from freshwater systems. Over 20,000 analyses were done on sediment samples representing 191 unique organic and 22 inorganic compounds. Of these, 2,911 analyses had reportable levels of organic compounds; however, none of the samples with reportable concentrations exceeded available criteria.

Overall, the biggest impacts to the quality of waters in the Region are from bacterial pathogens and from toxicity. The source of the pathogen impairment is fairly straightforward in some instances such as the New River. The sources of toxicity are not so straightforward. Very few of the analytes exceeded established criteria for organics in either sediment or water. However, there were many analytes that had 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 affects of the reportable results. Analysis of the toxicity data indicates that in locations where there are fewer reportable results for organics and pathogens, such as the Colorado River, there is lower toxicity. The converse is also true. The New River, which had the greatest number of pathogens and reportable organic results, also had the highest number of toxic results. Sediments samples had a greater percentage of results with reportable values compared with water samples. Sediment toxicity was higher than for water for all but three locations the Alamo River Outlet, the New River at the Boundary and at Rice Drain #3. Finally, selenium is consistently present at concentrations that are above the 5 ppb value that wildlife biologist feel is a maximum concentration therefore this constituent should be more closely monitored.

This assessment, primarily through toxicity results, shows that there are several sites in the Lower Colorado River Basin with water quality concerns. Laboratory tests at UC Davis performed to identify specific toxicants identified pyrethroid and ammonia as two potential causes for toxicity to aquatic organisms. Although there are high bacterial counts in several locations and high ammonia concentrations at the upper end of the New River, it is doubtful that these constituents alone are responsible for the toxicity. This leaves the trace organics or some combination of various constituents as the potential reason for toxicity.

Based on this assessment the following recommendations are made:

- Continue with the SWAMP at the 13 strategic sites including data analysis and reporting.
- Review the necessity to test for trace organics at the sites with low toxicity (>90% survival). This would include most sites on the Colorado River, in the Salton Sea and in the Coachella Valley Stormwater Channel.
- Prepare a toxicity identification plan (TIE) for locations that had high toxicity. This would include the many locations in the New and Alamo Rivers.
- Based on toxicity reports prepared by UC Davis, include monitoring for pyrethroid as part of each sampling period.
- Consider including the monthly monitoring results from the Region's New River International Boundary monitoring efforts into the next assessment of SWAMP results. This would provide a better long-term view of the water quality at this critical location.
- Prepare a short fact sheet that reports on this assessment and make it available to stakeholders in the Region.
- Provide public outreach to interested stakeholders on the findings of this assessment. Special emphasis should be made on the good news - very few samples with results that are above the water quality goals and the bad news – high toxicity in some locations and many samples with reportable results including actively used constituents such as *Diazinon and Chlopyrifos.*
- Establish a process for more timely review of the sampling results.
- Develop objectives for constituents that have been detected but have no established criteria to evaluate their impact to a waters use.

Additional program level comments were transmitted to the Lower Colorado River Regional Board staff.

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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 (CWA) require efforts to protect and restore surface water integrity in the state of California.

SWAMP is administered and implemented by the State Water Resources Control Board (State Board) and nine Regional Water Quality Control Boards (Regional Boards) that have jurisdiction over specific areas of the state. SWAMP monitoring is conducted by Regional Board staff, the California Department of Fish and Game, the U.S. Geological Survey, and other cooperating entities selected by the State and Regional Boards. 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. These entities are funded through SWAMP master contracts and through Regional Board contracts.

SWAMP Components and Goals

SWAMP has two major components: (1) statewide and regional monitoring, and (2) site-specific monitoring. To ensure data compatibility, government agencies, private contractors, and private laboratories coordinate their efforts. As additional funding becomes available, an analysis of SWAMP data will assess the status and trends of surface water quality statewide.

SWAMP goals include:

- Creation of a comprehensive ambient monitoring program to provide information to effectively manage the state's water resources.

- Usage 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 water bodies.

1.2 Overview of SWAMP in the Colorado River Basin Region

Regional Priorities and Goals

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

- Water quality assessment of surface waters
- CWA Section 305(b) reporting
- CWA Section 303(d) list for impaired surface waters
- Total Maximum Daily Load development and implementation
- Development of a bioassessment program.

To address these priorities Regional Board staff prepared a SWAMP Work Plan, in 2001 (Appendix A). This plan identified a prioritized list of monitoring sites with site-specific or general water quality problems. The plan provides the general approach taken to address 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 Report

This report summarizes the Region's first SWAMP-related data, collected biannually in the spring and fall of 2002, 2003, 2004 and spring of 2005. Toxicity testing results prepared by UC Davis for the spring and fall of 2005 are also discussed.

Analysis

This report compares data with water quality objectives and established criteria to determine if beneficial uses are being met. When possible the analysis will attempt to identify temporal or spatial trends. However, it should be stressed 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 Region is bordered for 40 miles on the northeast 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 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 Stormwater Channel, 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.

Regional Board staff selected surface water bodies of major interest to the Region—the Lower Colorado River and associated lakes, Alamo River, New River, Salton Sea and associated drains, and Whitewater River. 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, along with 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.

Waterbody	Watershed	Planning Area
Lower Colorado River and associated lakes	Lower Colorado River	East Colorado River Basin
Alamo River	Salton Sea Transboundary	Imperial Valley
New River	Salton Sea Transboundary	Imperial Valley
Salton Sea and associated drains	Salton Sea Transboundary	Salton Sea
Whitewater River	Salton Sea Transboundary	Coachella Valley

2.2 Selection of Monitoring Sites

Within targeted water bodies, Regional Board staff selected 45 monitoring sites, including 13 that are considered strategic because of their location along water bodies of major interest. Staff selected sites based on (1) known or potential problems, (2) potential reference waters that are considered the "cleanest" water in the Region, and (3) monitoring efforts that have occurred in the past or are planned for the future. Refer to the 2001 SWAMP Work Plan (2001 Plan) for a complete discussion about the selection of the monitoring sites.

Sampling in spring 2002 included 44 sites, while fall 2002 sampling included all 45 sites identified in the 2001 Plan. Following the fall 2002 sampling, the 45 sites were trimmed down to the 13 strategic sites. This change to the work plan was done because of diminished funding and to ensure that the strategic sites were monitored at a biannual minimum. It should be noted that the 2001 Plan called for quarterly monitoring of the strategic sites.

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. If there was confusion about a location, field crews resolved the situation by consulting with Regional Board staff in the field or via telephone.

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 used for water contact recreation such as swimming, Regional Board staff selected indicators such as total coliform bacteria 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, staff selected indicators such as nitrates 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 shows water quality indicators selected for the Colorado River Basin Region, as well as an indicator's relation to a 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 Work Plan.

Table 2. Selected water quality indicators from the SWAMP Work Plan.

Beneficial Use	**Desirable Quality to be Monitored**	**Indicator 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	Inorganic water chemistry Organic water 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 Examination Bioassessment
Same as above	Are aquatic populations, communities, and habitats protected?	Pollutant exposure	Organic and inorganic sediment chemistry Total organic carbon Nutrients Turbidity Inorganic and organic water chemistry
Same as above	Are aquatic populations, communities, and habitats protected?	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. Basically, for each sample taken information is recorded that documents 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, for the State of California's
Surface Water Ambient Monitoring Program, 2002
SWAMP Database Training Document, 2005
SWAMP Information Management Plan, 2006

The QA/QC summary that is discussed below describes how each sample is processed and either directly or indirectly tracked to ensure that the proper methods and procedures are followed. The main function of the QA/QC process is to ensure that the 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, and the results and discussion for the quality assurance and quality control (QA/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. The tables of results that are referred to under each QA/QC topic are presented in Appendix B. This section was independently prepared by Stacey Swenson at the Moss Marine Laboratory. 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 projects specific data quality objectives (DQOs) are performed.

Data for Region 7 SWAMP Project ID (Appendix A) 00SW7001, 01SW7001, 02SW7001, 02SW7002, and 03SW7001 has been verified. The data verification process determines whether the data are compliant with the individual measurement quality objectives (MQOs) specified in the SWAMP Quality Assurance Management Plan (QAMP). Data are classified as compliant when all of the individual measurement quality objectives (MQOs) described in the SWAMP QAMP have been met. Estimated data are non-compliant with all of the individual measurement quality objectives (MQOs) specified in the SWAMP QAMP, or rejected if the data are rejected by the reporting laboratory. The reader is reminded that data labeled as estimated, are measured data and not an approximated value or the result of a model. The biggest reason that data received the estimated label is because of an exceedance of a holding time criteria.

The objectives for achieving quality data are outlined in the SWAMP QAMP. In general, data quality is demonstrated through analysis of the following Data Quality Indicators discussed below:

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

Laboratory Method Blanks

Laboratory method blanks are used to evaluate laboratory contamination during sample preparation and analysis. Blank samples undergo the same analytical procedure as samples with at least one blank analyzed per 20 samples. Several Dissolved Organic Carbon, Volatile Organic Compound, Polynuclear Aromatic Hydrocarbon, metal and pesticide batches, and all of the bacteria batches did not have laboratory method blanks analyzed, and were classified as estimated (Appendix B, Table 2).

Acceptable blank sample results are those with values less than the method detection limit (MDL) for that particular analyte. All laboratory method blanks were acceptable with the exception of 21 blanks which had concentrations of target analytes that were above the MDL but less than the reporting limit (RL) and 10 blanks which had detectable levels of dissolved metals, chloroform and toluene above the RL (Appendix B, Table 3). Data results associated with acceptable blank results were classified as compliant with regard to the SWAMP QAMP MQO for laboratory blanks.

Surrogate Spikes

Surrogate spikes are used to assess analyte losses during sample extraction and clean-up procedures, and must be added to every field and quality control sample prior to extraction. Whenever possible, isotopically-labeled analogs of the analytes should be used.

Acceptable surrogate spike results are those with percent recoveries within an acceptable range for that particular analyte. All surrogate percent recoveries were within the acceptance criteria listed in Appendix B, Table 1, with the exception of surrogates spiked in samples analyzed for Polynuclear Aromatic Hydrocarbons, Diesel Range Organics, Polychlorinated Biphenyls, Organochlorine Pesticides, Volatile Organic Compounds and surfactants (Appendix B, Table 4). The associated analytes in these samples were classified as estimated with regard to the SWAMP QAMP MQO for surrogates.

Matrix Spikes and Matrix Spike Duplicates

A laboratory-fortified sample matrix (matrix spike, or MS) and a laboratory fortified sample matrix duplicate (MSD) are both used to evaluate the effect of the sample matrix on the recovery of the target analyte(s). Individually, these samples are used to assess the bias from an environmental sample matrix plus normal method performance. In addition, these duplicate samples can be used collectively to assess analytical precision.

Aliquots of randomly selected field samples were spiked with known amounts of target analytes. The %R of each spike was calculated as follows:

%R= (MS Result – Sample Result)/ (Expected Value – Sample Result) * 100

The %R acceptance criteria vary according to analyte groups (Appendix B, Table1).

This process was repeated on the same native samples to create a laboratory fortified sample matrix spike duplicate (MSD). MSDs were used to assess laboratory precision and accuracy. MS/MSD RPDs were calculated as:

RPD = (|(Value1-Value2)|/(AVERAGE(Value1+Value2)))*100

where:

Value1=matrix spike value

Value2=matrix spike duplicate value.

According to the SWAMP QAMP for conventional, organic, and inorganic analyses, at least one MS/MSD pair should be performed per 20 samples or one per batch, whichever is more frequent. Eight percent of the batches (48 out of 634 total batches) did not include MS/MSDs performed at the required frequency. These 48 batches were classified as estimated (Appendix B, Table 5).

Laboratory batches with MS/MSD %R and RPD values outside of acceptance criteria were classified either as compliant or estimated based on number of QC elements outside criteria. These are presented in Appendix B, Table 6. All other MS/MSD, %Rs, and RPDs were within acceptance criteria.

Certified Reference Materials and Laboratory Control Samples

Certified reference materials (CRMs) and laboratory control samples (LCSs) are analyzed to assess the accuracy of a given analytical method. As required by the SWAMP QAMP, one CRM or LCS should be analyzed per 20 samples or one per batch, whichever is more frequent. Nine percent of the batches (60 out of 634 total batches) did not include CRMs or LCSs performed at the required frequency. These 60 batches were classified as estimated (Appendix B, Table 7).

All CRM and LCS percent recoveries were within acceptance criteria.

Laboratory Duplicates

Laboratory duplicates (DUPs) were analyzed to assess laboratory precision. As required by the SWAMP QAMP a duplicate of at least one field sample per batch was processed and analyzed. Twenty eight percent of the batches (178 out of 634 total batches) did not include DUPs performed at the required frequency. These 178 batches were classified as estimated (Appendix B, Table 8).

The duplicates were compared and an RPD was calculated as described in Section 3.3. RPDs <25% were considered acceptable as specified in the QAMP. RPDs >25% were classified as estimated and are presented in Appendix B, Table 9.

Field Blind Duplicates

Field blind duplicates are analyzed to assess field homogeneity and field sampling procedures. Field blind duplicates were sampled at stations 723NROTWM, 723NREVHU, 727CRRMD4, and 728SSGS09, 723NRGNDN, 723ARGRB1, 728SSGS02 were sampled in May, September and October 2002, stations 715CPVOD2 and 715CRIDG1 were sampled in April and November 2003, station 719CVSCOT was sampled in May and October 2004, and station 723ARGRB1 was sampled in May 2005 for both water and sediments. Water samples were taken by collecting a separate grab sample immediately following the collection of the field sample. Sediment blind duplicates were obtained from homogenized field samples.

Field duplicate values were compared to field sample values from each site and RPDs were calculated as described in Section 3.3. RPDs <25% were considered acceptable as specified in the QAMP. RPDs >25% are presented in Appendix B, Table 10. All other RPDs were acceptable.

Contamination

On February 12, 2004, the CDFG Water Pollution Control Laboratory (DFG-WPCL) notified SWAMP participants of a low level contamination that occurred in samples analyzed for nitrate by flow injection analysis method (FIA). The contamination (0.036 ± 0.027 ppm [36 ppb]) was significant only for nitrate results reported <0.150 ppm (150 ppb). Samples that were analyzed via FIA, and are therefore positively biased by 0.036 ppm, are presented in Appendix B, Table 11.

Toxicity Tests

There were minor deviations in water quality parameters or test conditions for dissolved oxygen, salinity, hardness and conductivity in some replicates, nine samples were received at the improper temperature, and holding times were exceeded in some cases (see Holding Times below). Toxicity control criteria were not met for *Hyalella Azteca* in three batches, however the reference sample had acceptable criteria, and the associated results were classified as estimated. The data should be considered acceptable for their intended purpose.

Field Data Measurements

The procedures followed when conducting routine field data measurements for the SWAMP program can be found in Appendix E of the SWAMP QAMP. Field equipment used to take field data measurements is required to be calibrated within 24 hours of use and within 24 hours after field measurement activities are performed. Per the SWAMP QAMP, at a minimum, the following equipment should be calibrated; titration equipment, thermometers, DO meters, pH meters, conductivity meters, and multi-parameter field meters. After post-calibration checks are performed, the percent drift should be evaluated. If data has been collected outside compliance (% drift is outside criteria found in Appendix E of the SWAMP QAMP), it should not be reported unless it has been flagged to indicate non-compliance.

Field data measurements reported for Region 7 Project IDs 00SW7001, 01SW7001, 02SW7001, 02SW7002, and 03SW7001 include; dissolved oxygen, oxygen saturation, pH, salinity, specific conductivity, temperature, turbidity, and velocity. Of these field measurement results, 255 results were classified as estimated due to either a probe failure, unable to deploy instrument, field calibration not performed at the correct frequency, velocity too low to measure, or no documentation of the field measurement collection existed.

Holding Times

Twenty six percent of the results (24,737 out of 94,852 total results) in 708 samples (sample per method) were classified as estimated because they exceeded holding time criteria. These results consisted of ammonia, TSS, TOC, BOD, orthophosphate, nitrite and nitrate analyses, water and sediment organics (diesel range organics, orthophosphate pesticides, organochlorine pesticides, PCBs, PAHs, and pyrethroids), metals and water toxicity analyses. Water samples analyzed for orthophosphate, nitrate, nitrite and BOD exceeded the 48-hour holding time criteria, TSS exceeded the 7-day holding time criteria, and DOC/TOC exceeded the 28-day holding time criteria between collection and analysis. Water metals sample exceeded the 6-month holding time criteria between collection and analysis. Sediment metal samples exceeded the 1-year holding time criteria until analysis. Water organic samples exceeded either the 7-day holding time criteria between collection and extraction or the 40-day holding time criteria between extraction and analysis. Sediment organic samples exceeded the 40-day holding time criteria between extraction and analysis. Water toxicity samples for *Ceriodaphnia Dubia* and *Hyalella Azteca* were to be analyzed within 48 hours of collection, but samples 713CRNVBD and 715CPVLG1, and 723ARINTL and 723NRBDRY were analyzed outside this time period. Sediment toxicity samples for *Hyalella Azteca* were to be analyzed within 21 days of collection, but samples 723NROTWM and 723NRBDRY were analyzed outside this time period. Although estimated, this data is considered usable for the intended purposes and for this report.

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; data were classified as rejected when the reporting laboratory rejected the data. During the Data Quality Assessment (DQA) phase of reporting, end users may find estimated data batches meet project data quality objectives.

There were 96,111 sample results, including; field measures, grab and integrated samples, field blind duplicates, and field blanks, of which 28,505 were classified as compliant, 60,059 were classified as estimated, and 94 were classified as rejected. The summary of data classification on the dataset reported is as follows:

- All data presented in Appendix B, Table 3 were classified as SWAMP-compliant with the exception of 12 results, since the analytes detected in the laboratory blanks met the QAMP criteria of less than the RL for laboratory blank contamination.
- All data presented in Appendix B, Tables 2, 5, 7, and 8 are classified as estimated due to insufficient QC samples performed.
- All data presented in Appendix B, Table 4 were classified as estimated due to surrogate recovery exceedances.
- All data presented in Appendix B, Tables 9 and 10 was classified as estimated due to RPD exceedances.

- Twenty-four thousand seven hundred thirty-seven results were classified as estimated due to holding time exceedances.
- Six thousand forty-nine screening level results (PAH and triazine pesticides could not be quantified) were classified as estimated.
- Forty-one delta HCH results were classified by the laboratory as rejected due to low QC percent recoveries and 53 PAH results in sample 715CRIDG1were classified as rejected by the laboratory due to low surrogate percent recoveries.

2.6 Water Quality Objectives and Established Criteria

Evaluation of the data was based on criteria and objectives that are 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. Table C.1 in Appendix C was adopted from the Basin Plan and is a summary of the general and site-specific objectives for the region.

Although each type of water quality objective in Chapter 3 of the Basin Plan is addressed in Appendix C, only the 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 (Appendix C) they were used to evaluate the data. For example, for dissolved oxygen, the specific 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 dissolved oxygen was recorded.

Where general objectives are provided in the Basin Plan (Appendix C), 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 human, plant 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 probably the most difficult to analyze because there is generally no long-term monitoring of water quality, hydrology and ambient conditions. However, trends will show up over time and they will be used to indicate the relative direction that the toxicity of the water is headed.

Finally, for the Basin Plan objectives where no data were collected, or where field observations were not recorded, a note was made that the objective is not applicable. These objectives include tainting substances, aesthetic qualities, radioactivity, and biostimulatory substances.

Because 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 that are used to assess impacts to beneficial uses. Table 3 provides the specific reference for each document used.

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

Beneficial Use	**Beneficial Use Symbol**	**Water Quality Criteria ID**[1]
Municipal and Domestic Supply	MUN	1, 4, 5, 6, 10, 11
Agriculture Supply	AGR	
Aquaculture	AQUA	2, 3, 8, 9, 10, 11
Industrial Service Supply	IND	
Ground Water Recharge	GWR	1, 2, 3, 4, 5, 6, 7
Water Contact Recreation	REC I	11
Non-Contact Water Recreation	REC II	11
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
Preservation of Rare, Threatened, or Endangered Species	RARE	2, 3, 4, 8, 9

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

The water quality criteria for some constituents changes depending on the designated use of specific waters. For example, *Acenapthene* has a maximum allowable concentration of 1,200 ppb when evaluating for the protection of human health in freshwater system and 2,700 ppb when evaluated for the protection of aquatic organisms in saltwater systems. The toxic effects on freshwater aquatic life of Ag, Cd, Cu, Ni, Pb, Zn and Cr(VI) are all dependent on the hardness of water, with a higher hardness value allowing a higher concentration before the metal becomes toxic to aquatic life. When evaluating the beneficial uses of the water bodies these variations are taken into consideration.

Table 4. Water quality criteria description and reference used for numeric values.

Water Quality Criteria ID	Criteria Reference[1]
1	USEPA Drinking Water Criterion
2	CTR, freshwater acute (CMC)
3	CTR, freshwater chronic (CCC)
4	CTR, Human Health-FW (water and organisms)
5	CTR, Human Health-FW (organisms only)
6	Drinking Water (MUNI), MCLs Title 22 Table 64431A Primary (inorganics) 64444A (organics)
7	Drinking Water (MUNI), SMCLs Title 22 Table 64449-A (limits) and 64449-B (ranges) Secondary
8	Aquatic Life, CDFG Hazardous Assessment Criteria (water)
9	Aquatic Life, USFWS Biol. Effects
10	Freshwater Sediment (Policy)
11	Bacterial Criteria, USEPA Criteria (freshwater), Single-sample

[1] See the reference section of this document for citation of each goal and Table C.2 in Appendix C, for the numeric listing.

2.7 Data Review Procedure

Given that there is no established process for reviewing the SWAMP data, the methods described below are considered appropriate for providing an assessment of the data and an assessment of the water quality in the Basin. The SWAMP data are housed in a database that includes many queries that were prepared 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 for all data from 2002 through 2005. Once executed, outputs of all queries were imported into a spreadsheet for analysis. Only data from the permanent side of the database was used for use for this report. Due to the size of each file (60-70Mb), all spreadsheets prepared for this report will only be available through the Region 7 Office.

Database queries developed by the SWAMP Data Management Team (DMT) were used for this report. These queries provided information on 1) field sampling for parameters such as pH, dissolved oxygen, turbidity and specific conductance, 2) lab results for constituents such as organics, conventionals, trace metals, pathogens and sediment composition, and 3) toxicity results. Extracted 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 separated by the data were further grouped into like constituent categories such as organics in sediments, trace metals in water, pathogens etc and parsed into separate worksheets within the spreadsheet. Added to each spreadsheet were tables that contained Basin Plan objectives, water quality criterion and data labels to compare the sample results with.

Data was processed using summary statistics, lookup tables, pivot tables and many reference formulas. An initial sub-area (Alamo River) analysis was completed and, after error checking, the procedures were applied to data from the other sub-areas in the region. Error checking was completed using mathematical formulas and manually checking of formula results.

For field collected data and toxicity testing results (percent survival), the data was 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. This was achieved through the use of formulas and lookup tables in the Excel program.

Once organized into spreadsheets the data were summarized by results qualifiers. The result qualifier that is reported with each sample is a note that identifies the validity of the result. If there is no note 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. Other possible qualifying results when analyzing for a sample are – not reported, meaning the sample results were not reported, and detected not quantifiable, meaning that the concentration of the constituent was above the MDL but 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, dissolved oxygen was typically reported as percent saturation. Dissolved oxygen concentration in mg/L was estimated using standard equations relating percent dissolved oxygen and temperature; however no corrections were applied for salinity or elevation. For ammonia, the maximum allowable concentration was determined based on the field measured pH (US EPA, 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 that have established criteria. If the minimum limit was exceeded, then the sample result was further compared with 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. The next steps would be to review where the sample originated and the beneficial uses for the location. After this review, a statement could be made about whether the constituent exceeded applicable criteria.

Toxicity chemistry covers samples that were used to determine toxicity of either sediment or water. Each toxicity test is replicated at least eight times and the percent survival for either *Ceriodaphnia dubia* and *Hyalella azteca* when considering water toxicity or *Hyalella azteca* when determining sediment toxicity is recorded. Results that showed toxicity compared with a control were of three levels: (NSL) Not significant compared to negative control based on statistical test, alpha less than 5%, but less than the evaluation threshold; (SG) Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold; and (SL) Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold.

In some cases, duplicate samples were collected and tested from a single location at a single time. For this assessment, these duplicates were treated as independent samples. Therefore, in some of the reportable results there may be duplicates. This approach was taken because the duplication of the result does not change the fact that a sample result was reportable. A cursory review was made of duplicates and in most cases the chemistry and pathogen results were comparable.

3. Area Descriptions, Results and Discussion

This section of the document is divided into the different areas of the Basin: Lower Colorado River and associated lakes, the Alamo River, the New River, the Salton Sea and the Coachella Valley. For each area, there is a description of the region, the monitoring sites and objectives as well as a presentation and discussion of the water quality results. These sections are designed to be stand-alone sections on each of the areas in the region.

Due to the large amount of data collected and analyzed, only a summary of the results is reported for each constituent group. When the analysis result of a sample exceeds applicable criteria or objectives, as described in section 2.7 above, for a given analyte this information will be reported to the extent necessary to describe the issue. For example, if the concentration of *Diazinon* in a water sample exceeds the criteria established by the California Department of Fish and Game, then this value would be presented in the relevant area section of the document for discussion.

For each group of constituents in each sub-area the report describes the sampling (such as the number of samples taken) presents sample results, and analyzes the data. The results are compared with the appropriate criteria. The sampling, laboratory methods, and the assessment of the overall quality of the data are presented in previous sections of this report.

3.1 Lower Colorado River and Associated Lakes

Area Description, Monitoring Sites and Beneficial Uses

The Lower Colorado River and associated lakes are 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 flows into the Colorado River aqueduct. Input to the Lower Colorado River and associated lakes include direct precipitation, storm runoff, agricultural drainage and municipal discharge. The Lower Colorado River runs for 230 miles in California, 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 include Palo

Verde Valley and Bard Valley near Yuma, Arizona. The Fort Mojave, Chemehuevi, Colorado River, and Yuma Indian Reservations are also found in this watershed. 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 Valley, and the main drinking water supply for the Imperial Valley and Mexico's Mexicali Valley. The Colorado River water is part of the drinking water supply for the Los Angeles and San Diego metropolitan areas. A portion of the Colorado River is listed on the 303(d) List, from Imperial Reservoir to California – Mexico Border.

Table 5 lists the SWAMP monitoring sites and beneficial uses from the Region's Basin Plan for the Lower Colorado River and associated lakes. Also listed are known and potential problems for each of the monitoring sites. The rationale for these monitoring sites is provided in the SWAMP Work Plan (2001). Figure 2 provides a general map of the region and the approximate location of the sampling stations.

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

Site Name (station code)	**Beneficial Uses[2]**	**Known Problem**	**Potential Problem**
Colorado River at Nevada Border[1] (713CRNVBD)	AGR AQUA COLD GWR POW IND MUN RARE WARM REC I REC II WILD		
Lake Havasu (714CRLHSU)	Same as above		Bacteria Nutrients
Colorado River at Parker Dam (715CRPDDM)	Same as above	Bacteria	Organics Pesticides

Site Name (station code)	Beneficial Uses[2]	Known Problem	Potential Problem
Colorado River Upstream of Imperial Dam (715CRIDU1)	Same as above	Bacteria	Organics Pesticides
Colorado River at Imperial Dam Gates[1] (715CRIDG1)	Same as above	Bacteria	Organics Pesticides
Taylor Lake (715CRTLI1)	Same as above		Bacteria Nutrients
Ferguson Lake (715CRFGLK)	Same as above		Bacteria Nutrients
Squaw Lake (715CRSQLK)	Same as above		Bacteria Nutrients
Reservation Main Drain 4 (727CRRMD4	REC I REC II WARM WILD		Bacteria Nutrients
Palo Verde Lagoon[1](715CPVLG1)	REC I REC II WARM WILD RARE	Bacteria	Pesticides Nutrients
Palo Verde Outfall Drain[1](715CPVOD2)	REC I REC II WARM WILD RARE	Bacteria	Pesticides Nutrients
Palo Verde Diversion Dam (715CPVDRN)	AGR AQUA GWR REC I REC II WARM WILD		Bacteria Nutrients

[1]These sites are included in the 13 strategic sampling sites identified in the SWAMP Work Plan.

[2]Descriptions of beneficial uses are provided in the Basin Plan.

Colorado River at Nevada Border

This site is the northernmost station on the Lower Colorado River, near the California-Nevada state line. This site yields information about the quality of water entering the Region from the Upper Colorado River. The water quality at this site is assumed to be the "cleanest" in the Region.

Lake Havasu

This site is downstream from the Nevada Border site on the Colorado River. Lake Havasu is a reservoir behind Parker Dam and is about 45 miles long. Lake Havasu provides clear, de-silted water for the Colorado River Aqueduct and serves the Central Arizona Project. In addition, Lake Havasu has seven isolated coves that have been set-aside for biologists to raise populations of two endangered native fish: the bonytail club and razorback sucker.

Colorado River at Parker Dam

This site is about 155 miles downstream of Hoover Dam, on the California-Arizona state line. Parker Dam's main purpose is to provide reservoir storage in Lake Havasu for water that eventually is pumped into the Colorado River Aqueduct and Central Arizona Project for use by cities, industries, Indian tribes, and agriculture. Parker Dam also provides flood control by collecting water before the water is discharged downstream. Parker power plant, on the California side of the Colorado River, includes four hydroelectric generating units that distribute power to California, Nevada, and Arizona.

Colorado River Upstream of Imperial Dam

This site is about 20 miles northeast of Yuma, Arizona, on the California-Arizona state line. Imperial Dam is the diversion point for water flowing from the Colorado River into various canals that deliver water to Imperial Valley, Coachella Valley, Arizona, and Mexico. Water diverted into the All-American Canal passes through a desilting plant before being delivered to the Imperial and Coachella Valley. The reservoir above Imperial Dam is shallow and, therefore, has a minor storage capacity. Another SWAMP site is located nearby, just downstream, at the Imperial Dam Gates.

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.

Taylor Lake

The lake is located 69 miles north of the border with Mexico. It is approximately 140 acres. The main use of the lake is for recreation and wildlife.

Ferguson Lake

This lake is located 59 miles north of the border with Mexico. It is approximately 535 acres. The main use of the lake is for recreation and wildlife.

Squaw Lake

The Squaw Lake is located 50 miles north of the border with Mexico, it is approximately 92 acres and it is used as the other lakes on the Lower Colorado River for recreation and wildlife.

Reservation Main Drain 4

This Reservation Main Drain is the primary outlet for the subsurface drainage water and storm runoff water from lands in the Bard Valley. Downstream of this site is Arizona jurisdiction and the management of the river water is by the International Boundary Water Commission and the US Bureau Reclamation. It is the last area before the water flows to Mexico.

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; its population fluctuates depending on the season, consequently the population consists mainly 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 as a recreational area. 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. This outfall drain discharges its waters into the Colorado River at the Cibola National Wildlife Refuge.

Palo Verde Diversion Dam

The Palo Verde Diversion Dam, located on the Colorado River nine miles northeast of Blythe, the diversion dam maintains a constant water surface elevation at the canal intake during periods of normal river flow. Except during periods of high river discharge, this fore bay elevation is maintained at 283.5 feet. The water is for delivery to valley lands and to the Palo Verde Irrigation District.

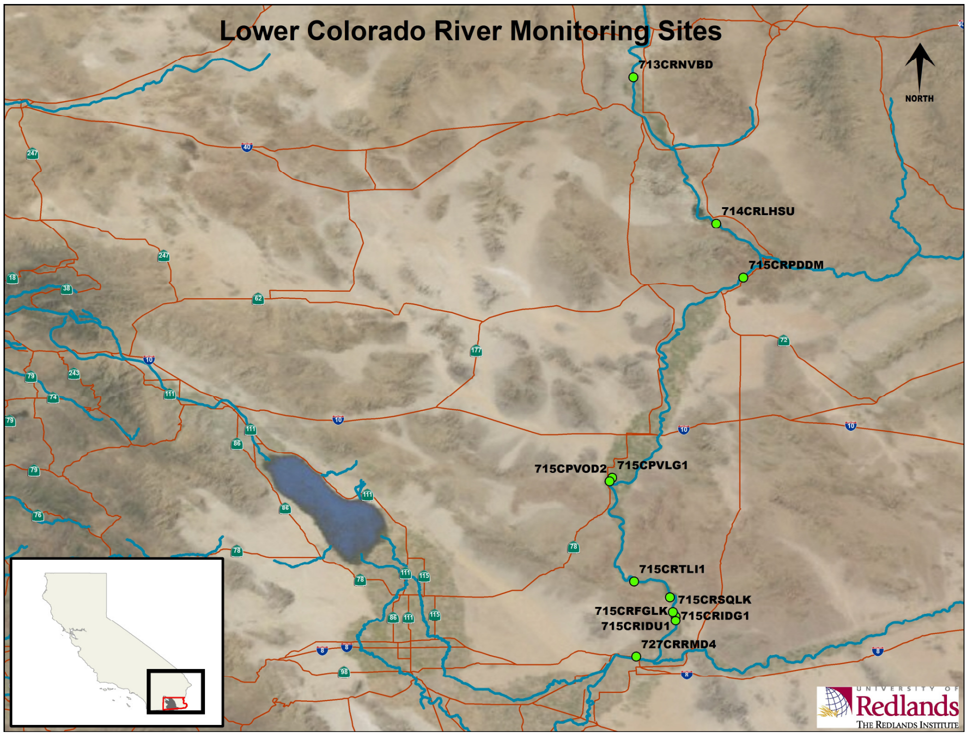

Figure 2. Monitoring sites in the Lower Colorado River and Associated Lakes.

3.1.1 Water Quality in the Lower Colorado River and Associated Lakes

Results and Discussion

Water and sediment samples were collected and analyzed for organics constituents, indicator bacteria, trace elements, and conventional constituents from the Lower Colorado River, in Palo Verde and at several lakes in the watershed. Measurements such as dissolved oxygen, pH, specific conductivity, temperature and turbidity were collected in the field at each sampling location when sampling. Table 6 lists the type of samples taken at each location. Beneficial uses for each water body are given in Table 5. In some of the water bodies, it is assumed that REC I use occurs through occasional fishing or is unauthorized.

Table 6. Summary of samples taken from Lower Colorado River sampling locations.

Location	Chemistry		**Toxicity**	
	Water	Sediment	Water	Sediment
Colorado River at Imperial Dam Grates	x	x	X	x
Colorado River at Nevada State Line	x		x	
Colorado River at Parker Dam	x	x	x	x

Colorado River u/s Imperial Dam	x	x	x	x
Ferguson Lake	x	x	x	
Lake Havasu	x	x	x	x
Palo Verde Diversion Dam	x		x	
Palo Verde Drain	x		x	
Palo Verde Lagoon (LG1)	x	x	x	x
Palo Verde Outfall Drain (PVOD2)	x	x	x	x
Squaw Lake	x	x	x	x
Taylor Lake	x	x	x	

Table 7 lists the total number of samples collected, the purpose of taking the sample and the breakdown of the results by data 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. The large number of samples reported under toxicity chemistry is due to the multiple replicates that are performed on each toxicity sample. Typically, each sample that is collected for toxicity testing, is split into eight, ten, and up to twenty aliquots with chemistry being taken on each aliquot.

Table 7. Summary of samples collected from the Lower Colorado River (2002-2005).

Sample Type[1]	Count of Analyses	
	Sediment	Water
Toxicity Chemistry	4,265	10,346
Chemistry	1,308	1,407
Totals [2]	5,573	11,753
Analysis Result Data Qualifiers[1]	Count of Results	
	Sediment	Water
Above the Reporting Limit	1,195	1,129
Below the Detection Limit (ND)	4,180	10,392
Detected but Not Quantifiable (DNQ)	198	232
Totals	5,573	11,753

[1] See section 2.7 for an explanation of the Sample Type. [2]Total number of samples collected equals the total number of sample results - the breakdown is of the Sample Type.[3] See Section 2.7 for descriptions of the Result Qualifiers.

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. An example of the water quality in the sub-area is shown in Table 8. Individual sampling dates in the spring and fall were combined so that all data could be displayed in one table. These data, along with the conventional constituents are used to describe the background water quality of a water body.

Table 8. Field measurements at the Colorado River at the Nevada state line.

		Spring 2002	**Fall 2002**	**Spring 2003**	**Fall 2003**	**Spring 2004**	**Fall 2004**	**Spring 2005**
Oxygen, Saturation	%	93.1	75.7	81.2	111.9		148.5	100
pH		8.4			7.91		8.19	8.5
Salinity	g/L			0.47	0.43		0.25	0.54
Specific Conductivity	µS/cm	920	942	940	861		512	948
Temperature	C	15.72	17.36	14.93	17.21		21.36	18.05
Turbidity	NTU			0.25	0.01		0.21	1.5

A typical characterization of water in the watershed is alkaline with a somewhat elevated level of total dissolved solids and sufficient oxygen. These conditions indicate that the waters are able to support aquatic life. Based on pH and EC all of the rivers and lakes appear to have relatively steady quality with sufficient oxygen saturation to support the designated aquatic life beneficial uses such as WARM and COLD. Oxygen saturation results for some of the sampling dates for drains in the watershed indicate that there were times when the 5.0 ppm dissolved oxygen for the WARM beneficial use was not met. However, these instances appear to be limited to the spring 2002 and 2004 sampling times and are limited to the Palo Verde Lagoon and Outfall Drain sites. Conductivity meets all of the Basin Plan objectives for the watershed.

Conventional Constituents in Water

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

None of the sample results for conventional water quality constituents exceed Basin Plan objectives or established criteria. Nitrate (as nitrogen) concentrations were less than 1 ppm and phosphate concentrations were less than 60 ppb for all samples. Some samples contained elevated levels of hardness (as calcium carbonate) that may impact plumbing systems. Two samples from the Colorado River contained perchlorate at concentrations that exceeded the California Department of Public Health criteria of 6 ppb set for the protection of drinking water uses. Nine samples had perchlorate concentrations between 5 and 5.9 ppb. Given that the Colorado River is used for drinking water, perchlorate should continue to be monitored.

Metals in Water:

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

All metals concentrations in the Colorado River met applicable objectives given in the Basin Plan. Selenium is a concern in the Colorado River. Although the majority of the 45 samples tested for selenium were between 2-3 ppb, two samples were above 5 ppb and two samples were above 10 ppb. Both of the 10 ppb samples were from stations that route agricultural drainage in the Palo Verde area. This constituent should continue to be monitored.

Metals in Sediment

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

All samples for metals concentrations in sediments, indicate that they are meeting the maximum concentration as given in the Freshwater Sediment Policy.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

A total of 166 individual trace organic analyte fractions, representing 59 unique compounds were analyzed for in samples taken on the six sampling dates. Of these, 59 had reportable results. One sample from PVOD2 contained *Dibenz(a,h)anthracene* that exceeded the California Toxics Rule criteria set for the protection of Human Health when consuming organisms from freshwater systems. The reported concentration was 0.105 ppb and the criteria is 0.049 ppb.

No other results exceeded applicable objectives. However, in most cases, there are no established criteria to compare the reported values against. Table 9 reports the breakdown of the results by data qualifier for the trace organics in water. For the samples with reportable results, there were 24 unique compounds with *Toluene* being found in eight, of 17 samples that were tested. No spatial or temporal trends could be found in the frequency or the occurrence of the constituents.

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

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	59
Below the Detection Limit	0
Analyte Detected but Not Quantifiable	107
Totals	166

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediment samples were analyzed for organic pesticides, PAH and PCB content. A total of 4,709 individual trace organic analyte fractions, representing 153 unique compounds were analyzed in samples taken on the six sampling dates. Of these, 396 had detectable results. Table 10 reports the breakdown of the 4,709 sediment trace organics that were analyzed. None of the reportable results exceed the criteria established for the Freshwater Sediment Policy. For the samples with reportable results there were 51 unique compounds with PAH's accounting for most of the results. There are no spatial or temporal trends in the frequency of the occurrence of the constituents.

Table 10. Breakdown of result qualifiers on trace organics in sediment for the Lower Colorado River and Associated Lakes.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	396
Below the Detection Limit	4,145
Analyte Detected but Not Quantifiable	168
Totals	4,709

Toxicity in Water and Sediment

Water and sediment samples from the Lower Colorado River, associated lakes and several drains in the Palo Verde area were subjected to toxicity tests. Water samples show a higher overall % survival (lower toxicity) compared with the sediment samples. There is a slight decrease in % survival for some of the sediment samples taken from the Palo Verde area compared with the Colorado River. None of the water or sediment samples were reported as significantly different compared with the negative control. There does not appear to be a spatial or temporal trend to the results.

Table 11. Toxicity in water and sediment in the Lower Colorado River and Associated Lakes.

Colorado River at Imperial Dam Grates

	Water		Sediment	
Date	Count	Result % Survival	Count	Result % Survival
Spring 2002	10	90	8	98
Fall 2002	10	100	8	67
Spring 2003				
Spring 2004	20	100	8	93
Fall 2004	10	90		
Spring 2005	14	99		

Colorado River at Nevada State Line

Spring 2002	10	100		
Fall 2002	10	100		
Spring 2003	10	100		
Spring 2004	17	100		
Fall 2004	10	70		
Spring 2005	14	100		

Colorado River at Parker Dam

Spring 2002	10	90	8	85
Fall 2002	10	100	8	78

Colorado River u/s Imperial Dam

Spring 2002	10	100	8	93
Fall 2002	10	100	8	75
Spring 2003	10	100	8	94

Ferguson Lake

Spring 2002	10	100		
Fall 2002	10	90		

Lake Havasu

Spring 2002	10	100	93	8
Fall 2002	10	100	64	8

Palo Verde Drain

Spring 2004	20*'	95		
Fall 2004	10	100		

Palo Verde Outfall Drain (PVOD2)

Spring 2002	10	90	94	8
Fall 2002	10	100	79	8
Spring 2003	20*	95	88	16
Spring 2004	20	100	95	8
Fall 2004	10	100		
Spring 2005	14	87		

Palo Verde Lagoon (LG1)

Spring 2002			93	8
Fall 2002			89	8
Spring 2003			93	8
Spring 04			98	8

Squaw Lake

Spring 2002	10	100		
Fall 2002	10	100	90	8

Taylor Lake

Spring 2002	10	100		
Fall 2002	10	100		

Bacteria Indicators

Bacteria samples were taken in the spring and fall of 2002 and the fall of 2003 and 2004. A total of 151 samples were cultured for bacteria. Of the 151 samples, 24 samples exceeded the REC I objective for *Enterococcus*, *E. coli*, and *fecal coliform*, and 11 exceeded the REC II objectives for *Enterococcus* but none for *E. coli*. The results show that at each sampling location bacterial objectives were exceeded at least once. Of all locations in the Lower Colorado River watershed, the Palo Verde sites had the greatest number of times when the bacterial count exceeded the Basin Plan objectives. Three of the samples that exceeded the REC I objective and two that exceeded the REC II objective were taken from the Palo Verde Lagoon and Drain. The Palo Verde Lagoon and Outfall Drain are currently on the federal CWA Section 303(d) list as impaired by pathogens. It should be noted that the Colorado River has more stringent bacterial objectives when compared with other locations in the Basin.

3.2 Alamo River

Area Description, Monitoring Sites and Beneficial Uses

The Alamo River is in the Imperial Valley planning area. Land in the Imperial Valley is both flat, and fertile which makes the land suitable for agricultural use. The principal community along the river is El Centro. The Alamo River drainshed drains 340,000 acres, through five major drains including the Verde, South Central, Central, Holtville Main, and the Rose and seventy-one minor drains. There are thirteen flow control structures to reduce velocity 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 sampling stations were selected to characterize the changes in water quality in each of the main drains. Sampling points were located at drop structures because it is believed that the water at these points is well mixed.

Most of the water in the Alamo River comes from agricultural runoff from Imperial Valley lands irrigated with Colorado River water. From the river's headwaters at the International Boundary with Mexico, the Alamo River flows through the Imperial Valley 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 relatively 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 303(d) list, as impaired by silt, pesticides, and selenium. The Region's first Total Maximum Daily Load (TMDL) was adopted in 2002 for the Alamo River to address the impairment. As part of TMDL implementation, Regional Board staff currently collects monthly water samples from the Alamo River for TSS analysis. The purpose for the sampling is to monitor the effectiveness of management practices that are currently being implemented by Imperial Valley farmers to control silt in their tailwater.

Table 12 lists the seven SWAMP monitoring sites in 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 SWAMP Work Plan (2001). After the first year of monitoring, the seven sites were reduced to two, the one at the International Boundary and the other at the Outlet to the sea. Figure 3 provides a general map of the region and the approximate location of the sampling stations.

Table 12. SWAMP monitoring sites and station code, beneficial uses, and known and potential problems in the Alamo River drainshed.

Site Name (station code)	**Beneficial Uses[2]**	**Known Problem**	**Potential Problem**
Alamo River at International Boundary[1] (723ARINTL)	FRSH RARE WARM REC I REC II WILD	Bacteria Organics Pesticides Nutrients Silt	Bacteria Organics Pesticides Nutrients
Alamo River at Drop 8 (723ARDP08)	Same as above	Same as above	
Alamo River at Drop 6A (723ARDP6A)	Same as above	Same as above	
Alamo River at Drop 6 (723ARDP06)	Same as above	Same as above	
Alamo River at Drop 3 (723ARDP03)	Same as above	Bacteria Pesticides Nutrients Silt	
Alamo River Outlet[1](723ARGRB1)	Same as above	Bacteria Organics Pesticides Nutrients Silt	Pesticides

[1]These sites are included in the 13 strategic sampling sites identified in the SWAMP Work Plan.

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

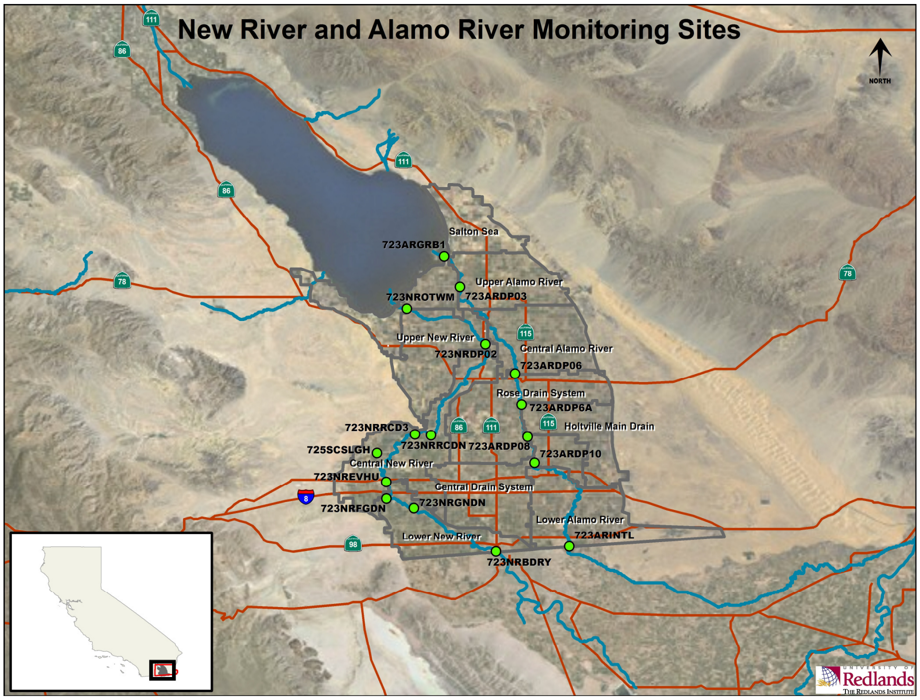

Figure 3. Monitoring sites in the Alamo River and New River Sub-drainsheds.

Alamo River at the International Boundary

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

Alamo River at Drop 10

This drop combines the discharges of two main drains Verde Drain and South Central and the drains from the Lower Alamo River drainshed.

Alamo River at Drop 8

This drop combines the discharges of the Central Drain and some small drains, such as Palmetto, Peach, Plum, Pine, Palm, and Pomelo.

Alamo River at Drop 6A

This drop combines the discharges of the small drains located in the Holtville Main Drain area.

Alamo River at Drop 6 & 3

The drains that are located between Drop 6 and Drop 6A correspond to the Rose Drain System. Most of the drains between drop 6 and 3 are considered small drains and are discharged directly to the Alamo River, therefore at drop 3, the water of the river is considered well mixed.

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.

3.2.1 Water Quality in the Alamo River

Results and Discussion

Water and sediment samples were taken from the Alamo River at the International Boundary, drops 3, 6, 6A, 8 10, at Sinclair and Harris Roads and at the outlet to the Salton Sea and analyzed for organics, pathogens, trace elements and conventional parameters. In addition, water and sediment from the International Boundary and the outlet to the Salton Sea were subjected to toxicity testing. It is assumed that REC I use of the Alamo occurs through occasional fishing.

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

Table 13. Summary of samples collected from the Alamo River (2002-2005).

Sample Type[1]	Count of Analyses	
	Sediment	Water
Toxicity Chemistry	2,067	3,715
Chemistry	760	1,368
Totals [2]	2,827	5,083
Analysis Result Data Qualifiers[2]	Count of Results	
	Sediment	Water
Above the Reporting Limit	651	864
Below the Detection Limit (ND)	2,030	4,099
Not Reported[4]	1	29
Detected but Not Quantifiable (DNQ)	145	91
Totals	2,827	5,083

[1] See section 2.7 for an explanation of the Sample Type. [2]Total number of samples collected equals the total number of sample results - the breakdown is of the Sample Type.[3] See Section 2.7 for descriptions of the Result Qualifiers.[4] Sample collected but results not reported

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. A sample of the output results is shown in Table 14 for the International Boundary and the Outlet to the Sea. Several of the individual sampling events in the spring and fall of 2002 were combined into spring and fall events, this was done so that all data could be displayed in one table. The spring 2003 event sampled the Boundary and Outlet stations two days in a row but only the 4/9/2003 data for the Boundary site and the 4/15/2003 date are shown in Table 14. This data, along with the conventional constituents are used to describe the background water quality of a water body.

Table 14. Field water quality measurements of the Alamo River taken at the International Boundary and at the outlet to the Salton Sea (2002-2005).

International Boundary		Spring 02	Fall 02	Spring 03	Fall 03	Spring 04	Fall 04	Spring 05
Oxygen, Dissolved	ppm						7.29	8.35
Oxygen, Saturation	%	40	26.1		22.5	26.4	92.3	103.7
pH		7.95	7.43	7.86	7.76	5.7	7.87	8.37
Salinity	g/L				2.97	0	0.14	1.92
Specific Conductivity	uS/cm	4512	4972	4633	5489	2	292	3652
Temperature	C	21.93	22.37	22.3	22.02	22.02	27.55	25.62
Turbidity	NTU	8.3	19		15.8	21.9	54.3	10.1
Velocity	Ft/s				0	0		

Outlet		Spring 02	Fall 02	Spring 03	Fall 03	Spring 04	Fall 04	Spring 05
Oxygen, Dissolved	ppm					4.98	7.37	6.37
Oxygen, Saturation	%	90.8	68	109.6	103.4	62	86.3	75.3
pH		7.81	7.77	7.72	7.92	7.97	7.78	8.56
Salinity	g/L			1.35	1.86	1.38	1.65	1.47
Specific Conductivity	uS/cm	2582	3036	2594	3522	2685	3156	2831
Temperature	C	23.2	20.21	18.73	15.95	26.14	23.42	23.58
Turbidity	NTU	150		170	125	115	140	69
Velocity	Ft/s	0.243			1.49	1.18		2.5

The field water quality measurements indicate that the Alamo River is typical of waters in the region. Like the Colorado River, which is indirectly the source for Alamo River water, this water is alkaline with a somewhat elevated level of total dissolved solids. The field water quality measurements indicate that Alamo is somewhat depleted in dissolved oxygen at the sampling locations near the International Boundary, but dissolved oxygen appears to increase as the river flows toward the Salton Sea. The Basin Plan objective for dissolved oxygen to protect WARM beneficial uses is greater than 5.0 ppm. Given the oxygen saturation and water temperature it is likely that the channel did not meet the standard at the International Boundary station, drop 10, drop 8, or drop 6. Conductivity is somewhat elevated, but is always below the 4,000 uS/cm Basin Plan objective. Turbidity increases as the River flows to the Sea, due to the inflow of, irrigation tailwater that contains sediment. There is no apparent explanation for the low conductivity measurements reported at the International Boundary in May and October 2004, or the low pH value reported at the International Boundary in May 2004.

Conventional Constituents in Water

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

Ammonia concentrations exceeded the criteria established for water bodies with fish present on two occasions – in the fall of 2003 at the Border and in the spring of 2004 at the outlet to the sea. Nitrate (as nitrogen) concentrations at the International Boundary station are very low (< 1 ppm), but increase to 5-8 ppm as the river flows through Holtville and remain relatively constant as it enters the lower portion of the drainshed near the Salton Sea.

Suspended sediments concentrations increase considerable after the Boundary station. The source of this loading is tailwater from agricultural fields. The Regional Board monitors this parameter for measuring the effectiveness of the silt TMDL. With the exception of one elevated suspended sediment measurement (190 ppm, spring 2002), the values at the Boundary station were between 20 and 30 ppm. The level of suspended sediment increases considerably after the Boundary station and was typically around 300 ppm for the remaining locations. The highest measured value was at Drop 6 in the spring of 2002 at 1,102 ppm.

Metals in Water:

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

Dissolved selenium concentrations exceeded the Basin Plan objective of 10 ppb in the Spring of 2004 and 2005 and the Fall of 2004 at the Boundary station and the spring of 2005 at the Outlet to the Salton Sea. In addition, all but one sample was above the 5 ppb value that wildlife biologist feel is a proper standard. Since these values are close to the Basin Plan objective and 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. In addition, it should be noted that the Alamo River is currently on the 303d list for impairment by selenium. All other metals concentrations in the River met the objectives given in the Basin Plan.

Metals in Sediment

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

Metals concentrations in sediments, indicate that they are below the maximum allowable concentration as given in the Freshwater Sediment Policy.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

A total of 4,000 individual trace organic analyte fractions, representing 250 unique compounds were analyzed in samples taken on the six sampling dates. Of these, 108 analytes had detectable results and four exceeded the California Toxics Rule (CTR) criteria set for the protection of Human Health when consuming water and organisms from freshwater systems. These four exceedances occurred at the Alamo River Outlet to the Salton Sea. One sample had *Aldrin* at 0.015 ppb on 5/6/02 and three samples had *Dieldrin* at 0.002 ppb on 5/6/02, 11/4/03 and 5/3/04. The lowest criterion for both constituents is 0.00014 ppb. It should be noted that neither analyte exceeded the acute CTR criteria maximum concentration for freshwater aquatic life use protection. This criterion is 0.024 ppb for *Dieldrin* and *3* ppb for *Aldrin*.

No other sample results exceeded the aquatic life protection criteria. However, in most cases, there are no established criteria to compare the reported values against. Table 15 reports the breakdown of the results qualifier for the trace organics in water. For the samples with reportable results, there were 31 unique compounds. The compounds *DDE(pp'), Dacthal, Chlorpyrifos, Atrazine and Diazinon* account for 50% of all reportable results. These constituents were present in nearly every sample tested.

Table 15. Breakdown of result qualifiers on trace organics in water for the Alamo River.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	108
Below the Detection Limit	3,810
Not Reported	25
Analyte Detected but Not Quantifiable	57
Totals	4,000

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. Table 16 reports the breakdown of the 2,503 sediment trace organics that were analyzed. None of the reportable results exceed the established criteria. For the sediment samples with reportable results, there were 51 unique compounds with PAH's accounting for most of the results. In addition, the herbicides *Dacthal and Trifluralin* were among the most frequently reported. There are no spatial or temporal trends in the frequency of the occurrence of the constituents. Chlorpyrifos, which is on the 303d list, was detected 11 times at concentrations above the reporting limit. However, in most cases, there are no established criteria to compare the reported values too. No other organics on the 303d list were above the reporting limit.

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

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	372
Below the Detection Limit	2,000
Not Reported	1
Analyte Detected but Not Quantifiable	130
Totals	2,503

Toxicity in Water and Sediment

Water and sediment toxicity tests were done for samples collected at the International Boundary and the Outlet to the Sea. Table 17 provides the results from the two sampling locations for both water and sediments. There does not appear to be a spatial or temporal trend to the results.

With the exception of the spring and fall of 2002, all sediment samples had relatively decent survival. The individual replicates for both sampling periods in 2002 at the outlet location varied between 20 and 90% survival whereas the boundary location was consistently above 90% survival. Compared to the negative controls, toxicity test results indicate that several water and sediment samples were significantly different from the negative control and exceeded the evaluation threshold. *Aldrin* and *Dieldrin* concentrations were above aquatic life criteria at the outlet location in the spring of 2002. *Aldrin* and *Dieldrin* may be partially to blame for the toxicity.

Table 17. Toxicity in water and sediment in the Alamo River.

Alamo River at International Boundary

	Water		Sediment	
Date	Count	Result % Survival	Count	Result % Survival
8-May-02	5	92		
1-Oct-02	5	90	8	58
9-Apr-03	5	100	8	93
3-May-04	5	92	8	96
4-Oct-04	10	100		
9-May-05	9	98		

Alamo River Outlet

Date				
6-May-02	10	80	8	57***
2-Oct-02	10	0***	8	69
15-Apr-03	10	100	8	95
3-May-04	20	90	8	87**
5-Oct-04	10	0	8	86
9-May-05	18	97	16	84

***Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (SL; Both criteria met)

**Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (SG; Only the first criteria met)

Bacteria Indicators

Samples were collected in the spring and fall of 2002 and the spring of 2003. A total of 39 samples were cultured for bacteria, 25 samples exceeded the REC I objective for *Enterococcus*, *E. coli*, and *fecal coliform*, and 12 exceeded the REC II objective for *Enterococcus*. Results show that at each sampling location the Basin Plan objectives were exceeded at least once. The Alamo River is listed for theses uses however it is assumed that REC I occurs through occasional fishing. The results indicate that all locations had some periods where the bacteria objectives were exceeded. The International Boundary station had fewer results that exceeded the Basin Plan objectives than Outlet and lower portion of the drain-shed. There were no clear spatial or temporal patterns in the results.

3.3 New River

Area Description, Monitoring Sites, and Beneficial Uses

The New River, like the Alamo River, is in the Imperial Valley planning area. 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, Cu, Hg, Se nutrients, VOCs, dissolved oxygen 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 18 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 SWAMP Work Plan (2001). Figure 3 (in the Alamo River section of this document) provides a general map of the Imperial Valley and the approximate location of the New River sampling stations.

Table 18. Monitoring sites and station code, beneficial uses, and known and potential problems in the New River and associated drains.

Site Name (station code)	**Beneficial Uses[2]**	**Known Problem**	**Potential Problem**
New River at International Boundary[1] (723NRBDRY)	FRSH RARE WARM REC I REC II WILD	Bacteria Pesticides Nutrients Silt	
New River at Evan Hughes Highway (723NREVHU)	Same as above	Same as above	
Salt Creek, Slough TSMP (725SCSLGH)			Organics
Greeson Drain (723NRGNDN)	Same as above	Same as above	
Fig Drain (723NRFGDN)	Same as above	Same as above	
Rice Drain (723NRRCDN)	Same as above	Same as above	
Rice Drain No. 3 (723NRRCD3)	Same as above	Same as above	
New River at Drop 2 (723NRDP02)	Same as above	Same as above	
New River Outlet[1] (723NROTWM)	Same as above	Same as above	

[1]These sites are included in the 13 strategic sampling sites identified in the SWAMP Work Plan.

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

New River at the International Boundary

The New River headwaters are located approximately 16 miles south of the International Boundary in Mexicali, Mexico. Within the United States, the New River flows approximately 60 miles before it discharges into the Salton Sea. The New River at International Boundary is known for the high concentrations of bacteria indicators, such as fecal coliforms and E. Coli. These are two of the pollutants 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 in Mexicali, Mexico. This site is the most upstream site and serves as a sort of reference for downstream sites on the US side of the New River.

New River Evan Hughes

This site collects the discharges from point and non-point sources. From point sources, the wastewater discharges of the City of Calexico wastewater treatment plant (WWTP), and non-point the small drains from the Lower New River Area, as well as seven confined animal feeding operation discharges facilities.

Greeson Drain

This is the main drain of the Lower New River system, with an average flow of 24,107 acre-feet pr year. Based on data from Toxic Substance Monitoring Program (TSMP), fish tissue samples collected from this drain have contained high concentrations of pesticides and metals.

Fig Drain

This site is one of the main drains in the Lower New River system with an annual average discharge of 10,503 acre-feet per year. Close to this drain is the Fig Lake. This lake was manmade and at the present is considered as a recreational area.

Rice Drain

This drain collects the agricultural run off from some of the small drains located at the east side of the New River identified under the Central New River System.

Rice Drain No. 3

Rice 3 Drain is one of the main drains from the Central New River drain system. This site also combines wastewater discharges from the following plants: US Navy Facility, Centinela Prison, McCabe School, Date Gardens MHP, El Centro and Seeley CWD.

New River at Drop 2

This drop combines the direct discharges of small drains into the New River between the Rice Drain and Drop 2 and the main Central North Drain. Besides the discharge of non-point sources, this site also mixes the point sources of the discharge from Imperial and Brawley WWTP's.

New River Outlet

This is the last station before the Salton Sea and is a key site for several agencies, such as United States Geological Service (USGS), IID, and Regional Water Quality Control Board (RWQCB). At this site, the discharges from the Westmorland WWTP and the agriculture run off from the area identified as Upper New River are mixed.

3.3.1 Water Quality in the New River

Results and Discussion

Samples were taken from the New River at the following locations; International Boundary, Drew Road, Drop 2, Evan Hughes Hwy, Fig Drain, Greeson Drain, Rice Drain, Rice Drain #3, and at the Outlet to the Salton Sea. It is assumed that REC I and II uses occurs through occasional fishing or are unauthorized.

Table 19 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 19. Summary of samples collected from the New River and associated drains (2002-2005).

Sample Type[1]	Count of Analyses	
	Sediment	Water
Toxicity Chemistry	2,099	3,578
Chemistry	516	1,870
Totals [2]	2,615	5,448
Analysis Result Data Qualifiers[3]	Count of Results	
	Sediment	Water
Above the Reporting Limit	1,161	987
Below the Detection Limit (ND)	1,309	4,308
Not Respoted[4]	0	17
Detected but Not Quantifiable (DNQ)	145	136
Totals [2]	2,615	5,448

[1] See section 2.7 for an explanation of the Sample Type. [2]Total number of samples collected equals the total number of sample results - the breakdown is of the Sample Type.[3] See Section 2.7 for descriptions of the Result Qualifiers. [4] Sample collected but results not reported

Field Measurements in Water:

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

Field measurements were taken at each sampling site as presented in Table 20. Several of the individual sampling events in the spring and fall of 2002 were combined into spring and fall events, this was done so that all data could be displayed in one table. This data, along with the conventional constituents are used to describe the background water quality of a water body.

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

New River at Boundary		Spring 2002	Fall 2002	Spring 2003	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005
Oxygen, Saturation	%	5.5	5.8	18.1		18.1	5.6	8.4	10.2
pH		7.94	7.67	7.3	7.56	7.73	7.63	7.84	8.37
Salinity	g/L			2.45		2.42	2.56	2.36	2.81
Specific Conductivity	µS/cm	4664	4005	4582	5350	4512	4806	4455	5226
Temperature	C	23.1	23.02	22.56	19.95	17.49	27.36	26.79	25.17
Turbidity	NTU	34		30		82.3	37.2	32.8	45
Velocity	Ft/s	0				1.32	2.2		2
New River Outlet									
Oxygen, Dissolved	mg/L						4.62	7.52	5.46
Oxygen, Saturation	%	57.6	83.7		68.8	97.8	55	80.9	58.9
pH		7.76	7.65	7.46	7.6	7.58	7.5	7.56	7.25
Salinity	g/L				1.96	2.36	1.94	1.8	2.19
Specific Conductivity	µS/cm	3693	3935	3640	3703	4404	3682	3433	4119
Temperature	C	22.76	19.97	20.73	18.45	17.36	24.05	23.52	19.93
Turbidity	NTU				132	40	84	98.8	61.7
Velocity	Ft/s					1.64	2.58		1.5

The field water quality measurements indicate that these waters are typical of waters in the region. Like the Colorado River, which is indirectly the source for the New River, this water is characterized as alkaline with a somewhat elevated level of total dissolved solids. Of the field measurements, dissolved oxygen appears to be the most impacted by the pollution in the New River. Conductivity and turbidity are elevated.

At the International Boundary, the conductivity of the New River exceeds the Basin Plan objective and the level of oxygen saturation is too low to meet the

WARM dissolved oxygen Basin Plan objective of 5.0 ppm. At the given temperature, the level of dissolved oxygen should be above the 5.0 ppm. The level of oxygen saturation improves as the River moves toward the Salton Sea, particularly beyond the Rice drain. At these points with the given temperature and the level of oxygen saturation, the level of dissolved oxygen should be above the 5.0-ppm objective. Conductivity is consistently above 4,000 uS/cm at the Boundary but the values are below the Basin Plan objective of 4,000 ppm TDS (assumes 640 ppm per 1,000 uS/cm). Conductivity values would need to average greater than 6,000 uS/cm to be above the Basin Plan objective. Turbidity is elevated in many of the samples and may impact beneficial uses of the water. Also, the reader is reminded that the Basin Plan requires monthly monitoring of the New River and the SWAMP sampling only occurs on a biannual basis.

Conventional Constituents in Water

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

Nitrate samples were generally below 5 ppm. Ammonia levels at the Boundary location exceeded the criteria for freshwater aquatic life with early life stage fish present for six of the seven sampling periods as did one sample from the Rice Drain. The seventh sample date at the Boundary exceeded the criteria for freshwater aquatic life without early stages of fish present. The remaining river stations all exceeded the lower threshold (aquatic life without early life stages present) once out of the two times they were sampled. Samples taken at the outlet to the sea exceeded the lower threshold all but the fall of 2003.

Suspended sediments concentrations increase considerable after the Boundary station. The source of this loading is tailwater from agricultural fields. The Regional Board monitors this parameter for measuring the effectiveness of the silt TMDL. Values at the Boundary station were relatively low ranging between 25-46 ppm. They increase after the Boundary but the 2002 samples show that they decrease at the Fig drain. Beyond the Fig, the suspended sediment measurement remains relatively constant at around 200 ppm to the Outlet at the Sea. Compared with the Alamo River, the New River appears to have a lower level of suspended sediments.

Metals in Water:

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

Dissolved selenium concentrations exceeded the Basin Plan objective of 1 ppb in the Spring of 2005 at the Boundary (38.5 ppb) and at the Outlet to the Salton Sea (31.2 ppb). The remaining samples were between five and ten ppb with the exception of one sample at the Boundary station that was <1 ppb. The dissolved oxygen content at this time was also low and this may have caused a reduction of aqueous selenium. With the exception of the one low value these samples are above the 5 ppb value that wildlife biologist feel is a proper standard. Since these values are close to the Basin Plan objective and 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. In addition, it should be noted that the Alamo River is currently on the 303(d) list for impairment by selenium. All other metals concentrations in the River met the objectives given in the Basin Plan.

Metals in Sediment

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

Two sediment samples taken in the fall of 2003 and 2004 from the International Boundary contained zinc concentrations that exceeded the Freshwater Sediment Policy criteria of 459 ppm. The Fall 2003 sample was 721 ppm and the fall 2004 sample was 632 ppm. A possible source for zinc could be from industrial discharges upstream in Mexicali, Mexico. No other samples at this or any other sites in the watershed were above the 459 ppm zinc criteria. All other metals concentrations in sediments indicate that they are below the maximum concentration criteria as given in the Freshwater Sediment Policy.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

A total of 4,639 individual trace organic analyte fractions, representing 290 unique compounds were analyzed for on samples taken on the six sampling dates. Of these, 288 analytes had reportable results above detection limit. Three analytes detected in New River Outlet samples exceeded the California Toxics Rule criteria set for the protection of Human Health when consuming water and organism from freshwater systems. Two samples on 5/6/02 contained *Aldrin* at 0.017 and 0.01 ppb, the third sample contained *Dieldrin* at 0.002 ppb on 5/6/02. The lowest criterion for both analystes is 0.00014 ppb. It should be noted that neither analyte exceeded the goal for acute CTR Criteria Maximum Concentration set for the protection of freshwater aquatic life uses. This criterion is 0.024 ppb for *Dieldrin* and *3* ppb for *Aldrin*.

No other sample results exceeded the aquatic life protection criteria. However, in most cases, there are no established criteria to compare the reported values to. Table 21 reports the breakdown of the results qualifier for the trace organics in water. For the sample results with reportable concentrations, there were 69 unique compounds with *Diazinon, Toluene* and several *Napthalenes* being found in most samples that they were tested for. The herbicides, *Dacthal and Trifluralin* were found in seven of the eight samples tested. However, beyond the constant presence of the mentioned organics there are no spatial or temporal trends in the frequency or the occurrence of these trace organic constituents.

Seven constituents on the 303d list including *Chloroform, Chlorpyrifos, Diazinon, Dieldrin Toluene and Xylene* were detected in reportable concentrations. Of these, *Diazinon* was consistently found at all locations and at all time periods. With the exception of *Dieldrin,* the remaining constituents were found at both the Boundary and Outlet locations multiple times. *Dieldrin* was only found once at the Outlet location.

Table 21. Breakdown of result qualifiers on trace organics in water in the New River.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	288
Below the Detection Limit	4,217
Not Reported	17
Analyte Detected but Not Quantifiable	117
Totals	4,639

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. Table 22 reports the breakdown of the 2,211 sediment trace organics that were analyzed. None of the reportable results exceed established sediment criteria.

Table 22. Breakdown of result qualifiers on trace organics in New River sediment.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	780
Below the Detection Limit	1,290
Analyte Detected but Not Quantifiable	141

Totals	2,211

For the samples with reportable results, there were 114 unique compounds with many PAHs and *Chlorpyrifos* occurring in most of the samples. However, beyond the constant presence of the mentioned organics there are no spatial or temporal trends in the frequency of the occurrence of the constituents.

Toxicity in Water and Sediment

Water and sediment toxicity tests were performed on samples collected from the International Boundary, from Rice Drain and from the outlet to the Sea (Table 23). Toxicity at the International Boundary is very high. In light of the previous discussion about pollution in the New River this is as expected. The remaining sites show a mix of toxicity results with the sediment samples having a higher level of toxicity. Although there were 288 reportable trace organic results found in the water, and 872 in the sediment, there were only 3 that exceeded the available water quality criteria. There were high pathogen counts and low oxygen levels particularly at the International Boundary station. These factors may all contribute to the low survival seen in both the sediment and water samples (Table 23). Toxicity testing indicates that several water and sediment samples were significantly different from the negative control and exceeded the evaluation threshold. In addition, a few samples exceeded the evaluation threshold.

Toxicity identification evaluations (TIE) were performed by the Aquatic Toxicology Laboratory at UC Davis on two samples collected from the New River at the Boundary station (Werner, 2007). The results indicated potential pyrethroid toxicity in both samples. Chemical analysis did not detect pyrethroids in the May 2005 sample, but interference of oil and grease and other organic compounds present in the water sample may have prevented their detection at concentrations toxic to the test organisms. Chemical analysis of the October 25, 2005 sample from this site revealed the presence of two pyrethroids at concentrations toxic to invertebrates: *Cyfluthrin* (0.013 ppb) and *Permethrin* (0.043 ppb). In addition, volatile toxic compounds were present in the sample collected in May 2005. Test results on the sample collected in October 2005 indicated possible pesticide toxicity. Overall, the TIE results indicate the presence of pesticides and associated compounds (e.g. surfactants) at toxic concentrations in the New River. Of particular interest is the detection of pyrethroid pesticides in the water column, because these compounds are believed to sequester to sediments within hours of being transported into surface waters.

Table 23. Toxicity in water and sediment in the New River.

New River at Boundary

	Water		Sediment	
Date	Count	Result % Survival	Count	Result % Survival
8-May-02	5	2***	8	8***
1-Oct-02	5	0***	8	0***
9-Apr-03	5	0***	8	1***
3-May-04	5	0***	8	46***
4-Oct-04	5	0	8	8

Salt Creek, Slough (TSMP)

15-May-02	5	96		
30-Sep-02	5	90		

New River at Rice Drain #3

7-May-02	10	100	8	70***
30-Sep-02	10	0***	8	83

New River Outlet

6-May-02	15	98	8	4***
2-Oct-02	5	100	8	80
15-Apr-03	10	80**	8	35***
4-May-04	20	90***	8	90
5-Oct-04	5	43	8	74

***Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (SL; Both criteria met)

**Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (SG; Only the first criteria met)

Bacteria Indicators

Samples were taken in the spring of 2002 through the spring of 2004. A total of 65 samples were cultured for bacterial pathogens, 62 samples exceeded the REC I objective for *Enterococcus, E. coli,* and *fecal coliform*, and 35 exceeded the REC II objective for *E. coli* and *Enterococcus*. Sampling on the New River for pathogens was not as comprehensive as other areas in the Basin. At the International Boundary, there were no bacteria samples collected in fall 2003, fall 2004, and either the fall or spring 2005. Other locations had even less monitoring.

The Basin Plan contains bacteria objectives to protect REC I and REC II uses. All New River sites exceeded the Basin Plan bacteria objectives at one time or another. As expected, the two sites closest two the International Boundary, the International Boundary site and the Evan Hughes site, had the highest counts. The bacterial populations reported were much greater at the International Boundary than at other sampling sites in the Basin. Given the location and the inflow from the Mexicali Valley this was as expected. The Basin Plan does require better 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. The only trend that is seen with these results is that all locations in the New River are impacted by pathogens.

3.4 Salton Sea and Associated Drains

Area Description, Monitoring Sites and Beneficial Uses

The Salton Sea is 35-miles long, 12 miles wide, 40 feet-deep, and is recognized as California's largest lake based on surface area. The sea is a terminal desert lake, or sink. Input to the Salton Sea drainage includes direct precipitation, storm runoff, agricultural drainage and municipal discharge. Since the sea has no outlet, its salinity is predicted to increases with time due to concentrating of salts left behind as water evaporates. It is an extremely saline water body with. salinity reaching concentrations around 47,000 ppm, saltier than the Pacific Ocean, which averages 35,000 ppm.

In 1924, the federal government recognized the Salton Sea's use as a depository for agricultural drainage waters, placing 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.

The present sea is sustained mainly by agricultural runoff from Imperial and Coachella valleys, which are irrigated with Colorado River water diverted through the All American and Coachella canals. The 303d lists the Salton Sea and its associated drains as impaired for selenium, nutrients, salinity and several pesticides.

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 discharge or recharge to the Sea (Michel and Schroeder, 1994). The predominant source of water in the rivers is irrigation drainage water. 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. 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. The depth of the Salton Sea increases with increasing distance from the shoreline, to a maximum of about 15 m. Bathymetric contours still exhibit some evidence of deposition from the rivers where the water depth is almost 5 m. 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 24 lists the SWAMP monitoring sites, 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 SWAMP Work Plan. Figures 4 and 5 provide general maps of the region and the approximate location of the sampling stations.

Table 24. SWAMP monitoring sites and station codes, beneficial uses, and known and potential problems in the Salton Sea and associated drains.

Site Name (station code)	**Beneficial Uses[2]**	**Known Problem**	**Potential Problem**
Salton Sea Drain NE1 - USGS 8 (728SSDNE1)	Same as above	Same as above	Organics
Salton Sea Drain NE2 - ARSTDR (728SSDNE2)	Same as above	Same as above	Organics
Salton Sea Drain S1 - W Drain (728SSDS01)	Same as above	Same as above	Organics
Salton Sea Drain S2- Niland 4 (728SSDS02)	Same as above	Same as above	Organics
Salton Sea Drain S3 - Trifolium TD1 (728SSDS03)	Same as above	Same as above	Organics

Salton Sea Drain SW2 - Salt Creek, Mouth (723SSDSW2)	Same as above	Same as above	Organics
USGS 2[1](728SSGS02)	Same as above	Same as above	Organics
USGS 3 (728SSGS03)	Same as above	Same as above	Organics
USGS 5 (728SSGS05)	Same as above	Same as above	Organics
USGS 7[1](728SSGS07)	Same as above	Same as above	Organics
USGS 9[1](728SSGS09)	Same as above	Same as above	Organics
USGS 10 (728SSGS10)	Same as above	Same as above	Organics
Salton Sea Drain NW1 - Torrez Martinez 1 (728SSDNW1)	Same as above	Same as above	Organics
Salton Sea Drain NW2 - Torrez Martinez 2 (728SSDNW2)	Same as above	Same as above	Organics

[1]These sites are included in the 13 strategic sampling sites identified in the SWAMP Work Plan.

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

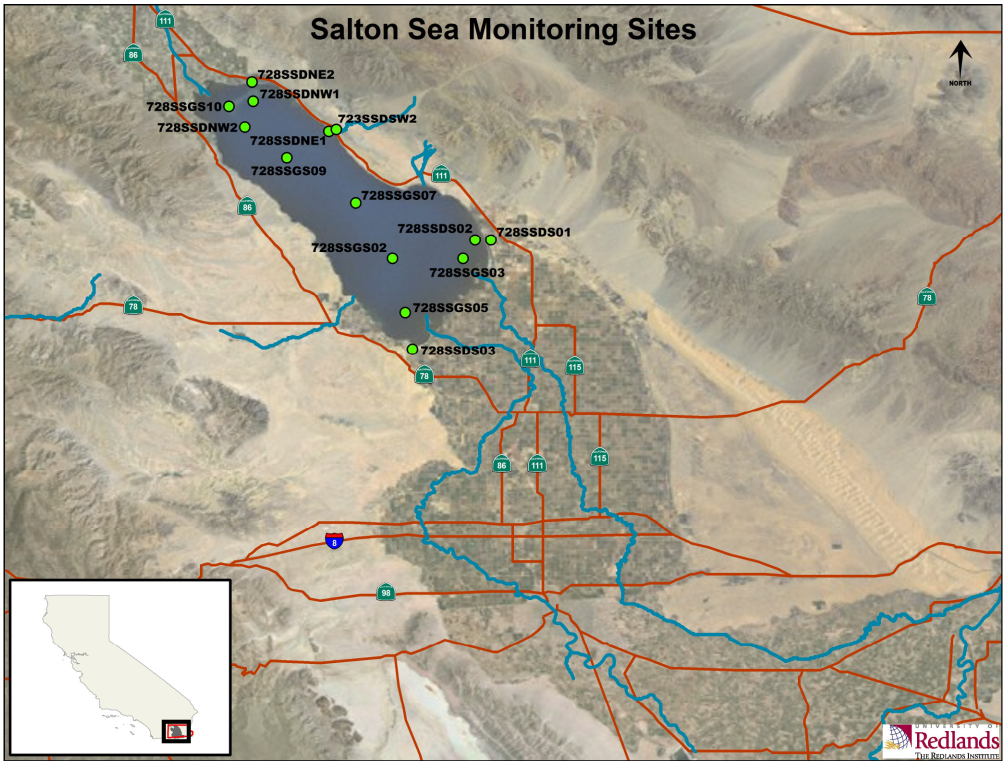

Figure 4. Monitoring sites in the Salton Sea.

<u>USGS 2</u>

This site is located in southeast part of the Salton Sea at the deep area. At this station, we have a mix of the waters coming from the New and Alamo outlets. The site is inside of the Salton Sea National Wildlife Refuge and close to the Salton Sea Test Base.

<u>USGS 3</u>

This site is located in southeast part of the Salton Sea at shallow depth area, close to the Alamo River outlet.

<u>USGS 5</u>

This site is located in southeast part of the Salton Sea at shallow depth area, close to the New River outlet.

<u>USGS 7</u>

This site is located in center part of the Salton Sea at deep depth area.

<u>USGS 9</u>

This site is located in northwest part of the Salton Sea at deep depth area.

<u>USGS 10</u>

This site is located in northwest part of the Salton Sea at medium depth area, mixing the water coming from the Whitewater River.

Salton Sea Torres Martinez Sites

Two SWAMP sites are located at the Torres Martinez Reservation area, these sites are inside of the sea situated at the northwest at medium depth area. The mixing of these sites is based on water coming from the Whitewater River. The sites are identified as 728 SSNDW1 and 728 SSDNW2.

Drains Discharging to the Salton Sea

The other Salton Sea sites under SWAMP are drains that discharge direct to the Salton Sea, these sites were collected during the spring and fall of 2002, and are considered as SWAMP baseline sites. Several Salton Sea drains were selected under SWAMP. Two main drains in the Northeast close to North Shore, 728 SSDNE1 located at relative shallow depth and also designated as USGS 08 station; and 728 SSDNE2 close to the north margin of the sea at the end of the Arthur Street, Riverside County. Two other tributaries, San Felipe Creek and Salt Creek Mouth, naturally occurring waters, were chosen for sampling to approximate baseline and small streams. Three drains located at the south zone of the Salton Sea; W drain, Niland 4 and the Trifolium Drain are monitored under the Salton Sea Nutrient TMDL development. Stations are shown in Fig. 4.

3.4.1 Water Quality in the Salton Sea and Associated Drains

Results and Discussion

Samples were taken from the Salton Sea watershed at the locations listed in Table 25. The Salt Creek site is in the New River watershed however given its physical proximity to the drains in this watershed it was included with this data. Complete site information is provided in the Region's Basin Plan.

Table 25. Type of sampling conducted at the monitoring stations for sediment and water chemistry and for toxicity testing in the Salton Sea.

Location			**Toxicity**	
	Water	Sediment	Water	Sediment
Salton Sea Drain NE1 (USGS 8)	x	x		
Salton Sea Drain NE2 (ARSTDR)	x	x		
Salton Sea Drain NW1 (Torrez Martinez 1)	x	x	x	x
Salton Sea Drain NW2 (Torrez Martinez 2)	x	x	x	x
Salton Sea Drain S1 (W Drain)	x	x		
Salton Sea Drain S2 (Niland 4)	x	x		
Salton Sea Drain S3 (Trifolium TD1)	x	x		
Salton Sea Drain SW2 (Salt Creek, Mouth)	x	x		
Salton Sea USGS10	x	x		
Salton Sea USGS2	x	x	x	x
Salton Sea USGS3		x	x	

Salton Sea USGS5	x	x		
Salton Sea USGS7	x	x	x	x
Salton Sea USGS9	x	x	x	x

Table 26 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 26. Sample counts and the breakdown of results for the Salton Sea SWAMP sampling (2002-2005).

Sample Type[1]	Count of Analyses	
	Sediment	Water
Toxicity Chemistry	3,130	6,733
Chemistry	4,300	5,263
Totals [2]	7,430	11,996
Analysis Result Data Qualifiers[4]	Count of Results	
	Sediment	Water
Above the Reporting Limit	1,809	1,357
Below the Detection Limit (ND)	5,393	10,228
Detected but Not Quantifiable (DNQ)	228	411
Totals [2]	7,430	11,996

[1] See section 2.7 for an explanation of the Sample Type. [2]Total number of samples collected equals the total number of sample results - the breakdown is of the Sample Type.[3] See Section 2.7 for descriptions of the Result Qualifiers.

Field Measurements in Water:

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

Field measurements were taken at each sampling location as presented in Table 25. Field measurement data is presented in Table 27 from two representative sites; Salt Creek and USGS 7. The Salt Creek site represents a site with more natural versus agricultural return flow to the Sea and the USGS 7 site represents a well-mixed site internal Sea site. For the Salt Creek site, data was only available for 2002, however this was typical for all sites except for the internal Sea sites. Individual sampling events in were combined into spring and fall events so that all data could be displayed in one table. This data, along with the conventional constituents are used to describe the background water quality of a water body.

Table 27. Field water quality measurements of the Salton Sea (2002-2005).

Salt Creek (Salton Sea Drain SW2)

		Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005
Oxygen, Saturation	%	0.8						
pH		8.48						
Specific Conductivity	uS/cm	10,140						
Temperature	C	34.4						
Turbidity	NTU	65						

Salton Sea USGS7

		Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005
Oxygen, Dissolved	mg/l						11.01	14.5
Oxygen, Saturation	%	8	28.8	335.2	129.1	2	169.7	194.5
pH		8.98		8.96	8.01	8.1	8.61	8.6
Salinity				29.78	37.7	56.5	33.35	39.22
Specific Conductivity	uS/cm	51,000	58,860	45,860	56,790	81,220	50,093	57,760
Temperature	C	26	27.13	21.73	23.17	27.78	26.43	24.19
Turbidity	NTU	9.3	4.6	25		8.2	6.4	13
Velocity	Ft/s	0	0			0		

There are two types of monitoring sites in this watershed: those that are draining to the Salton Sea, and those that are in the Salton Sea. For the sites that are draining to the Sea the field water quality and the conventional sampling results indicate that the water is typical of waters in the region, which is seen in the Salt Creek data above. This water is characterized as alkaline with elevated levels of specific conductance. However, the level of oxygen saturation is low in many of the samples. Since most sample were taken during the day this may be due to a biological demand for the oxygen at the time of sampling. Basin plan criteria for dissolved oxygen set for the protection of the WARM beneficial use is greater than 5.0 ppm. Given the oxygen saturation and water temperature it is likely that the channel did not meet the standard at many times for the drains flowing into the Sea. It should be noted that an exact dissolved oxygen value cannot be determined for these time periods because not all environmental factors are recorded when the samples were taken.

Specific conductance in the Sea (USGS 7) is very high due to the high salt load in the agricultural drainage along with a high evaporation rate. The Basin Plan states that the salinity objective for the Sea is 35,000 ppm. All Sea samples exceed this value. Turbidity in the drains to the Sea is higher than the Sea itself, but this is to be expected due to the opportunity time for suspended sediments to settle out in the Sea.

Conventional Constituents in Water

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

Three nitrate samples exceeded the Basin Plan objective of 10-ppm nitrate (as Nitrogen). Two of the samples were collected from the Salton Sea Drain S3 (Trifolium TD1) (19 and 19.1 ppm) in the spring and fall of 2002. The S3 drain was only sampled twice during the 2002-2005 period. The third nitrate exceedance was found in a sample collected from the Salton Sea Drain NE2 (ARSTDR) sampling site in spring of 2002. The NE2 drain was sampled twice but only exceeded the objective once (18 ppm).

Four samples exceeded the ammonia criteria. One sample in Salt Creek exceeded the aquatic criteria when early fish life stages are present. The remaining samples exceeded the lower threshold and were found in the Salton Sea Drain S3 (Trifolium TD1) site as well as in the Sea itself.

Metals in Water:

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

One sample collected on 5/8/02 from Salton Sea Drain S3 (Trifolium TD1) contained selenium at a concentration of 0.0113 ppm, above the Basin Plan Objective of 0.01 pm for municipal waters. Most other selenium samples from the drains were between 0.004 to 0.005 ppm, samples from the Sea were lowest in the Region and with a few exceptions were less than 0.002 ppm. No other metals exceeded established criteria.

Metals in Sediment

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

All sample results for metals in sediments are below the maximum concentrations of established sediment criteria.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

269 unique trace organics in water were analyzed a total of 10,379 times. The vast majority of sample results were qualified as not detected. Of the total number of individual sample results, 232 had reportable results and two exceeded the California Toxics Rule criteria set for the protection of Human Health when consuming water and organism from freshwater systems. One sample that exceeded the CTR criteria was collected from the Salton Sea Drain NW2 (Torres Martinez 2) that contained *Aldrin* at 0.004 ppb on 5/13/02, the CTR criteria is 0.00013 ppb. The second sample that exceeded the CTR criteria came from a sample that was collected from the USGS 9 sampling site, which contained *Dieldrin* at 0.003 ppb on 5/5/04; the CTR criterion is 0.00014 ppb. Neither analyte exceeded the acute CTR Criteria Maximum Concentration set for the protection of freshwater aquatic life uses. The CTR criteria are 0.024 ppb for *Dieldrin* and *3* ppb for *Aldrin*.

No other sample results exceeded the aquatic life protection criteria. However, in most cases, there are no established criteria to compare the reported values to. Table 27 reports the breakdown of the results qualifier for the trace organics in water. For the samples with reportable results, there were 40 unique compounds with *Atrazine* being reported in 25 samples of the 28 samples tested. Other organic constituents that were found in many samples were PAHs. *Diazinon* was found in four samples. There are no spatial or temporal trends in the frequency of the occurrence of the constituents.

Table 28. Breakdown of result qualifiers on trace organics in water in the Salton Sea.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	232
Below the Detection Limit	9,892
Not Reported	0
Analyte Detected but Not Quantifiable	255
Totals	10,379

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments samples were analyzed for organic pesticides, PAH and PCB content. Table 28 reports the breakdown of the 923 sediment trace organics that were analyzed. None of the reportable results exceed the established sediment criteria.

For the samples with reportable results, there were 74 unique compounds, PAHs were found in many of the samples. *Dieldrin* a constituent on the 303d list was found in one sample at USGS 9, in the Sea. There are no spatial or temporal trends in the frequency of the occurrence of the constituents.

Table 29. Breakdown of result qualifiers on trace organics in Salton Sea sediments.

Analysis Result Data Qualifiers	**Count of Results**
Above the Reporting Limit	709
Below the Detection Limit	0
Analyte Detected but Not Quantifiable	214
Totals	923

Toxicity in Water and Sediment

Water toxicity tests were performed on samples collected from two drains and three locations in the Salton Sea (Table 29). All sites except Salt Creek showed some level of toxicity, however the sediment samples had much greater toxicity than the water. Other than the low oxygen saturation percentage in the field sample, there does not appear to be an obvious reason.

Compared to the negative controls, toxicity test results indicate that several water and sediment samples were significantly different from the negative control and exceeded the evaluation threshold. There is no apparent spatial or temporal trend.

Table 30. Toxicity in water and sediment in the Salton Sea and associated drains.

Salton Sea Drain NW1 (Torrez Martinez 1)

	Water		Sediment	
Date	Count	Result % Survival	Count	Result % Survival
13-May-02	13	89	8	85
30-Sep-02	13	68	8	55

Salton Sea USGS2

14-May-02	13	78	8	78
3-Oct-02	26	64	16	43***
10-Apr-03	13	53	8	36***
5-May-04	13	72	8	58***

6-Oct-04	5	92		
11-May-05	5	84		

Salton Sea USGS3

15-May-02	5	80		
3-Oct-02	5	100		

Salton Sea USGS7

14-May-02	13	87	8	84
30-Sep-02	13	72	8	56
10-Apr-03	13	34***	8	15***
5-May-04	13	76	8	64***
6-Oct-04	13	79	8	71
11-May-05	5	88		

Salton Sea USGS9

14-May-02	13	71	8	58***
30-Sep-02	5	92		
30-Oct-02	8	41	8	41***
10-Apr-03	13	40	8	10***
5-May-04	13	93	8	89
6-Oct-04	5	57		
11-May-05	5	72		

***Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (SL; Both criteria met)

Bacteria Indicators

Bacteria samples were collected in the spring and fall of 2002 and 2003, as well as in the fall of 2004. A total of 58 samples were cultured for pathogens, 9 samples exceeded the REC I objective, primarily for *Enterococcus* and 1 exceeded the REC II objective for *Enterococcus*. The REC I exceedances were observed at all locations but the exceedances occurred at different times. Although there were several locations where the objectives were exceeded, overall the level of pathogen contamination is relatively low compared with the other watersheds in the Basin.

3.5 Coachella Valley (Whitewater River) 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 and toxaphene. Pathogens impair a 17 mile section of the CVSC from Dillon Street to the Salton Sea. Toxaphene impairs a 2 mile section from the Lincoln Street bridge to it's outlet to the Salton Sea.

Table 31. SWAMP monitoring sites, beneficial uses, and known and potential problems in the Coachella Valley area.

Site Name (station code)	**Beneficial Uses[2]**	**Known Problem**	**Potential Problem**
CVSC Outlet[1](719CVSCOT)	FRSH REC I	Bacteria	Pesticides Nutrients

Site Name (station code)	Beneficial Uses[2]	Known Problem	Potential Problem
	REC II WARM WILD RARE		
CVSC @ Avenue 52 (719CVSC52)	Same as above	Same as above	Same as above

[1]These sites are included in the 13 strategic sampling sites identified in the SWAMP Work Plan.
[2]Definitions for beneficial uses are provided in the Basin Plan.

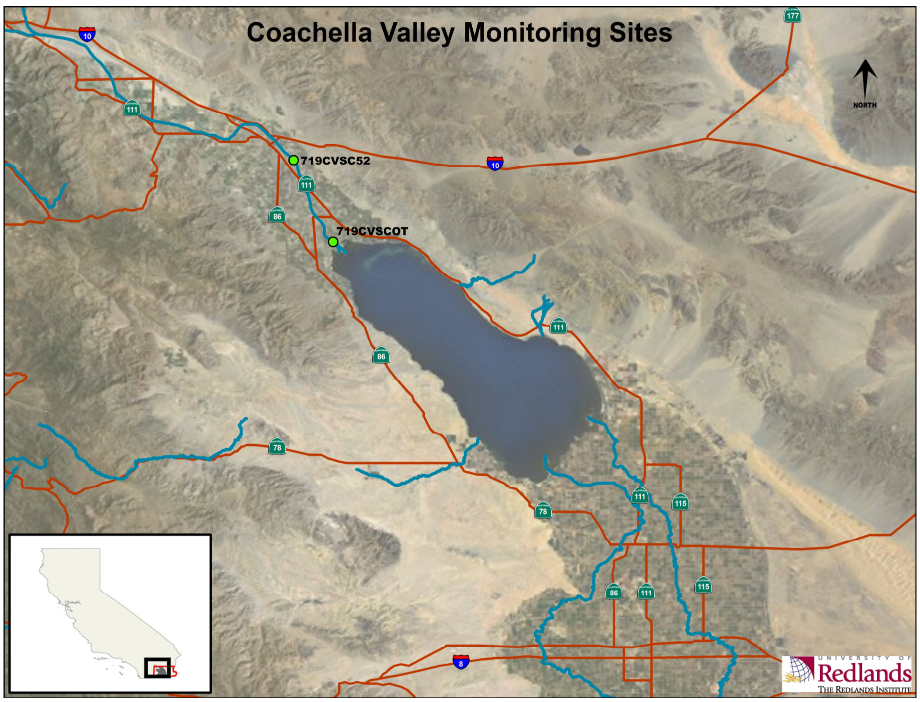

Figure 5. Monitoring sites in the Coachella Valley area.

Coachella Valley Stormwater Channel Monitoring Sites

Two sites were selected for monitoring through SWAMP. One monitoring site is located on the Coachella Valley Stormwater Channel at Avenue 52 (719 CVSC52), and the other location is on the Coachella Valley Stormwater Channel at the Outlet to the Salton Sea (719 CVSCOT).

3.5.1 Water Quality in the Coachella Valley

Results and Discussion

Water and sediment samples were collected from Coachella Valley Stormwater Channel at Avenue 52 (719 CVSC52), and from the Coachella Valley Stormwater Channel at the Outlet to the Salton Sea (719 CVSCOT). These samples were analyzed for conventional water quality information, metals, organics, and bacterial populations. In addition, water and sediment samples from these sites were subjected to toxicity testing. Note that after 2002 the Coachella Valley Stormwater Channel at Avenue 52 (719 CVSC52) site was dropped from sampling rotation when the total number of sites in the basin were reduced from 44 to 13.

Table 31 lists the total number of samples, the purpose of the sampling and the breakdown of the results by their 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 SWAMP QAMP.

Table 32. Sample counts and the breakdown of results for the Coachella area SWMAP sampling from fall 2002 to spring 2005.

Sample Type[1]	Count of Analyses	
	Sediment	Water
Toxicity Chemistry	1,102	2,107
Chemistry	557	336
Totals [2]	1,659	2,443
Analysis Result Data Qualifiers[5]	Count of Results	
	Sediment	Water
Above the Reporting Limit	298	350
Below the Detection Limit (ND)	1,271	2,052
Detected but Not Quantifiable (DNQ)	90	41
Totals [2]	1,659	2,443

[1] See section 2.7 for an explanation of the Sample Type. [2]Total number of samples collected equals the total number of sample results - the breakdown is of the Sample Type.[3] See Section 2.7 for descriptions of the Result Qualifiers.

Field Measurements in Water:

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

Field measurements were recorded at each sampling site as presented in Table 32. This data, along with the conventional constituents are used to describe the background water quality of a water body.

The field water quality measurements and conventional sampling results indicate that these waters are typical of the region. Like the Colorado River that is indirectly the source for this water, it is characterized as alkaline with a somewhat elevated level of total dissolved solids. The field water quality measurements indicate that the channel at AVE 52 is somewhat depleted in oxygen however, measurements at the channel outlet show that the oxygen content increases as the water flows downstream toward the Salton Sea. Basin Plan criteria for dissolved oxygen set for the protection of WARM beneficial uses is greater than 5.0 ppm. Given the oxygen saturation and water temperature it is likely that the channel did not meet the dissolve oxygen standard at AVE 52 or at the outlet to the Salton Sea in 2002. Conductivity is somewhat elevated but may be due to the sewage plant discharges.

Table 33. Field water quality measurements in the Coachella Valley area.

Coachella Valley Stormwater Channel (Ave 52)

		Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005
Oxygen, Saturation	%	21.7	23.1					
pH		7.67	7.34					
Specific Conductivity	uS/cm	1722	1825					
Temperature	C	22.25	23.07					
Turbidity	NTU	5.8	6.9					

Coachella Valley Stormwater Channel Outlet

		Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005
Oxygen, Dissolved	ppm					6.15	4.47	7.96
Oxygen, Saturation	%	26.1	55.5	89.4	79.3	72.1	50	87.7
pH		7.78	7.67	7.46	7.62	7.28	7.17	7.26
Salinity	g/L			0.95	1.07	1.04	1.9	0.9
Specific Conductivity	uS/cm	2163	1914	1863	2015	2040	1545	1762
Temperature	C	21.11	20.04	19.83	19.67	23.23	23.92	19.53
Turbidity	NTU	11			33	59.5	27.5	50.1
Velocity	Ft/s				1.393	1.78		1

Conventional Constituents in Water

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

At the Storm Channels outlet to the Salton Sea, the nitrates (as nitrogen) concentration exceeded the drinking water standard of 10 ppm for all sampling periods ranging from range from 11.9 – 19.4 ppm. However, MUN is not an existing beneficial use and there are currently no nitrate criteria established to protect freshwater aquatic life uses.

Metals in Water:

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

The results from the analysis of metals in the water samples indicate that all metals are below the maximum concentrations as stated in the Basin Plan objectives.

Metals in Sediment

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

The results from the analysis of metals in the sediment samples indicate that all metals are below and meeting established sediment criteria.

Trace Organics in Water:

Organic Pesticides, PAHs, PCBs

A total of 2,107 individual trace organic analytes, representing 250 unique compounds were analyzed for in samples taken on the six sampling dates. None of the sample results exceeded the freshwater aquatic life protection criteria. However, in most cases, there are no established criteria to compare the reported values to. For the samples with reportable results, there were 21 unique compounds with *Toluene, Dacthal,* and PAHs being found in many of the samples. There are no spatial or temporal trends in the frequency of the occurrence of the constituents. No water samples collected at AVE 52 were tested for trace organics. Table 33 reports the breakdown of the results qualifier for the trace organics in water.

Table 34. Breakdown of result qualifiers on trace organics in water in the Coachella Valley area.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	39
Below the Detection Limit	2033
Analyte Detected but Not Quantifiable	35
Totals	2,107

Trace Organics in Sediment

Organic Pesticides, PAHs, and PCBs

Sediments were analyzed for organic pesticides, PAH and PCB content. Table 34 reports the breakdown of the 1,437 sediment trace organics that were analyzed. None of the reportable results exceeded established sediment criteria. For the samples with reportable results there were 31 unique compounds with PAHs being found in many of the samples, one sample had *Chlorpyrifos*.

Table 35. Breakdown of result qualifiers on trace organics in Coachella Valley Storm Channel sediments.

Analysis Result Data Qualifiers	Count of Results
Above the Reporting Limit	100
Below the Detection Limit	1,261
Analyte Detected but Not Quantifiable	76
Totals	1,437

Toxicity in Water and Sediment

Water and sediment samples were collected from the Stormwater Channel's outlet to the Salton Sea site and subjected to toxicity tests (Table 35). The 5/4/04 water results are from two samples and two duplications giving a total of 40 replications. One of the replications of the toxicity test reported 0% survival of test subject. The 10/5/04 water toxicity results had 20 replications with three reporting 0% survivals and the remaining were 100%. There are no apparent reasons for the 0% survival results, however the sample was considered to be significantly different from the negative control.

Toxicity identification evaluations (TIE) were performed by the Aquatic Toxicology Laboratory at UC Davis on samples taken from the Coachella Valley

Stormwater Channel (Werner, 2007). A sample taken from the Coachella Valley Stormwater Channel in October 2005 was highly toxic to fathead minnow larvae, and caused reduced fecundity in C. dubia. The cause of toxicity was determined to be ammonia. However the ammonia level did not exceed the established criteria that protects freshwater life uses.

Table 36. Toxicity in water and sediment at the Coachella Valley Storm Channel Outlet to the Salton Sea.

	Water		Sediment	
Date	Count	Result % Survival	Count	Result % Survival
9-May-02	10	100	8	99
3-Oct-02	10	100	8	63
15-Apr-03	10	100	8	93
4-May-04	40	98	16	78
5-Oct-04	20	85	16	97***
10-May-05	14	100		

***Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (SL; Both criteria met)

Bacteria Indicators

Bacteria samples were collected in 2002 and 2003. The sample results indicate that AVE 52 exceeded the REC I objective five times for *Enterococcus.* The AVE 52 samples also exceeded the REC II objective three times for *Enterococcus*. None of the sampled from the Coachella Valley Stormwater Channel did not exceed the objectives for either RECI or II.

4. Summary

This assessment reviewed the results of analysis on water and sediment samples were collected between spring 2002 and spring 2005 in the Colorado River Basin Region under the SWAMP. In the first year of sample collection 44 sites were monitored, and in the remaining years sampling was restricted to 13 strategic sites throughout the Basin.

Field measurements were collected for dissolved oxygen, pH, specific conductance, temperature, turbidity, and velocity. In the laboratory, samples were analyzed for conventional constituents, and 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 SWAMP QAMP. All results were entered into the SWAMP database. The percentage of all water samples with reportable results was approximately equal (17 to 18%) for the New River, Alamo River, and the Coachella watersheds. The Salton Sea and the Colorado River watershed had the lowest percentage of reportable results, and were approximately equal at 11 and 9.6% respectively.

Field measurements for oxygen saturation, pH, specific conductance, and turbidity were taken at all sampling locations. Based on the level of oxygen saturation and the water temperature, many locations in the New and Alamo River drainsheds and in the Salton Sea drains would not meet the WARM objective of 5.0 ppm dissolved oxygen, all other parameters were acceptable.

Over 37,000 analyses were completed on water samples representing 289 unique organic compounds, 56 inorganic compounds, and 5 bacterial indicators. Of these, 4,696 samples results had reportable levels of organic compounds and ten sample results, representing three constituents exceeded criteria for the CTR for Human Health protection when consuming water and organisms from freshwater systems. These constituents included *Dibenz(a,h)anthracene, Aldrin* and *Dieldrin* and were found in the Palo Verde Outfall Drain in the Lower Colorado watershed, the outlets of the Alamo and New Rivers to the Salton Sea and in the Salton Sea. The Alamo River and New River are currently listed on the 303(d) list as impaired by *Dieldrin*. None of the waters are listed on the 303(d) list as impaired by *Dibenz(a,h)anthracene* or *Aldrin* It should be noted that neither *Aldrin* nor *Dieldrin* exceeded the acute CTR CMC set for the protection of freshwater aquatic life uses.

Other organic compounds with reportable concentrations included *Atrazine, Chloroform, Chlorpyrifos, Dacthal*, p,p'-*DDE*, *Diazinon*, *Dibenz(a,h)anthracene, Napthalenes*, *PAHs*, *Toluene*, *Trifluralin*, *Xylene*. For many of these constituents there are no established or applicable criteria to compare the results against, to determine if they impair the use of water. Some effort should be made to develop objectives for constituents that have been detected but have no established criteria to evaluate their impact to a waters use.

Several results from water analysis had reportable concentrations of inorganic compounds. Quite a few water samples contained selenium at concentrations above established criteria. Basin plan selenium objectives were exceeded several times in samples collected from the New and Alamo Rivers. In addition, about one-third of the samples where selenium was measured contained concentrations above 5 ppb, a concentration that many wildlife biologists feel is unsafe for certain aquatic life uses. The New and Alamo Rivers, the Imperial Valley Drains, and a portion of Colorado River are currently on the 303(d) list for impairment by Selenium. Selenium should continue to be monitored at all monitoring stations.

Several samples from the Coachella Storm Channel and several drains into the Salton Sea exceeded the drinking water MCL for nitrate (as nitrogen) of 10 ppm. However, these locations are not designated for MUN beneficial use. A total of 12 samples, including two duplicates, contained nitrate concentrations that ranged from about 12 to just under 20 ppm.

One sample from the Coachella Valley Stormwater Channel exceeded the more stringent ammonia criteria that indicates that the use of this water as fish habitat may be impaired. Ammonia concentrations were also elevated for nearly all samples in a few locations on the New River downstream of the International Border station. With the exception of the border station most samples violated the less stringent criteria set to protect waters where non-juvenile fish are present. Samples from other monitoring locations stations had some ammonia concentrations that exceeded the less stringent criteria, but there was no general trend. No waters are currently on the 303(d) for impairment by ammonia

Analysis for bacterial indicators was completed on 511 samples taken from 36 locations. All sampling locations had at least one bacteria result that exceeded bacteria Basin Plan objectives that protect RECI and RECII uses. Samples fro the Colorado River and the interior of the Salton Sea had the lowest bacterial counts and samples from the New River at the Boundary site had the highest bacterial counts. The bacteria counts in the New River at the International Boundary had bacterial populations that were orders of magnitude greater than other locations. Given that discharges of minimally treated domestic wastewater into the New River occur in the Mexicali Valley, this was expected. The New River, Coachella Valley Stormwater Channel, and Palo Verde Lagoon, are currently on the 303(d) list for impairment by bacteria (pathogens).

20,000 analyses were completed on sediment samples, representing 191 unique organic compounds, 22 inorganic compounds, and toxicity. The percentage of all sediment samples taken that had reportable results was greatest for the New River (44%) and ranged between 18 to 23% for the other waters. Of the 20,000 analyses, 2,911 sediment results had reportable levels of organic compounds. These compounds included *Chlorpyrifos, Dacthal, Dieldrin, PAHs, and Trifluralin*. None of the samples with reportable concentrations exceed available sediment criteria.

Two sediment samples from the New River at the International Boundary station exceeded the zinc sediment criteria of 459 mg/kg that is set to protect aquatic life uses. In the fall of 2003, a sediment sample contained zinc at a concentration of 632 mg/kg. In the fall of 2004, another sediment samples contained zinc at a concentration of 721 mg/kg. The zinc concentration in other sediment samples collected from the same monitoring station ranged between 105 to 299 mg/kg. A potential source for this constituent is industrial waste originating from the Mexicali Valley, Mexico. No waters are currently on the 303(d) list for impairment by constituents in sediment.

Toxicity testing was completed on water samples taken from 25 sampling locations and sediment toxicity was completed on sediment samples taken from 18 sampling locations. Seventeen of the 25 locations that were tested for water toxicity were also tested for sediment toxicity at the same time. 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. No sediment or water samples, at this site, had results that were significantly different compared with the negative controls. Sediment and water samples collected from several monitoring stations in and near the New River exhibited high toxicity. In addition, the Alamo River at the outlet to the Salton Sea had several samples that were significantly different from the negative control.

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