San Diego River
Baseline Sediment Investigation

Final Report

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1.0 INTRODUCTION

The City of San Diego and the San Diego River Park Foundation, in cooperation with the U.S. Department of the Interior's Bureau of Reclamation, are working together to enhance the San Diego River Watershed by creating a river-long park and community facility along the San Diego River. One of the objectives of this enhancement project is to educate the public about local history along the San Diego River and the environment.

Sediment disturbance is likely to occur during restoration activities, increasing the importance of characterizing the current sediment quality and how conditions might affect future planning and permitting of the San Diego River restoration. Previous sediment quality and water quality monitoring has identified potential areas of concern within San Diego River. Several sites within the Watershed are already on either California's Clean Water Act Section 303(d) List of Water Quality Limited Segments or a State monitoring list.

Weston Solutions, Inc. (Weston) collected water quality and sediment samples at multiple locations along the mainstem of the San Diego River between June 28 and 29, 2005 (Figure 1-1). The monitoring area focused within an area previously sampled by the U.S. Department of Interior's Bureau of Reclamation in August 2004 and was intended to be confirmatory in nature, rather than a comprehensive sampling program to investigate the full magnitude and extent of potential contaminant concentrations within San Diego River sediment. Sediment samples were collected and analyzed for general chemistry, including grain size, total solids, total organic carbon, oil and grease, nutrients (ammonia-N, nitrate-N, nitrite-N, total kjeldahl nitrogen, and total phosphorus), and trace metals; as well as for semi-volatile organics, volatile organics and chlorinated pesticides. Water quality samples were collected and analyzed for dissolved oxygen, temperature, and conductivity in the field, and for ammonia-N, nitrate-N, nitrite-N, hardness, pH, and dissolved copper in the lab.

1.1 Background

The San Diego River Watershed (Watershed) is the second largest watershed lying entirely within San Diego County and is the most highly populated watershed within the County. The Watershed consists of approximately 277,500 acres and contains over a half-million people. It includes four hydrologic areas, Lower San Diego, San Vicente, El Capitan, and Boulder Creek which are all drained by the San Diego River. The San Diego River discharges into the Pacific Ocean.

Nearly three quarters of the Watershed is unincorporated, which is the second largest percentage of unincorporated land of any watershed in San Diego County. Incorporated areas of the Watershed include the communities of El Cajon, La Mesa, Poway, San Diego, and Santee. Land use within the Watershed is primarily vacant or undeveloped. Other major uses are residential, park land, and open space. There are over 162,000 acres of vacant or undeveloped land in the Watershed, over one third of which is planned to be developed for residential use in the future. Half of the Watershed is privately owned. The remaining portions are mostly owned by the Federal government, with a small percentage of land being state or locally-owned. The Watershed provides many beneficial uses with its reservoirs, lakes, rivers, and creeks.

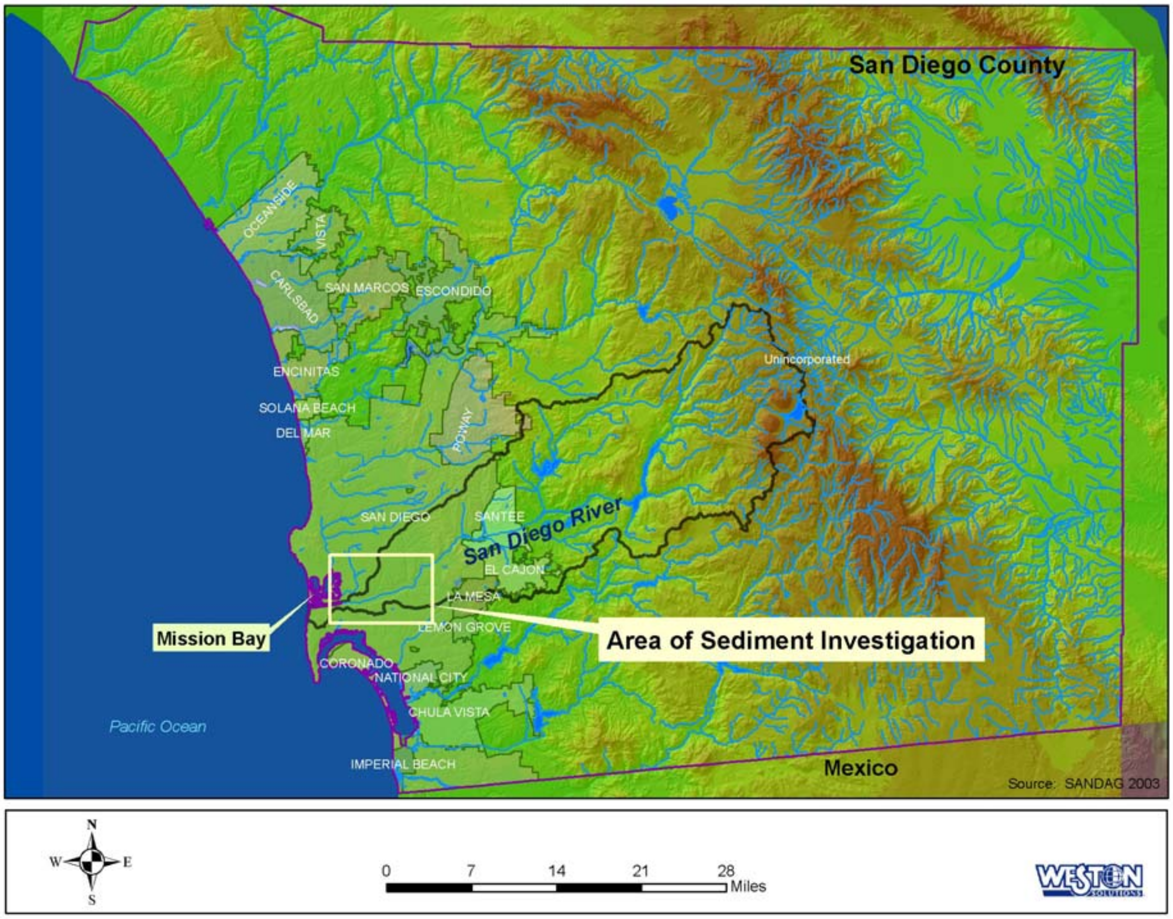

Figure 1-1. San Diego River Watershed Vicinity Map

1.2 Previous Investigations

1.2.1 San Diego River Watershed Characteristics Inventory Report, July 2003

The San Diego River Watershed Workgroup released the San Diego River Watershed Characteristics Inventory Report in July 2003. This report summarized the Watershed's surface and groundwater hydrology, soils, habitat and biology, land uses, and physical and political boundaries.

The Characteristics Inventory Report reviewed water bodies within the Watershed found on either California's Clean Water Act Section 303(d) List of Water Quality Limited Segments or the State's less-formal Monitoring List, along with the water bodies' associated pollutants/stressors. Three water bodies in the San Diego River Watershed were 303(d) listed for such pollutants/stressors as eutrophic conditions, fecal coliform, pH, total dissolved solids, bacterial indicators, low dissolved oxygen and phosphorus. Eleven water bodies within the Watershed were on the monitoring list; four of which had associated pollutants/stressors of volatile organic compounds, semi-volatiles, or pesticides such as chlordane, DDT, and dieldrin.

1.2.2 Staff Report: Revision of the Clean Water Act Section 303(d) List of Water Quality Limited Segments, September 2005 DRAFT

This draft report presents recommendations for additions, deletions, and changes to the 2002 California section 303(d) list. No changes are suggested for the San Diego River constituent list.

1.2.3 San Diego River Restoration Project, Baseline Monitoring, August 2004

The U.S. Department of the Interior's Bureau of Reclamation (Bureau) completed a wide-ranging baseline monitoring program of the San Diego River (River) in August 2004. Baseline monitoring data collection included water, sediment, macro-invertebrate, butterfly, and taxonomic identification for *Ludwigia* (water primrose) biocontrol.

Data collection for the baseline monitoring program was informed by previous research, including the San Diego River Watershed Characteristics Inventory Report which, as described in Section 1.2.1, listed parts of the Watershed on a State monitoring list for volatile and semi-volatile organic compounds and pesticides.

The Bureau collected ten sediment samples in the San Diego River which were analyzed for semi-volatile organics and pesticides. Sediment data results for semi-volatile organics exceeded the U.S. Environmental Protection Agency, Region 9 (Region 9), Preliminary Remediation Goals (PRGs) at the Estuary site. Additionally, phthalates and several different pesticides were found at values below the PRGs in the sediments from Mission Trails Park to the estuary. The Bureau also found a suspect ratio of dichlorodiphenyltrichloroethane (DDT) to dichlorodiphenyl-dichloroethylene (DDE) at the Qualcomm Stadium site.

The Bureau also collected water quality samples which were analyzed for pH, oxidation/reduction potential, nitrate, temperature, dissolved oxygen, and conductivity. These water quality results revealed low dissolved oxygen at three stations and low pH at one station.

1.2.4 San Diego River Baseline Sediment Investigation Data Review, May 2005

The City of San Diego contracted Weston Solutions, Inc. to perform a San Diego River Baseline Sediment Investigation Data Review (Data Review), which was completed in May 2005. The Data Review examined known and potential contaminant sources that may impact sediment quality within the Lower San Diego River, as well as historical water quality, sediment quality, and toxicity data. Baseline monitoring data collected by the U.S. Bureau of Reclamation, described in Section 1.2.2, was included in the data review, although different standards were used to examine the Bureau's data.

National Oceanic and Atmospheric Administration (NOAA) Threshold Effect Levels (TELs) and Probable Effect Levels (PELs) were used to re-evaluate the sediment sample results reported by the Bureau. The Bureau had used U.S. Environmental Protection Agency, Region 9's Preliminary Remediation Goals (PRGs) as the sediment quality objective. Although no current regulatory guidelines are available for freshwater sediment analysis, the determination to use NOAA screening levels instead of PRGs was aided by the Users Guide and Background Technical Document for Region 9's PRG Table.

PRGs were designed to evaluate soil, water and air at residential and industrial CERCLA and RCRA sites and do not consider impact to groundwater or address ecological concerns (USEPA 2004 rev.). The NOAA Sediment Screening Table TELs and PELs are doses or exposure concentrations based on benthic invertebrate community characteristics and toxicity tests in freshwater sediments. The lower value, or TEL, represents the concentration below which significant adverse biological effects are expected to rarely occur. The upper value, or PEL, defines the level above which adverse effects are expected to occur frequently.

To determine constituents of potential concern (COPCs) for the previously sampled San Diego River sediments, the detected sediment concentrations from the Bureau's 2004 baseline monitoring data set were compared against the NOAA screening level tables. Two pesticides exceeded their respective TELs, however, because the exceedances were well below the PEL screening levels, they were not expected to pose any ecologically significant risk to receptors in the San Diego River. Six semi-volatile organic compounds, all polycyclic aromatic hydrocarbons (PAHs), exceeded their NOAA PELs.

Historical water quality data, fish tissue data, and sediment data were also reviewed and assessed relative to historic land uses and potential contaminant sources that may impact water quality in the San Diego River.

Historical water quality data from 1993 to 2004 was reviewed from two sources, the San Diego County municipal National Pollutant Discharge Elimination System (NPDES) monitoring program and the Padre Dam monitoring program. These data showed no semi-volatile or chlorinated pesticides in any water samples, although some water quality criteria were exceeded for such general parameters as chemical oxygen demand (three sites with five exceedances) and biological oxygen demand (two sites with four exceedances). The Bureau's general water quality results revealed low dissolved oxygen at three stations and low pH at one station.

Historical fish tissue data was available from Padre Dam from 2000 through 2004. Samples were analyzed for trace metals, semi-volatiles and pesticides. Pesticides and semi-volatile were not measured above the method detection limit, with one exception; the chlorinated pesticide 4,4-DDE was reported to have a value of 11.1 µg/kg in 2001.

Data from two historical San Diego River sediment samples, collected in 1999, were available on EPA's STORET website. Although limited, the dataset offered a good comparison to a Bureau of Reclamation sample that was located in the same general vicinity (Estuary sampling location). The historical data shared similar benchmark exceedances with the 2004 Bureau sample. Chrysene was the only constituent to exceed the NOAA PEL benchmarks in both historical samples. Fluoranthene and pyrene were also detected in both samples and exceeded their respective NOAA PELs. Eldrin exceeded the NOAA PEL screening level in the 1999 data but not in any of the Bureau of Reclamation samples. Levels of DDT and DDE were not detected in the August 1999 samples.

2.0 MATERIALS AND METHODS

2.1 Field Collection Program for Sediment Core Samples

The following sections detail the methodology used for collecting sediment and water quality samples during this investigation study. Sediment and water quality sampling was conducted June 28-29, 2005. The weather was mild and sampling was conducted primarily under sunny skies with little to no wind.

2.1.1 Sampling Locations

Push core sediment sampling was conducted at ten sampling locations along the mainstem of the San Diego River (Table 2-1, Figure 2-1). Planned sediment sample locations were based on qualitative descriptions provided in the Bureau's summary letter of sampling efforts conducted in August, 2004. To spatially characterize sediment quality, downstream (D) and upstream (U) transects relative to the Bureau's sampling locations were added as part of this investigation. At each transect location, push core sediment samples were collected from three stations, river right, river center and river left (facing downstream).

Water quality sample locations were collected at the same stations as the sediment quality sample stations at each of the central transects at EST, FV, QC and at KSR, ABGC and MTP. One additional station, Jackson Street (JS), was sampled for water quality but not for sediment quality. Field measurements for water quality were taken from three stations along each transect, river right, river center and river left (facing downstream). Water quality samples for laboratory analysis were only collected at the river center station.

Table 2-1. Sample Locations

Site	Acronym
Estuary Downstream	EST-D
Estuary (below I-5 bridge)	EST
Estuary Upstream	EST-U
Fashion Valley Downstream	FV-D
Fashion Valley	FV
Fashion Valley Upstream	FV-U
Qualcomm Stadium Downstream	QC-D
Qualcomm Stadium	QC
Qualcomm Stadium Upstream	QC-U
Kaiser Pond Site	KSR
Admiral Baker Golf Course	ABGC
Mission Trials Park	MTP
Jackson Street (water quality only)	JS

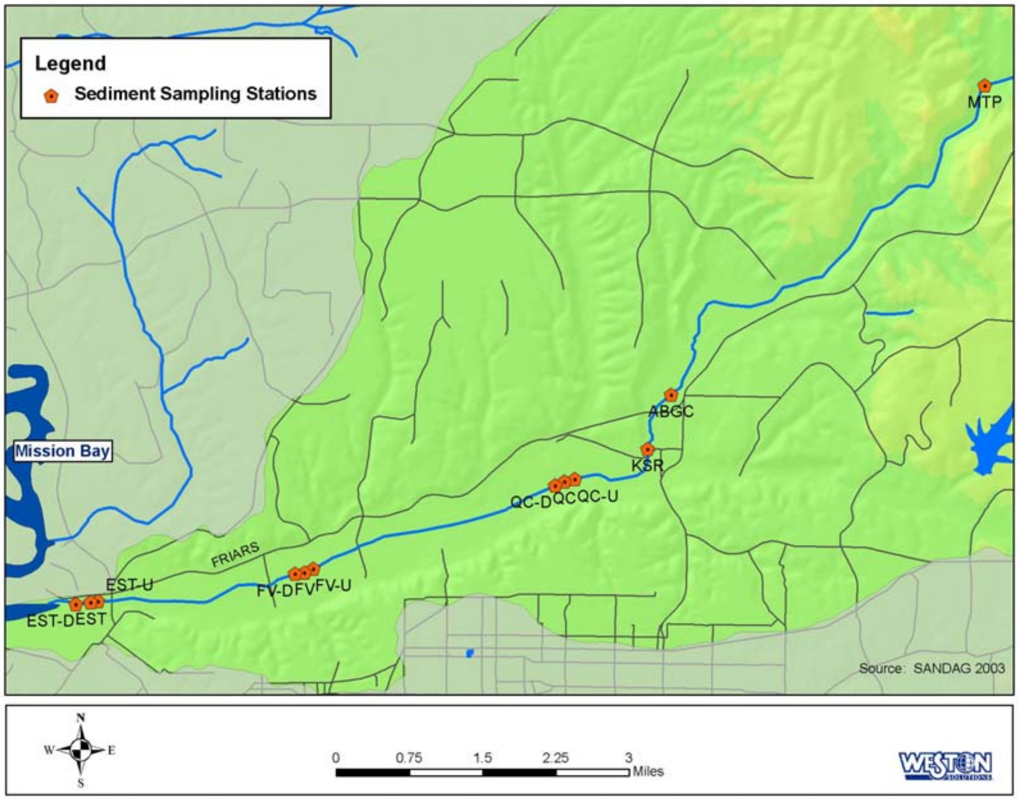

Figure 2-1. San Diego River Sediment Sampling Locations, June 28-29, 2005

2.1.2 Sample Collection Equipment

Sediment samples were collected with a piston core equipped with a 3” LEXAN® barrel. Sediments were collected manually from either a small boat or, from shallower channels, by wading. When collected from a boat, a stainless steel slide hammer was used to push the barrel into the sediment. The sampling vessel used was a rigid inflatable boat equipped with floor boards. When the field technician waded into the channel, the barrel was physically pushed into the sediment by hand. Figure 2-2 illustrates the latter sediment sampling method.

Figure 2-2. Collecting sediment samples by wading into the channel and manually pushing the core into the sediment.

An Horiba U-10 water quality instrument was used to take field measurements of water quality parameters (dissolved oxygen [DO], temperature, and conductivity) at each station. The instrument can resolve DO to 0.01 mg/L, temperature to 0.1 °C and conductivity to 0.01 µS/cm. Water quality samples were collected in one-liter plastic bottles, either by hand or with a telescoping sampling pole.

2.1.3 Navigation

During sediment sampling, a Wide Area Augmentation System (WAAS) enabled Garmin 76 Global Positioning System (GPS) was used to document the geographic coordinates of the sampling location. The Garmin 76 GPS is capable receiving an accuracy of less than 3 meters when receiving WAAS corrections. WAAS corrects for GPS signal errors caused by atmospheric conditions, time and satellite orbit errors, and WAAS enabled GPS receivers utilize one of 25 reference stations as well as a master station (of which there is one located on each coast) to receive GPS correction algorithms in the field. All final field locations were recorded in the field using positions from the Garmin 76 GPS.

2.1.4 Sediment and Surface Water Collection

2.1.4.1 Sediment and Water Quality Sample Handling

Three sediment samples were collected at each sample location, one from the center of the channel and one from each river bank. The target core penetration depth (15 cm) was successfully achieved for all samples. The top 5 cm of sediment from each of the three stations (river right, river center and river left) were combined and thoroughly homogenized to a uniform consistency in the field using a stainless steel mixing bowl and mixing spoon (Figure 2-3). This composite was then delivered to the analytical laboratory for analysis.

Figure 2-3. Composite being mixed in the field.

Water quality samples were collected into one-liter plastic bottles at most sample stations. These samples were taken from the center channel and both banks of the river. Each sample of the three samples were analyzed in the field, however, only the center sample was kept for lab analysis.

2.1.4.2 Sample Description

A qualified scientist evaluated sediment cores according to the Unified Soil Classification System (USCS) and recorded the results on site-specific sediment quality data log forms. The geologic description of each core included the odor, color, consistency, and approximate grain size distribution of the sediment.

Water quality samples were evaluated in the field for odor, color, floating materials, appearance of oil and grease, and turbidity. Observations were documented on site-specific water quality field data log forms.

2.1.5 Sample Processing and Transport

The composites sediment samples were placed in clean polyethylene bags, double bagged, labeled, logged onto a field chain of custody (COC) form, and placed into polystyrene coolers.

Water quality samples were collected into clean, plastic, one liter bottles, logged onto COC forms, and placed in coolers. All samples remained on ice and in the dark until delivered to CRG Laboratories.

2.1.6 Documentation and Chain-of-Custody

Samples were considered to be in custody if they were (1) in the custodian's possession or view, or (2) retained in a secured place (under lock) with restricted access. The principal documents used to identify samples and to document possession were chain-of-custody (COC) records, field logbooks, and field tracking forms. Chain-of-custody procedures were used for all samples throughout the collection, transport, and analytical process, as well as for all data and data documentation, whether in hard copy or electronic format. Copies of all COC forms are located in Appendix A.

2.1.7 Decontamination of Field and Laboratory Equipment

All push core and water quality sampling equipment was cleaned prior to sampling event. All sampling equipment was cleaned with Alconox between sample stations and tripled rinsed with sample site water prior to core operations. Before creating each composite, all stainless steel utensils (stainless steel bowls and mixing apparatus) were cleaned and triple rinsed.

2.2 Physical and Chemical Analysis

2.2.1 Physical Analyses

Physical analyses performed on the sediment samples included the grain size distribution of the sediment (e.g. gravel, sand, silt, and clay) using the sieve-pipette method (Plumb 1981). The frequency distribution of the size ranges (reported in microns [µm]) of the sediment samples is reported in the data report. Percent solids were analyzed using EPA Method 160.3.

2.2.2 Chemical Analysis

Chemistry analyses performed on the sediment samples included total solids, total organic carbon, oil and grease, nutrients (ammonia-N, nitrate-N, nitrite-N, total Kjeldahl nitrogen, and total phosphorus), and trace metals; as well as for semi-volatile organics, volatile organics and chlorinated pesticides. Table 2-2 summarizes the standardized methods used to analyze sediments.

Table 2-2. Sediment Chemistry Methods.

Constituent	Method
Acid Extractable Compounds	EPA 8270C
Base/Neutral Extractable Compounds	EPA 8270C
Chlorinated Pesticides	EPA 8270C
Nutrients	SM 4500
Total Kjeldahl Nitrogen	EPA 351.3M
Oil & Grease	EPA 1664A
PCBs - Aroclor and Congeners	EPA 8270C
Polynuclear Aromatic Hydrocarbons	EPA 8270C
Trace Metals	EPA 6020
Mercury	EPA 245.7
Volatile Organic Compounds	EPA 8260B

Water quality samples were collected and analyzed for dissolved oxygen, temperature, and conductivity in the field, and for ammonia-N, nitrate-N, nitrite-N, hardness, pH, and dissolved copper in the lab. Table 2-3 summarizes the standardized laboratory methods used to analyze water quality.

Table 2-3. Water Quality Chemistry Methods.

Constituent	Method
Copper	EPA 200.8
Ammonia-N	SM 4500
Nitrate-N	EPA 300
Nitrite-N	EPA 300
pH	EPA 150.1
Hardness	SM 2340 B

2.3 Quality Assurance Procedures

Weston's quality control (QC) staff performs periodic audits to ensure that test conditions, data collection, and test procedures are conducted in accordance with Weston Solutions' standard operating procedures (SOPs). Weston Solutions' SOPs have been audited and approved by an independent USEPA-approved laboratory and placed in the quality assurance (QA) file as well as laboratory files.

2.3.1 Field Collection and Sample Handling

All relevant project and sample information and field measurements were recorded on water-proof data log forms which were customized to the media being sampled. A daily field log was maintained, and formal chain-of-custody procedures were followed and documented. All sampling equipment was cleaned with Alconox between sample stations and tripled rinsed with sample site water prior to core operations. Samples were double-bagged, labeled, and kept on ice until delivered to CRG Laboratories.

2.3.2 Chemical and Physical Characteristics of Sediments

Chemical analyses were performed using QC criteria specified in *Methods for Chemical Analysis of Water and Wastes* (USEPA 1983) and *Test Methods for Evaluating Solid Waste (SW-846)* (USEPA 1986), in California state-certified laboratories. Grain size analyses performed by Weston Solutions were consistent with internal QC criteria. Performance was evaluated via the use of standard reference materials or laboratory controls samples, method blanks, surrogates, spiked samples, duplicate samples, and internal QC samples. Precision and accuracy objectives were established for MRLs, spike recoveries, and duplicate analysis.

3.0 RESULTS

3.1 Sample Collection and Handling

Field coordinates of San Diego River sediment and water quality samples, sample channel positions, sediment sample depths, and the water depths (relative to the sediment surface), are summarized in Table 3-1. Photographs of the sediment sampling events can be found in Appendix B. Sediment quality field data logs are provided in Appendix C.

Water quality sampling did not occur at every sediment collection site. Sites where water quality samples were collected are noted in the "Sampling Type" column. Water quality field data logs are provided in Appendix D.

3.2 Analytical Results

3.2.1 Physical Characteristics of Sediment

All San Diego River sediments sampled were analyzed for grain size. All of the sediment samples were typically classified as silty sand, with trace amounts of clay. None of the sediment samples contained gravel particles. Grain size distributions at each site are depicted graphically in Figure 3-1.

Table 3-1. Sediment Sample Field Coordinates, Sampling Method, Sample Depths, and Water Depths at Push Core Sample Locations.

Site ID	Composite ID	Latitude (NAV84)	Longitude (NAV84)	Sample Type	Channel Position	Sample Depth (cm)	Water Depth (cm)
Estuary	EST-D	32 45.693	117 12.146	Sediment	River Left	15	192
					River Center	15	189
					River Right	15	133
	EST	32 45.692	117 12.136	Sediment and Water	River Left	15	143
					River Center	15	151
					River Right	15	124
	EST-U	32 48.645	117 12.112	Sediment	River Left	15	146
					River Center	15	133
					River Right	15	132
Fashion Valley	FV-D	32 45.978	117 09.88	Sediment	River Left	15	35
					River Center	15	36
					River Right	15	32
	FV	32 45.977	117 09.868	Sediment and Water	River Left	15	65
					River Center	15	85
					River Right	15	82
	FV-U	32 45.975	117 09.840	Sediment	River Left	15	45
					River Center	15	48
					River Right	15	42
Qualcomm Stadium	QC-D	32 46.788	117 07.136	Sediment	River Left	15	28
					River Center	15	40
					River Right	15	32
	QC	32 46.784	117 07.125	Sediment and Water	River Left	15	21
					River Center	15	19
					River Right	15	20
	QC -U	32 46.794	117 07.106	Sediment	River Left	15	23
					River Center	15	27
					River Right	15	21
Kaiser Pond Site	KSR	32 47.100	117 06.234	Sediment and Water	River Left	15	173
					River Center	15	161
					River Right	15	122
Admiral Baker Golf Course	ABGC	32 47.585	117 05.988	Sediment and Water	River Left	15	62
					River Center	15	78
					River Right	15	67
Mission Trails Park	MTP	32 50.353	117 02.703	Sediment and Water	River Left	15	37
					River Center	15	32
					River Right	15	32
Jackson Street	JS	32 49.268	117 03.729	Water	River Left	NA	NA
					River Center	NA	NA
					River Right	NA	NA

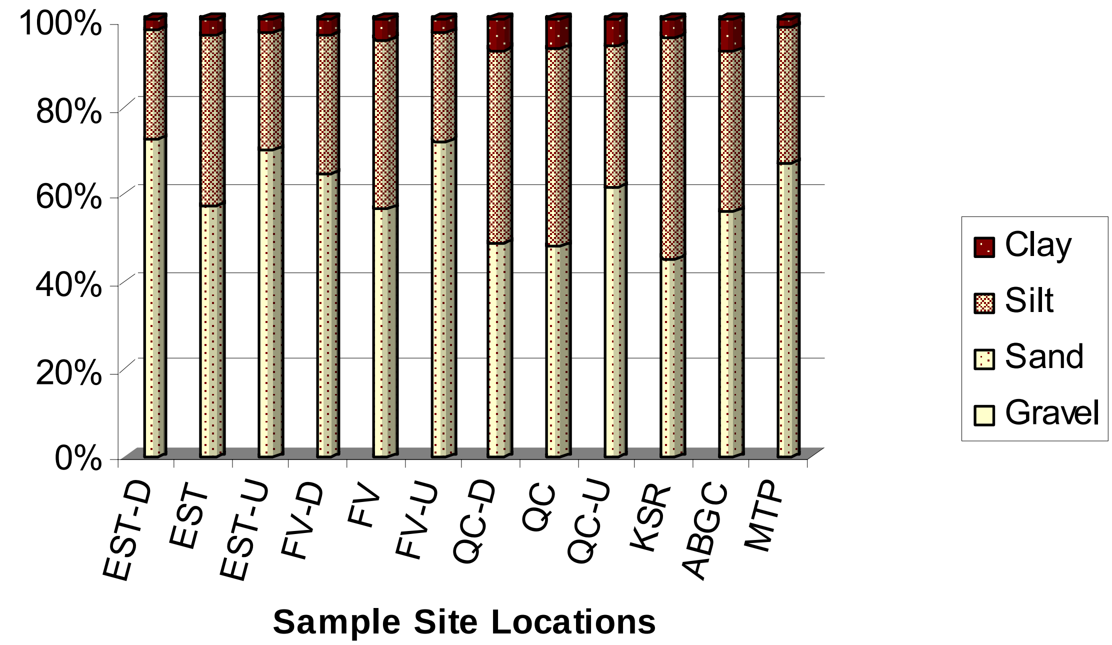

Figure 3-1. Grain Size Distribution of San Diego River Sediments.

3.2.2 Chemical Characteristics of Sediment

National Oceanic and Atmospheric Administration (NOAA) Threshold Effect Levels (TELs) and Probable Effect Levels (PELs) were used to evaluate the chemical characteristics of the sediment sample results. TELs and PELs are doses or exposure concentrations based on benthic invertebrate community characteristics and toxicity tests in freshwater sediments. The lower value, or TEL, represents the concentration below which significant adverse biological effects are expected to rarely occur. The upper value, or PEL, defines the level above which adverse effects are expected to frequently.

Chemical concentrations that exceed the TEL do not necessarily predict toxicity, however, for concentrations that are below the TEL, it ensures with a high degree of confidence that the constituent poses no potential threats. Chemical concentrations that exceed PELs identify compounds that do pose potential threats and that should be further evaluated as constituents of potential concern, or COPCs.

Results of physical and chemical analyses for San Diego River sediments are discussed below. All results are expressed in dry weight unless otherwise indicated. Results for each analyte that currently has NOAA effect level guidelines are presented in Table 3-2 and Figure 3-2. In Figure 3-2, each segment of the pie symbol represents a group of analytes, with the scale determined by the magnitude of at least one individual constituent within a group.

Table 3-2. Comparison of SD River Sediment Sample Results with Published NOAA TELs and PELs for Freshwater Sediments.

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
Trace Metals (µg/dry g)															
Arsenic	0.025	5.9	17	4.97	1.3	1.61	3.81	5.57	2.11	5	5.01	3.91	11.7	5.3	2.43
Cadmium	0.025	0.596	3.53	1.49	0.07	0.06	0.16	0.17	0.07	0.45	0.42	0.19	0.93	0.12	0.07
Chromium	0.025	37.3	90	4.24	3.6	4.34	13.5	6.22	3.27	14.8	16.1	13.4	29.2	16.1	2.12
Copper	0.025	35.7	197	5.73	3.03	4.26	8.15	8.57	6.78	18.1	19.9	10.9	41.2	10.2	4.23
Lead	0.025	35	91.3	55	5.42	4.35	14.4	14	6.31	59.6	51.1	28.9	61.4	10.2	5.4
Mercury	1E-05	0.174	0.486	0.011	0.016	0.005	0.013	0.013	0.004	0.083	0.080	0.024	0.081	0.020	0.005
Nickel	0.025	18	35.9	2.37	2.07	1.72	3.26	3.84	1.61	7.67	7.47	5.28	14.9	6.14	1.58
Zinc	0.025	123	315	233	18.6	17.2	53.1	69.2	30.3	112	102	42.8	187	33.4	15.3
Chlorinated Pesticides (ng/dry g)															
2,4'-DDD	1	3.54	8.51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4'-DDE	1	1.42	6.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	1	3.54	8.51	ND	ND	ND	ND	ND	ND	1.7	3.2	ND	ND	ND	ND
4,4'-DDE	1	1.42	6.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Detectable DDTs	-	6.98	4450	0	0	0	0	0	0	1.7	3.2	0	0	0	0
BHC-gamma	1	0.94	1.38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-alpha	1	4.5*	8.9*	ND	ND	ND	ND	ND	ND	8.4	8.5	4.7	ND	ND	ND
Chlordane-gamma	1	4.5*	8.9*	ND	ND	ND	ND	ND	ND	7.2	6.2	5.6	ND	ND	ND
Dieldrin	1	2.85	6.67	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB Congeners (ng/dry g)															
Total Detectable PCBs	-	34.1	277	0	0	0	0	0	0	0	0	0	0	0	0
Polynuclear Aromatic Hydrocarbons (ng/dry g)															
Benz[a]anthracene	1	31.7	385	4.5J	4J	ND	6.8	7	1.2	93	88.3	46	13.3	2.9	1.3
Benzo[a]pyrene	1	31.9	782	4.4	6.7	1.4	12.6	14.1	4.5J	178	158	71.4	20.7	5.6	2.9
Chrysene	1	57.1	862	36.5	4.9	2J	19.2	19	4.6	180	155	60.6	24.2	10.9	3.4
Fluoranthene	1	111	2355	4.5J	23.4	4.2	18	21.8	4.8	225	211	87.5	35.3	9	5.1
Phenanthrene	1	41.9	515	1.4	3.7	2.9	7.9	9.4	3.3	85.5	75.6	28	14.8	3.2	4.7
Pyrene	1	53	875	5.6	20.6	5J	21.3	25.7	7.3	261	247	105	36.5	10.9	6.9

* TEL/PEL for Total Chlordane

J Denotes estimated concentration above MDL but below RL

Bold ≥ TEL (Threshold Effect Level)

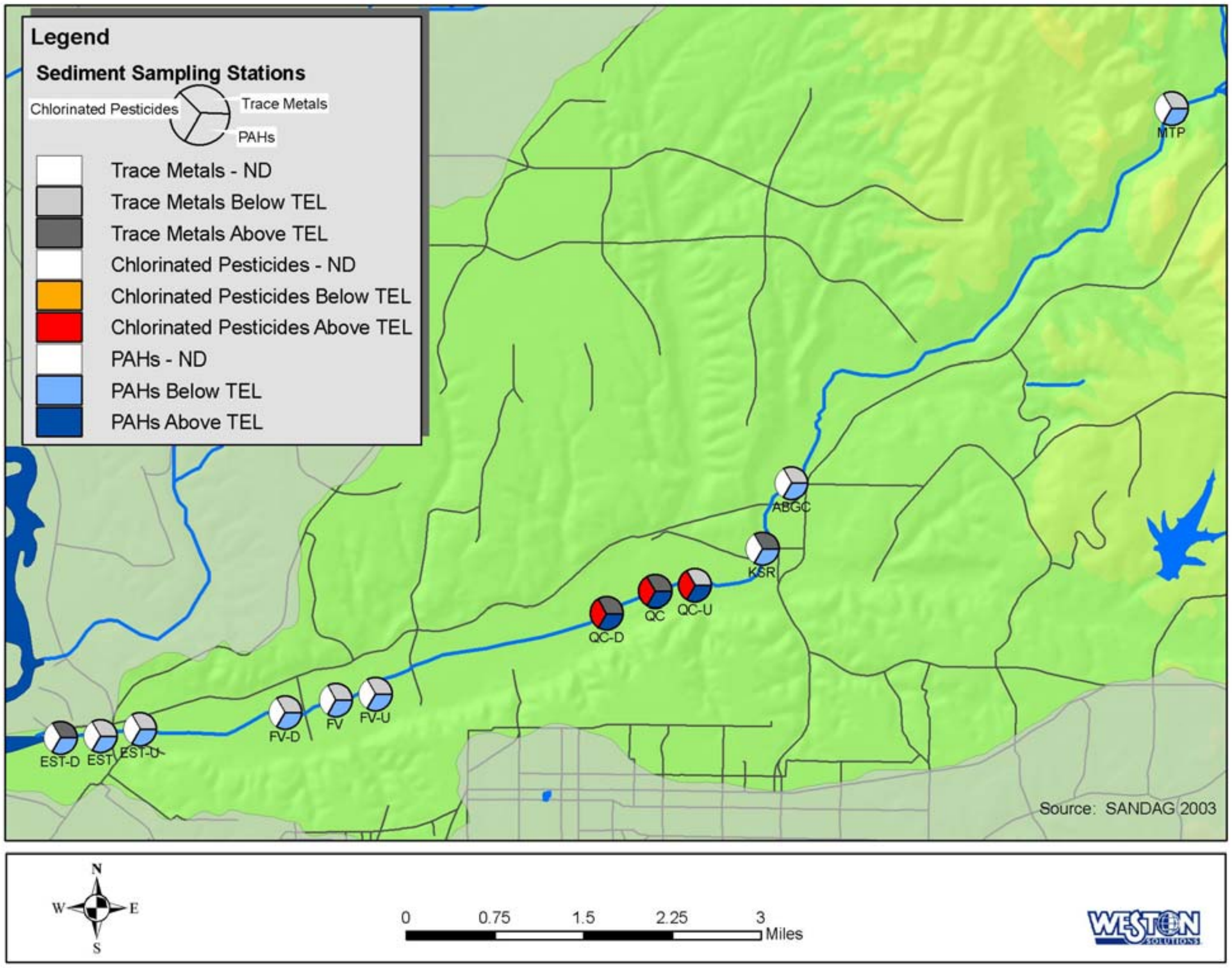

Figure 3-2. San Diego River Sediment Sampling Results Compared to TELs/PELs for Metals, Pesticides and PAHs, June 28-29, 2005

Results for all analytes, whether a NOAA effect levels exists for that constituent or not, are found in Table 3-3. In both Tables 3-2 and 3-3, results above the TELs are reported in bolded text. No results exceeded PELs. Any detection results between the method detection limit (MDL) and reporting limit (RL) are reported in the table as “J”, or estimated values. An estimated or "J" value means the compound is definitely present; although the concentration may be slightly higher or lower than reported. The original chemistry data can be found in its entirety as Appendix E.

Table 3-3. Physical/Chemical Analysis of San Diego River Push Core Sediment Samples Including a Comparison to Published NOAA TELs and PELs for Freshwater Sediments.

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
Particle Size (%)															
Gravel	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sand	-	-	-	71.8	56.4	69.0	63.6	55.5	71.4	47.2	46.5	60.0	44.6	54.4	66.4
Silt	-	-	-	24.8	38.1	26.8	31.5	38.0	24.2	42.7	43.7	31.5	49.8	35.2	30.6
Clay	-	-	-	2.3	3.5	2.8	3.2	4.3	3.0	6.6	6.4	5.8	3.7	6.9	1.8
Percent Solids	0.1	-	-	74.7	82.8	76.8	63.4	64.8	78.7	64.7	63.1	72	74.5	72.5	79.6
General Chemistry															
Ammonia-N (mg/L)	0.01	-	-	1.62	1.75	1.1	8.12	6.62	1.75	ND	0.25	0.25	9.0	0.87	33.0
Nitrate-N (mg/L)	0.01	-	-	ND	0.1	0.27	0.41	0.21	0.25	ND	ND	ND	ND	ND	10.7
Nitrite-N (mg/L)	0.01	-	-	ND	0.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.18
Total Kjeldahl Nitrogen (mg/kg)	7.6	-	-	ND	ND	ND	420	620	390	600	730	360	1500	210	200
Oil & Grease (mg/dry kg)	2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Phosphorus (mg/kg)	0.016	-	-	3.86	0.643	1.95	0.594	0.643	0.742	0.313	0.396	0.544	3.5	0.214	9.16
Total Organic Carbron (%)	0.01			0.03	0.08	0.03	0.65	0.98	0.51	1.46	1.54	0.35	5.54	0.31	0.18
Trace Metals (µg/dry g)															
Aluminum	1	-	-	3020	4470	3440	7760	6380	2710	13000	14000	11700	35900	11800	4820
Antimony	0.025	-	-	0.84	ND	ND	0.37	0.47	0.19	0.37	0.46	0.13	0.87	0.25	ND
Arsenic	0.025	5.9	17	4.97	1.3	1.61	3.81	5.57	2.11	5	5.01	3.91	11.7	5.3	2.43
Barium	0.025	-	-	22	22.7	21.7	92.5	113	82.5	117	127	116	255	87.2	44.1
Beryllium	0.025	-	-	0.05J	0.07	0.05J	0.19	0.17	0.07	0.26	0.27	0.19	0.64	0.26	0.09
Cadmium	0.025	0.596	3.53	1.49	0.07	0.06	0.16	0.17	0.07	0.45	0.42	0.19	0.93	0.12	0.07
Chromium	0.025	37.3	90	4.24	3.6	4.34	13.5	6.22	3.27	14.8	16.1	13.4	29.2	16.1	2.12
Cobalt	0.025	-	-	1.76	2.1	1.55	2.17	2.84	1.72	4.62	4.75	4.62	12.4	4.46	2.18
Copper	0.025	35.7	197	5.73	3.03	4.26	8.15	8.57	6.78	18.1	19.9	10.9	41.2	10.2	4.23
Iron	1	-	-	14300	6110	4710	8850	8400	5310	13900	15700	14800	35900	15300	10000
Lead	0.025	35	91.3	55	5.42	4.35	14.4	14	6.31	59.6	51.1	28.9	61.4	10.2	5.4
Manganese	0.025	-	-	140	130	124	1840	2630	982	292	379	319	923	256	258
Mercury	0.00001	0.174	0.486	0.011	0.016	0.005	0.013	0.013	0.004	0.083	0.080	0.024	0.081	0.020	0.005
Molybdenum	0.025	-	-	0.35	0.13	0.12	0.61	0.8	0.97	0.93	0.94	0.47	1.77	0.48	0.23
Nickel	0.025	18	35.9	2.37	2.07	1.72	3.26	3.84	1.61	7.67	7.47	5.28	14.9	6.14	1.58

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
Selenium	0.025	-	-	ND	ND	ND	ND	ND	ND	ND	ND	0.39	ND	1.14	ND
Silver	0.025	-	-	ND	ND	ND	0.2	0.36	ND	ND	0.08	ND	0.43	ND	ND
Strontium	0.025	-	-	11.3	20.6	16	22.1	31	60.9	27.8	31.5	24.6	97	22.2	7.19
Thallium	0.025	-	-	ND	0.03J	ND	0.04J	0.04J	0.03J	0.12	0.12	0.12	0.32	0.13	0.05J
Tin	0.025	-	-	10.3	0.81	1.29	0.98	0.58	0.87	1.38	1.39	1.05	3.11	0.93	0.6
Titanium	0.025	-	-	203	253	223	370	372	268	787	882	876	1650	845	233
Vanadium	0.025	-	-	11.7	12.7	12.4	22.7	20.8	13	41.4	48.5	41.3	79.9	45.7	26.4
Zinc	0.025	123	315	233	18.6	17.2	53.1	69.2	30.3	112	102	42.8	187	33.4	15.3
Chlorinated Pesticides (ng/dry g)															
2,4'-DDD	1	3.54	8.51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4'-DDE	1	1.42	6.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4'-DDT	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	1	3.54	8.51	ND	ND	ND	ND	ND	ND	1.7	3.2	ND	ND	ND	ND
4,4'-DDE	1	1.42	6.75	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Detectable DDTs	.	6.98	4450	0	0	0	0	0	0	1.7	3.2	0	0	0	0
Aldrin	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BHC-alpha	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BHC-beta	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BHC-delta	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BHC-gamma	1	0.94	1.38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-alpha	1	4.5*	8.9*	ND	ND	ND	ND	ND	ND	8.4	8.5	4.7	ND	ND	ND
Chlordane-gamma	1	4.5*	8.9*	ND	ND	ND	ND	ND	ND	7.2	6.2	5.6	ND	ND	ND
Dieldrin	1	2.85	6.67	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan-I	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan-II	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
Mirex	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oxychlordane	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-Nonachlor	1	-	-	ND	ND	ND	ND	ND	ND	6.8	6	4.4	ND	ND	ND
Aroclor PCBs (ng/dry g)															
Aroclor 1016	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB Congeners (ng/dry g)															
PCB018	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB028	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB031	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB033	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB037	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB044	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB049	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB052	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB066	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB070	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB074	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB077	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB081	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB087	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB095	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB097	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB099	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB101	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB105	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB110	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
PCB114	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB118	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB119	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB123	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB126	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB128+167	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB138	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB141	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB149	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB151	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB153	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB156	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB157	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB158	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB168+132	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB169	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB170	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB177	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB180	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB183	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB187	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB189	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB194	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB200	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB201	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB206	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Detectable PCBs	-	34.1	277	0	0	0	0	0	0	0	0	0	0	0	0
Acid Extractable Compounds (ng/dry g)															
2,4,6-Trichlorophenol	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
2-Methyl-4,6-dinitrophenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	100	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base/Neutral Extractable Compounds (ng/dry g)															
1,2,4-Trichlorobenzene	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-dichlorobenzidine	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenylphenylether	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenylphenylether	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Azobenzene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzyl Phthalate	5	-	-	6.8	7.9	7J	11.8	18.3	7.4	76.4	88.3	13	21.2	6.7	9J
Di-n-butyl Phthalate	5	-	-	169	553	564	272	887	231	255	817	215	233	224	565
Di-n-octyl Phthalate	5	-	-	ND	ND	ND	8.3	7.3	ND	9.1	7.6	ND	16.6	ND	ND
Diethyl Phthalate	5	-	-	18.6	26.6	31.2	29.7	67.8	27.9	39	58.7	31.8	28.2	29.2	35.3
Dimethyl Phthalate	5	-	-	29.3	26.9	30.7	41.6	43	35.3	54	46.7	42.1	36.2	31.9	34.9
Hexachlorobenzene	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
bis(2-Chloroethoxy)methane	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroethyl)ether	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl)ether	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	5	-	-	314	68.4	83.9	460	343	155	495	539	671	339	229	83.8
Polynuclear Aromatic Hydrocarbons (ng/dry g)															
Acenaphthene	1	-	-	ND	ND	ND	ND	ND	ND	6.2	4.6	1.2	ND	ND	ND
Acenaphthylene	1	-	-	ND	ND	ND	1J	ND	ND	6.7	10.2	4.1	1.7	ND	ND
Anthracene	1	-	-	2.7	1.5J	ND	2.3	1.3	ND	16.6	15.8	6.9	3.1	1.1	ND
Benz[a]anthracene	1	31.7	385	4.5J	4J	ND	6.8	7	1.2	93	88.3	46	13.3	2.9	1.3
Benzo[a]pyrene	1	31.9	782	4.4	6.7	1.4	12.6	14.1	4.5J	178	158	71.4	20.7	5.6	2.9
Benzo[b]fluoranthene	1	-	-	3.7	5.2	1.6	14.3	16.4	4J	162	145	50.5	20.2	5.1	2.9
Benzo[g,h,i]perylene	1	-	-	4.4	7	ND	25.1	25.4	8	207	177	58.5	21.7	8.7	3.4
Benzo[k]fluoranthene	1	-	-	4J	4.2	1.5J	10.6	13.2	2.6	159	141	57.3	20.2	4.9	2.4
Chrysene	1	57.1	862	36.5	4.9	2J	19.2	19	4.6	180	155	60.6	24.2	10.9	3.4
Dibenz[a,h]anthracene	1	-	-	ND	ND	ND	6.3	4.9	ND	42.2	34.7	14.8	ND	ND	ND
Fluoranthene	1	111	2355	4.5J	23.4	4.2	18	21.8	4.8	225	211	87.5	35.3	9	5.1
Fluorene	1	-	-	ND	1.1	1.3	1.4	ND	1.3	6	5.5	1.7	5.2	1.6	1.4
Indeno[1,2,3-c,d]pyrene	1	-	-	2.2	3.9	ND	13.5	15.2	3.7	182	154	60.8	17.9	4.8	ND
Naphthalene	1	-	-	1.4	ND	14.7	4.6	5.7	3.1	7.6	7.4	3.7	7	2.4	4.3
Phenanthrene	1	41.9	515	1.4	3.7	2.9	7.9	9.4	3.3	85.5	75.6	28	14.8	3.2	4.7
Pyrene	1	53	875	5.6	20.6	5J	21.3	25.7	7.3	261	247	105	36.5	10.9	6.9
VOCs (ug/kg)															
1,1,1,2-Tetrachloroethane	1.3	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.91	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-Trifluoroethane	2.4	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	2.5	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.89	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	1.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	1.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	2.4	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	1.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
1,2,4-Trimethylbenzene	0.31	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	5.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.67	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	2.9	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	0.53	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.48	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	0.79	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.76	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	2.7	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	13	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	0.79	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	10	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	0.47	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	6	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	14	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	160
Benzene	0.54	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	0.84	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	3.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	2.5	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	16	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.51	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	2.7	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	1.3	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	5	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	1.5	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	2.7	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.3	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.42	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

				Sample Location											
				Estuary			Fashion Valley			Qualcomm Stadium			Kaiser Pond	Adm. Baker	Mission Trails
Analyte	MDL	TEL	PEL	EST-D	EST	EST-U	FV-D	FV	FV-U	QC-D	QC	QC-U	KSR	ABGC	MTP
Isopropylbenzene	0.71	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl-t-Butyl Ether (MTBE)	0.68	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	7.4	-	-	ND	ND	ND	ND	ND	150	ND	ND	ND	ND	ND	ND
Naphthalene	0.66	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.8	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.59	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	1.1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	12	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	1.5	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1,2-Dichloroethene	1.2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1,3-Dichloropropene	1.3	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	0.88	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	0.7	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	0.5	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	0.6	-	-	ND	ND	ND	ND	ND	5.6	ND	ND	ND	ND	ND	ND
p/m-Xylene	0.73	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	0.36	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
t-1,2-Dichloroethene	1.6	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
t-1,3-Dichloropropene	2	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	0.7	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* TEL/PEL for Total Chlordane

J Denotes estimated concentration above MDL but below RL

Bold ≥ TEL (Threshold Effect Level)

No constituents exceeded the upper PEL threshold value. Several constituents, including metals, pesticides, and polynuclear aromatic hydrocarbons (PAHs) exceeded the lower TEL. Results for these groups of constituents are discussed in further detail, below. Results for PCBs, acid extractable compounds (phenols), and volatile organic compounds (VOCs) were all below detectable limits at each site sampled and do not require further presentation

General Chemistry
Oil and grease was not detected in any sediment sample within the San Diego River. Ammonia-N was detected in every sample, except at the Qualcomm downstream site. Ammonia-N levels ranged in concentration from 0.25 mg/L to 33.0 mg/L. Nitrate-N was detected in half of the samples, ranging in concentration from 0.1 mg/L to 10.7 mg/L. Nitrite-N was only detected in two samples, EST and MTP. Total Kjeldahl Nitrogen (TKN) was not detected in any of the three estuary samples, but was detected at all remaining transects, ranging in concentration from 200 mg/kg to 1,500 mg/kg. Total phosphorus was detected in every sample, ranging in concentration from 0.214 mg/kg to 9.16 mg/kg. The Mission Trails Park sample site had the greatest concentrations of ammonia-N, nitrate-N and total phosphorus.

Metals
Many metals were found at detectable limits, however, not all have TELs and PELs. The downstream Estuary location (EST_D) had TEL exceedances of cadmium, lead, and zinc. The Qualcomm (QC) location and Qualcomm downstream location (QC_D) both had lead exceedances. The Kaiser Pond location (KSR) had the most metal exceedances; samples exceeded the TELs for antimony, cadmium, copper, lead, and zinc.

Chlorinated Pesticides
None of the chlorinated pesticides were measured at levels above the detection limit in any sample except at the Qualcomm location. All sediment samples collected at the Qualcomm location and its corresponding upstream and downstream locations exceeded the TEL for chlordane-alpha and chlordane-gamma. Levels of chlordane-alpha closely approached the PEL of 8.9 ng/dry g at QC and QC-D, whose results were 8.5 ng/dry g and 8.4 ng/dry g, respectively. Total detectable DDTs were also found at QC at less than 50% of the TEL and at QC-D at less than 25% of the TEL. The total detectable DDT values were based on the detection of only 4,4' DDD. DDD is a breakdown product of DDT. One other analyte, trans-nonachlor, which does not have a NOAA effect level, was detected at all three Qualcomm sites. Trans-nonachlor is a primary ingredient of chlordane and is persistent in the environment.

Polynuclear Aromatic Hydrocarbons (PAHs)
None of the PAHs were measured at levels above the TEL in any sample except at the Qualcomm location. The Qualcomm location and its corresponding upstream and downstream locations exceeded the TEL for several PAHs, including benz[a]anthracene, benzo[a]pyrene, chrysene, and pyrene. Fluoranthene and phenanthrene also exceeded the TEL at the QC and QC-D locations. These exceedances from 15-30% of the TELs. Ten other compounds, without established NOAA effect levels, were detected in sediment samples collected from the Qualcomm locations. These compounds included, acenaphthene, acenaphthylene, anthracene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, dibenz[a,h]anthracene, fluorene, indeno[1,2,3-c,d]pyrene and naphthalene.

Base/Neutral Extractable Compounds

Of all the base/neutral extractable compounds analyzed, only phthalate compounds were measured above detection levels in the sediments throughout San Diego River. It should be noted, though, that phthalate compounds are typical environmental contaminants and the sample results should be adjusted according to the laboratory procedural blank results for phthalates. After correcting the analytical results, none of the six phthalate compounds were actually detected in the sediment samples. Table 3-3 presents the uncorrected phthalate results. No TELs or PELs are available for any of the base/neutral extractable compounds for which the sediments were analyzed.

3.2.3 Chemical Characteristics of Water

Results of chemical analyses for San Diego River water quality samples are presented in Table 3-5 and discussed below. The data were compared to WQOs as established in the Regional Water Quality Control Plan for the San Diego Basin and the California Toxics Rule (40 CFR Part 131).

Table 3-4. Summary of Chemical Analysis of San Diego River Water Quality Samples Including a Comparison to Water Quality Objectives.

	Sample Locations								
	MDL	**WQO**	**EST**	**FV**	**QC**	**KSR**	**ABGC**	**JS**	**MTP**
Field Measurements			**River Right River Center River Left**						
Dissolved Oxygen	-	<5.0	5.2 **4.42** **4.97**	**4.01** **3.97** **4.03**	6.33 6.30 6.27	6.95 6.65 6.75	**4.65** **4.45** **4.66**	8.49 9.23 9.21	6.23 6.09 5.33
Temperature (°C)	-	-	24.7 24.2 24.6	23.5 23.7 23.7	22.7 21.7 21.7	26.2 25.9 25.4	23.8 23.7 23.9	21.2 21.0 21.0	21.3 21.3 21.2
Conductivity (µS/cm)	-	-	3.20 2.87 3.25	3.99 2.95 2.92	2.98 2.98 2.98	2.34 2.34 2.34	2.83 2.84 2.83	2.02 2.01 2.10	2.05 2.05 2.05
Lab Analysis	**Nutrients (mg/L)**								
Ammonia-N	0.01	0.025	ND	0.02	**0.04**	0.01	0.01	ND	0.01
Nitrate-N	0.02	10	0.12	ND	0.32	ND	0.16	0.11	0.43
Nitrite-N	0.02	1	ND	ND	ND	0.12	ND	0.43	ND
	General Chemistry								
Hardness (mg/L)	1	-	806	668	668	660	640	568	555
pH	0.1	6.5-8.5	7.9	7.9	8.0	7.9	7.8	8.3	7.9
	Trace Metals (µg/L)								
Copper	0.1	*	2.24	1.91	2.84	1.69	2.02	1.73	1.66
Copper WQO			95.88	80.34	80.34	79.43	77.16	68.96	67.47

* Water Quality Objective for dissolved copper is based on total hardness and is calculated as described by the USEPA Federal register Doc. 40 CFR Part 131, May 18, 2000.

General water quality parameters, DO, temperature, conductivity and pH tended to be within established WQOs or expected ranges with the exception of DO at three sites. Dissolved oxygen was depressed below the inland surface WQOs at two stations along the EST transect, at FV and ABGC. Ammonia ranged from non-detect at two stations to 0.04 mg/L at one station, which it exceeded the WQO of 0.025 mg/L. Neither nitrate nor nitrite exceeded WQOs, each having measurable concentrations ranging from ND to 0.43 mg/L. Dissolved copper at all sites was detected and did not exceed the hardness dependent WQO at any site.

3.3 Quality Control Summary

All procedural blank results were non-detect, all duplicate analyses met or were within the relative percent difference (RPD) criteria and all of the surrogate recoveries and spike recoveries were within the appropriate recovery range as established for the appropriate methods, unless otherwise noted below.

One metal in each of the two certified reference material (CRM) control samples did not meet the percent recovery acceptance range. However, as specified in the laboratory QAPP, these results were accepted because their procedures only require 95% of the analytes to be within the acceptance range for that particular analytical method (EPA 6020). Twenty-two metals (96%) were within the acceptance range for each of the control samples.

Phthalates were detected in the procedural blank sample. Phthalates are a pervasive, environmental contaminant and in a laboratory setting may be an artifact of using plastics, therefore the low concentrations (parts per trillion) are extremely difficult to remove from deionized water used for the procedural blank. Sample results should only be interpreted after appropriately correcting for the detections in the procedural blank. A few phthalate compounds and PAHs did not have matrix spike recoveries or RPD within the acceptance range. These failures are likely attributable to the difficulty in obtaining a thoroughly homogenous sediment sample (natural variability in the sample due to physical and chemical characteristics) and extremely low concentrations of the contaminants (concentrations reported within 10 times the MDL should be interpreted with caution due to potential variability in the sample and ability of the analytical method to confidently measure concentrations closer to the MDL). Further, the phthalate failures may also be attributable to the replicate and matrix spike results not being blank corrected.

4.0 DISCUSSION

The primary objective of this study was to confirm results provided by the Bureau. The Bureau stated three specific conclusions in their letter report. Each of these conclusions is addressed below.

First, the Bureau report states, "Most of the compounds identified appear to be associated with older highway and retaining wall structures such as treated wood and asphalt. Of particular note, are the results from the estuary sediments, where the treated wood from an old bridge structure is visible above the water surface." The elevated levels of PAHs measured by the Bureau at the

EST site were not confirmed by the more recent sediment sampling conducted during this study. Table 4-1 compares the Bureau EST data and more recent confirmation samples for each of the three transects sampled in the vicinity of the Bureau's site. Results of PAH concentrations in sediments collected in June, 2005 were typically two to three orders of magnitude lower than those collected by the Bureau in August, 2004.

Table 4-1. Estuary Sediment Sample Results Collected by the Bureau (8/2004) Compared to Estuary Sediment Sample Results Collected by Weston Solutions (6/2005).

Analyte	TEL	PEL	Bureau	Confirmatory Sampling		
			EST	EST-D	EST	EST-U
Acenaphthylene	-	-	290	ND	ND	ND
Anthracene	-	-	560	1.5J	2.7	ND
Benzo[a]anthracene	31.7	385	8700	4J	4.5J	ND
Benzo[a]pyrene	31.9	782	3200	6.7	4.4	1.4
Benzo[b]fluoranthene	-	-	6800	5.2	3.7	1.6
Benzo[g,h,i]perylene	-	-	2000	7.0	4.4	ND
Benzo[k]fluoranthene	-	-	2300	4.2	4.0J	1.5J
Chrysene	57.1	862	11000	4.9	36.5	2.0J
Dibenzo[a,h]anthracene	-	-	600	ND	ND	ND
Fluoranthene	111	2355	27000	23.4	4.5J	4.2
Indeno[1,2,3-cd]pyrene	-	-	2000	3.9	2.2	ND
Phenanthrene	41.9	515	1100	3.7	1.4	2.9
Pyrene	53	875	25000	20.6	5.6	5.0J

It is possible that the record rainfall experienced during the 2004/2005 wet weather season generated sufficient flow to transport sediments from this site to downstream locations. If the source of PAH contamination is indeed treated wood from old bridge structures, the results from the confirmatory study indicate this source is not rapidly contributing to the sediments. Other potential sources should be investigated, including runoff from nearby arterials and highways.

Second, the Bureau report states, "Additionally, the data report included numerous phthalates at levels below the PRGs. Phthalates are compounds affiliated with plastics or plastic industry and are commonly found in sediments." The phthalate levels reported by the Bureau are similar to those measured during this study. As noted in Section 3.3 and stated by the Bureau, phthalates are associated with plastics, however, the Bureau fails to state that because of their pervasiveness, they tend to be a typical laboratory contaminant as well. It is unknown whether phthalate levels presented by the Bureau were corrected based on results of quality assurance/quality control samples. After appropriately correcting the phthalate results for the detections in the laboratory procedural blank, this study concludes that phthalate levels in San Diego River sediments are below laboratory detection limits. It should be emphasized that phthalates, although common in the environment, do not persist in the environment, biodegrade rapidly and do not bioaccumulate in tissues.

Third, the Bureau report states, "The pesticide analysis revealed the presence of low level residues of several different pesticides in the sediments from Mission Trails Park to the estuary. While those reported concentrations are below the PRGs, the sampling at the Qualcomm site reveals that the concentrations of Trichloroethylidene (DDT) are greater than the concentrations of the degradation products. This raises the concern about the possibility of a more recent source of DDT to the river." This study did not find low levels of pesticides throughout San Diego River. The Qualcomm site was the only location which chlorinated pesticides were measured. Chlorinated pesticides were not detected in sediment samples from all remaining sites. Analytical results from sediment samples collected from the Qualcomm site did not measure detectable levels of 2,4'-DDT nor 4,4'-DDT. Only the degradation product, 4,4,'-DDD, had measurable concentrations in the sediment.

Results from the confirmatory sediment sampling effort show that sediment samples collected from the Qualcomm site consistently exceeded PEL guidelines for PAHs and the only samples which chlorinated pesticides (4,4'-DDD and chlordane) were detected. Concentrations of all metals at the Qualcomm site tended to be amongst the highest measured throughout San Diego River. The downstream and center transects at the Qualcomm site typically had contaminant concentrations twice as great as the upstream transect. This may be a function of the greater percentage of fine-grained material at the downstream and center transect as compared to the upstream transect which had a greater percentage of coarse-grained material. Most contaminants tend to bind preferentially to fine grained silts and clays.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Sediment sampling conducted in June, 2005, by Weston Solutions, did not confirm the results presented by the Bureau (August 2004). This study measured levels of PAHs in estuarine sediments which were two to three orders of magnitude below the PAH levels measured by the Bureau. Low levels of phthalates were detected in most sediment samples, however, this is likely an artifact of phthalates pervasiveness in the environment; phthalates are a typical laboratory contaminant due to their association with plastics. Elevated levels of DDT were not measured at any of the sites; DDD, a degradation product of DDT, was measured at the Qualcomm site.

Three transects centered around the Qualcomm site contained sediments that consistently exceeded PEL guidelines for PAHs and chlordane. The downstream and center Qualcomm transects were the only two locations which 4,4'-DDD was detected. As the objective of this study was to confirm the findings presented by the Bureau, it is recommended that a follow-up investigation be performed in this vicinity. A sediment characterization study would be appropriate which identifies the vertical and horizontal extent of contaminants at this location. An evaluation of discharges to the River at this location would further assist in identifying potential sources of the contamination.

Water quality was within expected ranges with the exception of dissolved oxygen and ammonia. Three sites showed depressed levels of dissolved oxygen, including the estuary, Fashion Valley, and near the Admiral Baker Golf Course. One site, Qualcomm Stadium, showed levels of ammonia above the water quality objective. Further investigations may be warranted to identify the potential causes of the high ammonia and low dissolved oxygen and the effects at these sites.

6.0 REFERENCES

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