

**Final  
Sediment Sampling Activity Report**

**Oxford Retention Basin Sediment and  
Water Quality Characterization  
Study**

Marina del Rey  
Los Angeles, California

**Prepared For:**

**County of Los Angeles Department of Public Works**  
Watershed Management Division  
900 South Fremont Avenue  
Alhambra, California 91803

**February 2010**



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## **ACRONYMS AND ABBREVIATIONS**

AVS/SEM	acid volatile sulfides/simultaneously extracted metals
CAM	California Assessment Manual
COC	chain-of-custody
FAA	Federal Aviation Administration
GPS	global positioning system
HSP	health and safety plan
ID	identification
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
SAP	sampling and analysis plan
STLC	Soluble Threshold Limit Concentration
SVOCs	semivolatile organic carbons
TMDL	Total Maximum Daily Loads
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration
USCS	Unified Soil Classification System
WAAS	Wide Area Augmentation System
WET	Waste Extraction Test

## **1.0 INTRODUCTION**

### **1.1 Sampling and Testing Objectives**

The objective of this project task was to utilize an efficient and scientifically defensible approach to clearly define the spatial extent of sediment contamination to be excavated and identify the overall organic content of the sediment. Specifically, the sediment study aimed to complete the following:

- Surficial sediment data was collected to determine feasibility of proposed bioremediation.
- Surficial sediment bacterial tests were conducted to determine if sediments are a likely source of bacteria.
- Surficial sediment acid volatile sulfides/simultaneously extracted metals (AVS/SEM) analyses were conducted to determine bioavailability of metals in surface sediments.
- Sediment from the surface to the design depth was evaluated to characterize the bulk of the sediment proposed for excavation.
- Sediment at or below the design depth was evaluated to characterize what will become the new surface layer based on the proposed grading plan.

## **2.0 MATERIALS AND METHODS**

### **2.1 Field Collection Program for Sediment Core Samples**

The sediment quality field sampling program was completed on October 19-20, 2009 in accordance with the approved Sampling and Analysis Plan (SAP) and followed guidance provided in the Health and Safety Plan (HSP).

#### **2.1.1 Station Locations and Depths**

Sediment cores were collected at all 10 stations within the Oxford Retention Basin (Figure 1). Cores extended through recently deposited sediments and into the native sediment layer at seven of the ten stations. At three stations, the native layer was not encountered due to refusal. Once collected, the cores were delivered to an on-site processing station where a certified California geologist characterized the vertical stratification of cores. The targeted sampling latitude and longitude coordinates and targeted core lengths are provided in the approved SAP.

Multiple cores per location were collected to ensure an adequate volume of material (~ 2 L) for all required testing and archival. Based on sediment stratification, the cores were split into vertical segments to assess the vertical resolution of potential chemical contamination.

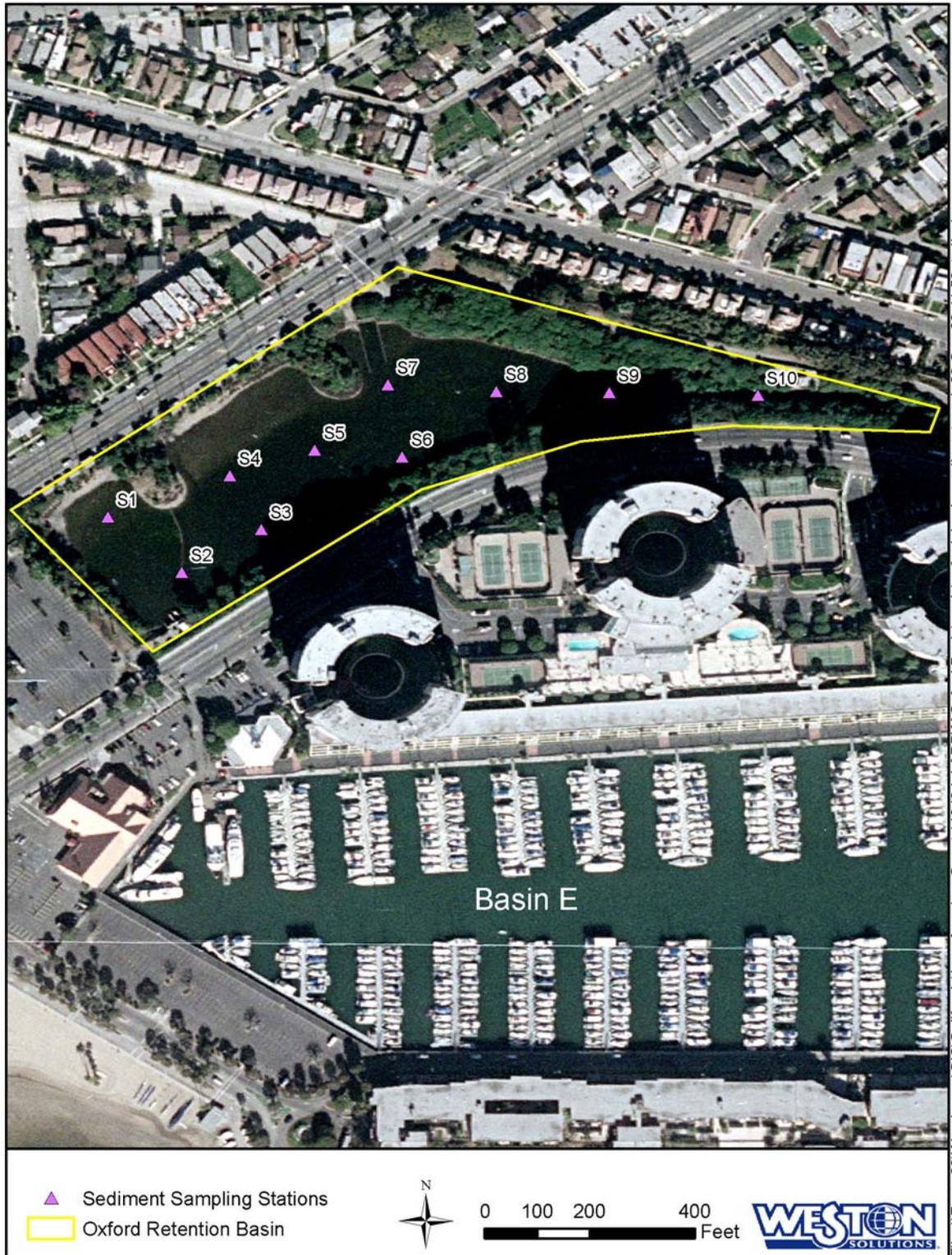


Figure 1. Sediment Stations within the Oxford Retention Basin

### **2.1.2 Core Collection and Handling**

Sediment cores were collected at all stations using a piston core deployed from an inflatable vessel (Figure 2.). The piston core was equipped with a 3-inch outer diameter polycarbonate tube. Piston coring is the process of obtaining continuous well-preserved sediment core samples from water saturated, unconsolidated sediments. Penetration of the polycarbonate core tube was achieved by manually pushing the tube into the sediment via application of downward pressure on aluminum extensions attached to the piston core. To prevent compaction of the core during penetration, a plunger within the tube was set at the sediment water interface and maintained static pressure ensuring core integrity. To increase penetration, a hammering device was utilized to drive the core deeper into sediments. To eliminate the possibility of cross contamination between stations, a new polycarbonate tube was utilized at each station.

Following sampling, the piston core was retrieved to the deck of the boat and the liner with sediment removed from the piston device and placed in a core tray for processing. At the on-site processing station, the tube was placed vertically in a rack for 20 minutes to allow settling and then the tube was cut vertically along the length of the core to expose the sediment for processing. A certified geologist examined and classified the sediment as well as photographed the sediment core (Appendix A). The core stratigraphy, sediment grain size distribution, color, texture, and other pertinent sediment characteristics were logged according to the Unified Soil Classification System (USCS). The station identification (ID), actual latitude and longitude coordinates, and core lengths were also documented in the sample core logs (Appendix B).

At all stations, cores did not penetrate sediment to the anticipated target core length (based on existing bathymetry and planned design drawings). Refusal was encountered at shallower depths than expected. Refusal was defined as less than 2 inches of penetration per minute. Each time refusal was encountered, the vessel or sampling point was moved slightly and a second core attempted. If refusal was encountered again, additional cores were attempted until a sufficient amount of sample was collected. In cases where sediment cores with native layers were insufficient to collect a full sample set, sample volume was reduced.



Figure 2. Piston Core Sampling

### **2.1.3 Sample Processing and Storage**

Sediment cores were vertically sub-sampled to determine the vertical extent of sediment contamination and assess the presence of distinct layers of sedimentation. Each core was vertically segmented into two sections representing the proposed excavation material and native layers. Residual layers were not present in the sediment cores.

Once collected, subsamples from each of the ten cores were taken from the upper six inches of the excavation layer to be analyzed for grain size and indicator bacteria (total coliform, fecal coliform, enterococci, and *E. coli*). The remaining sediment from the excavation layer was combined into two composite samples, each composite consisting of sediment from five of the ten sampling locations. Native sediment from each of the seven cores was analyzed separately.

All cores were processed on-site and the sediment samples homogenized to a uniform consistency using a stainless steel mixing apparatus. Sub-samples representing the distinct layers were placed in appropriate containers for all analyses. All samples were labeled (project name, date, sampler ID, analysis, and preservative where applicable), logged into a field chain-of-custody (COC) form, and placed into a cooler. Samples were stored in the dark on ice or at 4°C until shipped or delivered to the appropriate analytical laboratory.

## **2.2 Overall Field Collection Program Protocols**

### **2.2.1 Navigation**

All station locations were pre-planned (refer to SAP). Locations were determined using a Garmin Wide Area Augmentation System (WAAS) enabled Global Positioning System device (GPS). The system uses corrections provided by the Federal Aviation Administration (FAA) and was accurate within 15 ft. All final station locations were recorded in the field using positions from the GPS.

### **2.2.2 Decontamination of Field and Laboratory Equipment**

All sampling equipment was cleaned prior to sampling. Between stations, the piston core was rinsed and a new polycarbonate tube used at each sample location. Before homogenizing each core segment, all stainless steel utensils (stainless steel bowls, spoons, spatulas, mixers, and other utensils) were cleaned with soapy water, rinsed with tap water, and then rinsed three times with deionized water.

### **2.2.3 Shipping**

Prior to delivery of samples to the various chemistry laboratories, sample containers were securely packed inside the cooler with ice. COC forms were filled out, and the original signed COC forms were inserted in a sealable plastic bag and placed inside the cooler. The cooler lids were securely taped shut. Samples were delivered to the analytical laboratories listed in Table 1.

Table 1. Analytical Laboratories, Point-of-Contact Information, and Shipping Information

<b>Laboratory</b>	<b>Analyses Performed</b>	<b>Point-of-Contact</b>	<b>Shipping Information</b>
Weston Solutions, Inc. Carlsbad, CA	Grain size, archival	Dr. Wendy Hovel and Ms. Olga Weaver (760) 795-6901	Weston Solutions, Inc. 2433 Impala Dr. Carlsbad, CA 92010
CRG Marine Laboratories, Inc.	Sediment and Water chemistry	Mr. Eugene Chae (310) 533-5190/(310) 320-1276	CRG Marine Laboratories, Inc. 2020 Del Amo Blvd. Torrance, CA 90501

## **2.2.4 Documentation of Chain-of-Custody**

Samples were considered to be in custody if they were: (1) in the custodian’s possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a secured container. The principal documents used to identify samples and to document possession were COC records, field log books, and field tracking forms. COC procedures were used for all samples throughout the collection, transport, and analytical process, and for all data and data documentation, whether in hard copy or electronic format.

COC procedures were initiated during sample collection. A COC record was provided with each sample or sample group. Each person who had custody of the samples signed the form and ensured that the samples were not left unattended unless properly secured. Minimum documentation of sample handling and custody included the following:

- Sample identification
- Sample collection date and time
- Any special notations on sample characteristics
- Initials of the person collecting the sample
- Date the sample was sent to the laboratory
- Shipping company and waybill information

The completed COC form was placed in a sealable plastic envelope that traveled inside the ice chest containing the listed samples. The COC form was signed by the person transferring the custody of the samples. The condition of the samples was recorded by the receiver. COC records were included in the final analytical report prepared by the laboratory, and were considered an integral part of that report.

## **2.3 Physical and Chemical Analyses**

### **2.3.1 Sediment Samples**

Once collected, sub-samples from each of the ten cores were taken from the upper six inches of the excavation layer to test for indicator bacteria (total coliform, fecal coliform, enterococci, and E. coli) and grain size analyses. The remaining sediment from the excavation layer was combined into two composite samples, each composite consisting of sediment from five of the ten sampling locations. The two composite samples were analyzed for the following parameters:

- Semivolatile organic carbons (SVOCs) (including polycyclic aromatic hydrocarbons [PAHs], base/neutral extractables, phthalates, and acid extractables [phenols])

- California Assessment Manual (CAM) 17 Metals
- AVS/SEM for TMDL listed metals (Copper, Lead and Zinc)
- Organochlorine Pesticides (including Aroclor polychlorinated biphenyls [PCBs] and PCB congeners)
- Total petroleum hydrocarbon (TPH) (C6-C44)
- Total organic carbon (TOC)
- pH
- Toxicity Characteristic Leachate Procedure (TCLP) for Metals, SVOCs, Organochlorine Pesticides
- Grain Size
- Percent Solids
- Nutrients (Ammonia, Nitrate and Nitrite)
- Total Sulfides

Native sediment from each of the ten cores was analyzed separately. Sediment from the native layer was analyzed for the same parameters as listed above for the composite samples with the exception of AVS/SEM for total maximum daily loads (TMDL) listed metals. A residual layer (i.e., in cases where the proposed grading depth was shallower than the native layer) was not identified; therefore, no residual layer samples were collected.

To understand the potential feasibility of bioremediation techniques on existing sediment, WESTON, in consultation with Anderson Environmental, conducted the additional analysis of organophosphorus pesticides on the composite sediment samples.

### 3.0 RESULTS

#### 3.1 Sample Collection

Piston core sampling was conducted between October 19 and October 20, 2009 at 10 stations located within the Oxford Retention Basin. All 10 stations were successfully sampled, although native material from Stations S7, S9 and S10 was not recovered due to refusal. Field coordinates, number of cores per station, depth of core penetration, final core length (i.e., recovery length), and thickness of the native and non-native layers are summarized in Table 2.

Table 2. Field Coordinates, Sample Depths and Piston Core Recoveries for Samples Collected in the Oxford Retention Basin.

Station ID	Attempt	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (Feet)	Target Core Length (Feet)	Actual Depth Sampled (Feet)	Penetration (Feet)	Final Core Length (Feet)	Thickness of Native Layer (Feet)	Thickness of Non-Native Layer (Feet)	Comments
S1	1	33.984971°	-118.456618°	3.9	8	6.4	2.5	0.3	0	0.3	Refusal encountered in native layer due to sediment composition and/or compaction
	2	33.984971°	-118.456618°	3.9	8	6.4	2.5	1	0.5	0.5	
	3	33.984971°	-118.456618°	3.9	8	6.4	2.5	1.5	1	0.5	
S2	1	33.984679°	-118.456232°	3.9	8	6.4	2.5	0.3	0.15	0.15	Refusal encountered in native layer due to sediment composition/compaction
	2	33.984679°	-118.456232°	3.9	8	6.9	3	0.7	0.2	0.5	
	3	33.984679°	-118.456232°	3.9	8	6.9	3	0.7	0	0.7	
	4	33.984679°	-118.456232°	3.9	8	NA	NA	NA	0	NA	
	5	33.984679°	-118.456232°	3.9	8	NA	NA	NA	0	NA	
	6	33.984679°	-118.456232°	3.9	8	6.9	3	1.5	0.3	1.2	
	7	33.984679°	-118.456232°	3.9	8	6.9	3	2.6	0.4	2.2	
S3	1	33.984904°	-118.455816°	3.9	8	6.4	2.5	0.7	0.4	0.3	Refusal encountered in native layer due to sediment composition and/or compaction
	2	33.984904°	-118.455816°	3.9	8	6.9	3	1.4	0.3	1.1	
	3	33.984904°	-118.455816°	3.9	8	6.9	3	1.3	0	1.3	
	4	33.984904°	-118.455816°	3.9	8	6.9	3	1.1	0.3	0.8	
	5	33.984904°	-118.455816°	3.9	8	6.9	3	1.4	0	1.4	
S4	1	33.985186°	-118.455979°	3.9	8	6.4	2.5	1.5	0.3	1.2	Refusal encountered in native layer due to sediment composition and/or compaction
	2	33.985186°	-118.455979°	3.9	8	6.4	2.5	1.4	0.8	0.6	
S5	1	33.985321°	-118.455536°	3.9	8	6.4	2.5	1.6	0.5	1.1	Refusal encountered in native layer due to sediment composition and/or compaction
	2	33.985321°	-118.455536°	3.9	8	6.4	2.5	1.6	0	1.6	
	3	33.985321°	-118.455536°	3.9	8	6.9	3	2.2	0.3	1.9	
S6	1	33.985286°	-118.455077°	3.3	8	4.3	1	0.5	0	0.5	Refusal encountered in native layer due to sediment composition and/or compaction
	2	33.985286°	-118.455077°	3.3	8	4.8	1.5	1	0.2	0.8	
	3	33.985286°	-118.455077°	3.3	8	6.3	3	2.1	0.4	1.7	

S7	1	33.985664°	-118.455151°	3.3	8	4.8	1.5	0.6	0	0.6	Refusal encountered in native layer due to woody/vegetated debris and possible riprap
	2	33.985664°	-118.455151°	3.3	8	4.8	1.5	0.6	0	0.6	
S8	1	33.985627°	-118.454585°	2.6	8	5.6	3	1.2	0.6	0.6	Refusal encountered in native layer due to sediment composition and/or compaction
S9	1	33.985624°	-118.453995°	3.3	8	6.3	3	1.3	0	1.3	Refusal encountered in native layer due to woody/vegetated debris and possible riprap
	2	33.985624°	-118.453995°	3.3	8	5.8	2.5	1	0	1	
	3	33.985624°	-118.453995°	3.3	8	5.8	2.5	1.5	0	1.5	
S10	1	33.985609°	-118.453217°	3.3	8	6.3	3	2.3	0	2.3	Refusal encountered in native layer due to woody/vegetated debris and possible riprap

## 3.2 Physical and Chemical Characteristics of Sediment

Results of the physical and bulk chemical analyses for sediments collected within the Oxford Retention Basin are presented in Table 3. These results were compared to the Total Threshold Limit Concentration (TTLC) and ten times the Soluble Threshold Limit Concentration (STLC) values. Briefly, TTLC and STLC values are published in Title 22 of the State of California Code of Regulations and are the benchmark for determining whether a solid, or its leachate, respectively, exhibits the characteristics of toxicity, thereby causing it to be classified as hazardous. If bulk chemistry values exceed ten times the STLC, it does not definitively classify the material as hazardous; rather, it suggests those analytes have the potential to exceed the STLC after conducting the Waste Extraction Test (WET). Sediment was also subjected to TCLP tests. Results of the TCLP analyses are presented in Table 4. Briefly, the TCLP values are published in the Code of Federal Regulations (40 CFR §261.24) and are the federal benchmark for determining whether the leachate from a solid would be classified as toxic, therefore hazardous.

### 3.2.1 Total Threshold Limit Concentration and Soluble Threshold Limit Concentration

None of the analytes exceeded any of the TTLC values.

Only two metals exceeded the screening level assessment of ten times the STLC values. These were chromium and lead. Both metals exceeded ten times the STLC value (50 µg/g) in the proposed excavation layer composite samples, but only chromium slightly exceeded this value in two of the native layer samples (S2 and S4). At station S2, it exceeded ten times the STLC value by 13.6% and at station S4 it exceeded the criteria by 3.9%.

### 3.2.2 Simultaneously Extracted Metals/Acid Volatile Sulfides

The Simultaneously Extracted Metals/Acid-Volatile Sulfides (SEM:AVS) method is used to determine the potential toxicity of metals in a sediment sample. This method is based on the theory that AVS, comprised primarily of iron monosulfides in sediments, bind to divalent cationic metals and form metal-sulfide complexes. Because these metal-sulfide complexes have low solubility, metal bioavailability and toxicity to benthic organisms is therefore affected by the amount of AVS in sediment. Thus, to determine the potential toxicity of metals in a sediment sample, the ratio of SEM to the concentration of AVS in a

sample is evaluated. If SEM is higher than AVS, or  $SEM:AVS > 1$ , then some portion of the metals are not bound up by AVS and therefore are bioavailable and potentially toxic. If SEM is less than AVS, or  $SEM:AVS < 1$ , then the metals are bound to AVS in the sediment sample are likely not toxic to benthic organisms.

It should be emphasized that this approach works specifically with divalent metals, including cadmium, copper, lead, nickel and zinc (McGrath et al. 2002). Further research has suggested that silver may also bind with AVS; however, unlike the one to one relationship of the each of the other metals to AVS, one mole of SEM silver reacts with two moles of AVS (Berry et al. 1999 and USEPA 2000 in McGrath et al. 2002).

In addition, results should be interpreted in light of other environmental factors such as dissolved oxygen and salinity, which at their extremes, may interfere with the determination of this ratio (Long et al. 1988). Nonetheless, a number of studies have demonstrated the usefulness of this method in predicting the toxicity of metals in sediments (Di Toro et al. 1991, Ankley et al. 1991 and Casas and Crecelius 1994).

**Error! Reference source not found.** presents the SEM results for the six divalent metals that are likely to bind AVS and the concentration of AVS for each sample. The table also presents the sum ( $\Sigma$ ) of the SEM metals and the ratio of the  $\Sigma SEM$  to AVS. The SEM results are presented as  $\mu\text{mol/dry g}$ . The AVS results are presented as  $\text{mg/dry kg}$  (as reported by the analytical laboratory) and also as  $\mu\text{mol/dry g}$ . Stations with a  $\Sigma SEM:AVS$  ratio greater than one have been highlighted.

All of the station samples that were analyzed using the SEM:AVS method had  $\Sigma SEM:AVS$  ratios greater than one. Ratios ranged from 1.8 in the S2 Native Layer sample to 177.7 in the S5 Native Layer sample. This indicates that the concentration of SEM was higher than the concentration of AVS in the sediment sample, suggesting that not all of the metals in the sediment samples were bound up by AVS and therefore may be bioavailable and potentially toxic to benthic organisms. It should be noted that although the ratios for each station were greater than one, suggesting the potential for metal toxicity from excess  $\Sigma SEM$  to AVS, the calculated ratios for several of the samples (S1, S2 and S8 Native Layer samples and both Excavation Layer samples) were within a range of 2 to 40 in which the prediction of effects is uncertain (McGrath et al. 2002). Therefore, these results should be interpreted in the context of toxicity test results and other chemical/physical measurements.

### **3.2.3 Toxicity Characteristic Leaching Procedure**

None of the analytes exceeded any of the TCLP values.

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLIC	10x-STLC	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
<b>Grain Size</b>												
Gravel	%			1.4	4.7	0.4	2.0	2.5	1.5	2.2	2.6	2.0
Sand	%			15.8	46.2	23.4	47.5	35.8	29.0	37.1	47.5	39.9
Silt	%			47.5	30.8	51.0	35.0	39.8	41.4	35.7	31.4	35.3
Clay	%			35.3	18.3	25.3	15.6	21.9	28.0	25.0	18.5	22.8
<b>General Chemistry</b>												
Ammonia-N	mg/dry kg			19.61	8.5	3.41	22.82	8.27	6.96	11.6	9.25	8.66
Total Sulfides	mg/dry kg			4.8	5	<0.2	5.3	<0.2	<0.2	<0.2	<0.2	1.7
Acid Volatile Sulfides	mg/dry kg			4.76	5.02	<0.05	5.31	<0.05	<0.05	<0.05	<0.05	1.67
TKN	mg/kg			1130	732	333	239	310	301	345	182	217
Total Organic Carbon	% Dry Weight			4.07	5.62	0.54	0.63	0.56	1.15	0.76	0.33	0.86
TPH-CC (C6-C44)	mg/kg			160	200	150	22	12	<4.8	59	<4.8	<4.8
pH	pH Units			8.3	8.4	9.3	8.9	8.8	9	8.9	9.3	9.2
Percent Solids	Percent			57.8	65.9	76.2	77.1	81.9	80.9	78.9	88.5	76.8
<b>Trace Metals</b>												
Antimony (Sb)	µg/dry g	500	150	1.57	2.002	0.925	1.009	0.593	1.198	0.772	0.564	0.893
Arsenic (As)	µg/dry g	500	50	15.17	10.51	7.952	32.51	6.23	12.77	7.998	5.09	8.854
Barium (Ba)	µg/dry g	10000	1000	162	140	219.7	194	167.1	183.2	176.3	68.44	209.2
Beryllium (Be)	µg/dry g	75	7.5	0.653	0.398	0.676	0.701	0.559	0.673	0.512	0.416	0.581
Cadmium (Cd)	µg/dry g	100	10	2.842	3.093	0.533	1.217	0.303	0.775	0.673	0.658	0.5
Chromium (Cr)	µg/dry g	2500	50	66.28	52.11	49.34	56.84	35.75	51.93	37.46	25.27	45.97
Cobalt (Co)	µg/dry g	8000	800	12.05	8.36	10.14	13.06	8.441	12.79	9.22	9.608	8.775
Copper (Cu)	µg/dry g	2500	250	157.7	101.9	33.91	39.8	26.09	33.74	31.35	18.06	31.58
Lead (Pb)	µg/dry g	1000	50	306.3	359.6	5.987	36.16	10.88	13.78	28.49	7.026	30.22
Mercury (Hg)	µg/dry g	20	2	0.37	0.28	0.03	0.07	0.04	0.04	0.06	0.04	0.04
Molybdenum (Mo)	µg/dry g	3500	3500	6.367	6.046	1.935	2.215	1.445	2.845	1.761	1.847	3.092
Nickel (Ni)	µg/dry g	2000	200	39.41	30.26	36.87	39.8	25.59	36.57	25.12	19.31	27.3
Selenium (Se)	µg/dry g	100	10	1.088	0.79	1.807	0.577	1.996	1.768	1.204	1.139	0.37
Silver (Ag)	µg/dry g	500	50	1.978	1.059	0.598	0.52	0.47	0.674	0.668	0.58	0.72
Thallium (Tl)	µg/dry g	700	70	0.329	0.187	0.277	0.288	0.185	0.276	0.198	0.155	0.218
Vanadium (V)	µg/dry g	2400	240	95.5	60.9	107.2	110.7	74.05	103.7	73.8	51.06	93.29
Zinc (Zn)	µg/dry g	5000	2500	481.2	459.2	72.06	107.8	76.65	98	105.1	51.02	86.82
<b>Simultaneously Extracted Metals (AVS/SEM)</b>												
Cadmium (Cd) - SEM	µmol/dry g			<0.0018	0.0022J	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
Copper (Cu) - SEM	µmol/dry g			<0.0062	<0.0062	0.0102J	<0.0062	0.0085J	0.007J	0.0065J	0.0116J	<0.0062

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLIC	10x-STLC	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
Lead (Pb) - SEM	µmol/dry g			0.147	0.2691	0.0015	0.0847	0.007	0.0029	0.0121	0.0101	0.0198
Nickel (Ni) - SEM	µmol/dry g			0.0167	0.0325	0.007	0.0142	0.0098	0.013	0.0119	0.015	0.0089
Silver (Ag) - SEM	µmol/dry g			<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
Zinc (Zn) - SEM	µmol/dry g			0.7977	1.5269	0.008	0.2	0.0884	0.0348	0.106	0.0797	0.0826
ΣSEM <sup>1</sup>	µmol/dry g			0.967	1.835	0.029	0.304	0.116	0.060	0.139	0.118	0.116
Acid Volatile Sulfides	µmol/dry g			0.148	0.157	0.001	0.166	0.001	0.001	0.001	0.001	0.052
ΣSEM:AVS	ratio			6.511	11.72	36.91	1.836	148.5	76.67	177.7	152.0	2.236
<b>Polynuclear Aromatic Hydrocarbons</b>												
1-Methylnaphthalene	ng/dry g			2.4J	3.4J	<1	<1	<1	<1	<1	<1	<1
1-Methylphenanthrene	ng/dry g			4.4J	<1	<1	<1	<1	<1	<1	<1	<1
2,3,5-Trimethylnaphthalene	ng/dry g			1.8J	1.9J	<1	<1	<1	<1	<1	<1	<1
2,6-Dimethylnaphthalene	ng/dry g			32.9	21.4	<1	1.1J	<1	<1	<1	<1	<1
2-Methylnaphthalene	ng/dry g			5.9	11.3	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	ng/dry g			2.6J	4J	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	ng/dry g			3.6J	4.6J	<1	<1	<1	<1	2J	<1	<1
Anthracene	ng/dry g			18.9	30.7	<1	1J	<1	<1	2.8J	<1	1J
Benz[a]anthracene	ng/dry g			105.5	198.5	<1	6.1	1.2J	<1	14	11.1	4.2J
Benzo[a]pyrene	ng/dry g			231	275	32.1	11.6	5.9	1.6J	22.3	11	5.4
Benzo[b]fluoranthene	ng/dry g			254.5	361.3	<1	8.6	<1	<1	14.7	11	4.4J
Benzo[e]pyrene	ng/dry g			215.3	285.6	8.8	9.2	3.2J	<1	13.2	8.8	5
Benzo[g,h,i]perylene	ng/dry g			265.5	353.2	7.5	11.1	3.1J	<1	16.1	10.6	5.8
Benzo[k]fluoranthene	ng/dry g			95.8	148.1	<1	3.6J	<1	<1	4.5J	6	1.9J
Biphenyl	ng/dry g			2.4J	7.5	<1	<1	<1	<1	<1	<1	<1
Chrysene	ng/dry g			154.4	267.1	11.8	8	2.9J	<1	21.1	14.8	5.9
Dibenz[a,h]anthracene	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibenzothiophene	ng/dry g			<1	7.6	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	ng/dry g			169.6	493.3	5.2	9.8	2.8J	<1	22.8	25.5	6.7
Fluorene	ng/dry g			4.6J	7.8	<1	<1	<1	<1	<1	<1	<1
Indeno[1,2,3-c,d]pyrene	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	ng/dry g			5.7	10.3	<1	1J	<1	<1	1.8J	<1	<1
Perylene	ng/dry g			113.7	99	59.1	3.8J	4J	3.5J	19.2	3.6J	2.9J
Phenanthrene	ng/dry g			42.7	80.3	<1	3J	1.5J	<1	12.2	5	5.1
Pyrene	ng/dry g			362.9	671.3	12.6	18.6	5.6	1.1J	32.2	27.3	11.9
Total Detectable PAHs	ng/dry g			2096.1	3343.2	137.1	96.5	30.2	6.2	198.9	134.7	60.2
<b>Base/Neutral Extractable Compounds</b>												
1,2,4-Trichlorobenzene	ng/dry g			<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLIC	10x-STLC	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
1,2-Dichlorobenzene	ng/dry g			<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	ng/dry g			<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	ng/dry g			<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
2,6-Dinitrotoluene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Chloronaphthalene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
3,3'-dichlorobenzidine	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Bromophenylphenylether	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Chlorophenylphenylether	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Azobenzene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzidine	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
bis(2-Chloroethoxy)methane	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
bis(2-Chloroethyl)ether	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
bis(2-Chloroisopropyl)ether	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Hexachlorobenzene	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Hexachlorocyclopentadiene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Hexachloroethane	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Isophorone	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
N-Nitrosodi-n-propylamine (NDPA)	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
N-Nitrosodimethylamine (NDMA)	mg/kg			<0.3	<0.26	<0.33	<0.28	<0.27	<0.3	<0.31	<0.3	<0.29
N-Nitrosodiphenylamine	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
Nitrobenzene	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
<b>Phthalates</b>												
bis(2-Ethylhexyl) Phthalate	ng/dry g			4773	6158	<100	168	<100	<100	158	149	<100
Butylbenzyl Phthalate	ng/dry g			344	460	<25	<25	<25	<25	<25	<25	<25
Di-n-butyl Phthalate	ng/dry g			<75	<75	<75	<75	<75	<75	<75	<75	<75
Di-n-octyl Phthalate	ng/dry g			<10	60	<10	<10	<10	<10	<10	<10	<10
Diethyl Phthalate	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
Dimethyl Phthalate	ng/dry g			222	271	<50	<50	<50	<50	<50	<50	<50
<b>Acid Extractable Compounds</b>												
2,4,6-Trichlorophenol	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
2,4-Dichlorophenol	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50
2,4-Dimethylphenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
2,4-Dinitrophenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Chlorophenol	ng/dry g			<50	<50	<50	<50	<50	<50	<50	<50	<50

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLc	10x-STLc	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
2-Methyl-4,6-dinitrophenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Nitrophenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Chloro-3-methylphenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Nitrophenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
Pentachlorophenol	ng/dry g	17000	17000	<50	<50	<50	<50	<50	<50	<50	<50	<50
Phenol	ng/dry g			<100	<100	<100	<100	<100	<100	<100	<100	<100
<b>Organochlorine Pesticides</b>												
2,4'-DDD	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4'-DDE	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4'-DDT	ng/dry g			9.9	<1	<1	<1	<1	<1	<1	<1	<1
4,4'-DDD	ng/dry g	1000	1000	<1	44.8	<1	<1	<1	<1	<1	<1	1J
4,4'-DDE	ng/dry g	1000	1000	<1	3.8	<1	2.3	<1	<1	<1	<1	<1
4,4'-DDT	ng/dry g	1000	1000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Detectable DDTs	ng/dry g			9.9	48.6	<1	2.3	<1	<1	<1	<1	1
Aldrin	ng/dry g	1400	1400	<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-alpha	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-beta	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-delta	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-gamma	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlordane-alpha	ng/dry g			17.9	34.3	<1	<1	<1	<1	<1	<1	<1
Chlordane-gamma	ng/dry g			28.5	50	<1	1.6J	<1	<1	1.1J	<1	1J
Total Detectable Chlordane (a,g)	ng/dry g			46.4	84.3	<1	1.6	<1	<1	1.1	<1	1
DCPA (Dacthal)	ng/dry g			<5	<5	<5	<5	<5	<5	<5	<5	<5
Dicofol	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Dieldrin	ng/dry g	8000	8000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan Sulfate	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan-I	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan-II	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Endrin	ng/dry g	200	200	<1	<1	<1	<1	<1	<1	<1	<1	<1
Endrin Aldehyde	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Endrin Ketone	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Heptachlor	ng/dry g	4700	4700	<1	<1	<1	<1	<1	<1	<1	<1	<1
Heptachlor Epoxide	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Methoxychlor	ng/dry g	100000	100000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mirex	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-Nonachlor	ng/dry g			<1	15	<1	<1	<1	<1	<1	<1	<1

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLIC	10x-STLC	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
trans-Nonachlor	ng/dry g			15.5	24.8	<1	<1	<1	<1	<1	<1	<1
Oxychlorane	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
Perthane	ng/dry g			<5	<5	<5	<5	<5	<5	<5	<5	<5
Toxaphene	ng/dry g	5000	5000	61.29	168.71	<10	<10	<10	<10	<10	<10	<10
<b>Aroclor Polychlorinated Biphenyls</b>												
Aroclor 1016	ng/dry g	50000	50000	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aroclor 1221	ng/dry g	50000	50000	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aroclor 1232	ng/dry g	50000	50000	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aroclor 1242	ng/dry g	50000	50000	137	<10	<10	<10	<10	<10	<10	<10	<10
Aroclor 1248	ng/dry g	50000	50000	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aroclor 1254	ng/dry g	50000	50000	110	199	<10	20	<10	<10	<10	<10	16J
Aroclor 1260	ng/dry g	50000	50000	<10	148	<10	38	<10	<10	<10	<10	<10
Total Aroclor	ng/dry g			247	347	<10	58	<10	<10	<10	<10	16
<b>Polychlorinated Biphenyl Congeners</b>												
PCB003	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB008	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB018	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB028	ng/dry g			11	<1	<1	<1	<1	<1	<1	<1	<1
PCB031	ng/dry g			4.8	<1	<1	<1	<1	<1	<1	<1	<1
PCB033	ng/dry g			10.4	<1	<1	<1	<1	<1	<1	<1	<1
PCB037	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB044	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	1J
PCB049	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	1.1J
PCB052	ng/dry g			<1	11.4	<1	<1	<1	<1	<1	<1	<1
PCB056/060	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB066	ng/dry g			7.1	4.2	<1	<1	<1	<1	<1	<1	<1
PCB070	ng/dry g			5.8	32	<1	<1	<1	<1	<1	<1	1J
PCB074	ng/dry g			<1	11.4	<1	<1	<1	<1	<1	<1	<1
PCB077	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB081	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB087	ng/dry g			6.2	4.2	<1	<1	<1	<1	<1	<1	<1
PCB095	ng/dry g			6.9	15.8	<1	1.3J	<1	<1	1.1J	<1	<1
PCB097	ng/dry g			<1	7.4	<1	<1	<1	<1	<1	<1	<1
PCB099	ng/dry g			6.2	8.4	<1	1.1J	<1	<1	<1	<1	<1
PCB101	ng/dry g			18	30.3	<1	2.7	<1	<1	<1	<1	1.5J
PCB105	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLIC	10x-STLC	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
PCB110	ng/dry g			13.5	24.3	<1	2.4	<1	<1	<1	<1	2
PCB114	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB118	ng/dry g			<1	22.1	<1	<1	<1	<1	<1	<1	<1
PCB119	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB123	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB126	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB128	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB138	ng/dry g			<1	13	<1	3	<1	<1	<1	<1	1J
PCB141	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB149	ng/dry g			14.3	16.8	<1	1.6J	<1	<1	<1	<1	<1
PCB151	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB153	ng/dry g			<1	12.2	<1	1.4J	<1	<1	<1	<1	1.3J
PCB156	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB157	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB158	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB167	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB168+132	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB169	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB170	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB174	ng/dry g			<1	4.4	<1	<1	<1	<1	<1	<1	<1
PCB177	ng/dry g			<1	1.1J	<1	<1	<1	<1	<1	<1	<1
PCB180	ng/dry g			8.3	9	<1	3	<1	<1	<1	<1	<1
PCB183	ng/dry g			<1	2.2	<1	<1	<1	<1	<1	<1	<1
PCB187	ng/dry g			4.9	8.3	<1	3	<1	<1	<1	<1	<1
PCB189	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB194	ng/dry g			<1	18.5	<1	4.7	<1	<1	<1	<1	<1
PCB195	ng/dry g			<1	<1	<1	<1	<1	<1	<1	<1	<1
PCB200	ng/dry g			1.3J	<1	<1	1J	<1	<1	<1	<1	<1
PCB201	ng/dry g			<1	6.6	<1	8.2	<1	<1	<1	<1	<1
PCB203	ng/dry g			<1	2.3	<1	6.9	<1	<1	<1	<1	<1
PCB206	ng/dry g			<1	3.9	<1	9.5	<1	<1	1J	<1	<1
PCB209	ng/dry g			<1	<1	<1	2.9	<1	<1	1.7J	<1	<1
Total PCBs	ng/dry g			118.7	269.8	<1	52.7	<1	<1	3.8	<1	8.9
<b>Organophosphorus Pesticides</b>												
Azinphos Methyl	ng/dry g			<50	<50							
Bolstar (Sulprofos)	ng/dry g			<10	<10							

Table 3. Summary of Oxford Retention Basin Sediment Chemistry

Parameter	Units	CRITERIA		EXCAVATION LAYER		NATIVE LAYER						
		TTLC	10x-STLC	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
Chlorpyrifos	ng/dry g			<5	<5							
Demeton	ng/dry g			<10	<10							
Diazinon	ng/dry g			<5	<5							
Dichlorvos	ng/dry g			<10	<10							
Dimethoate	ng/dry g			<5	<5							
Disulfoton	ng/dry g			<10	<10							
Ethoprop (Ethoprofos)	ng/dry g			<10	<10							
Ethyl Parathion	ng/dry g			<10	<10							
Fenclorphos (Ronnel)	ng/dry g			<10	<10							
Fenitrothion	ng/dry g			<10	<10							
Fensulfothion	ng/dry g			<10	<10							
Fenthion	ng/dry g			<10	<10							
Malathion	ng/dry g			<5	<5							
Merphos	ng/dry g			<10	<10							
Methamidophos (Monitor)	ng/dry g			<50	<50							
Methidathion	ng/dry g			<10	<10							
Methyl Parathion	ng/dry g			<10	<10							
Mevinphos (Phosdrin)	ng/dry g			<10	<10							
Phorate	ng/dry g			<10	<10							
Phosmet	ng/dry g			<50	<50							
Tetrachlorvinphos (Stirofos)	ng/dry g			<10	<10							
Tokuthion	ng/dry g			<10	<10							
Trichloronate	ng/dry g			<10	<10							

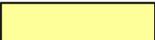
< Less than the method detection limit  
 J Estimated value less than the reporting limit but greater than the method detection limit  
 1 ΣSEM = sum (Cd + Cu + Pb + Ni + (Ag/2) + Zn); if ND, then 1/2 MDL used  
 ΣSEM:AVS = >1, indicating potential for metal toxicity due to excess ΣSEM

Table 4. Summary of Oxford Retention Basin Sediment Chemistry using TCLP.

Parameter	Units	CRITERIA	EXCAVATION LAYER		NATIVE LAYER						
		TCLP	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
<b>Trace Metals</b>											
Antimony (Sb)	µg/L		1.3	4.5	1.7	1.1	1	2	1.5	0.9	1
Arsenic (As)	µg/L	5000	178	94.5	11.7	24.7	10.3	9.5	18.8	8.5	35.2
Barium (Ba)	µg/L	100000	406.2	393.5	546.4	620.4	586.8	461.2	512.5	628.1	456.2
Beryllium (Be)	µg/L		3.7	2.9	6.8	5.6	5.2	5.3	4.6	3	3.4
Cadmium (Cd)	µg/L	1000	24.7	17.7	3.8	6.8	7.3	7.5	6	6.7	4.1
Chromium (Cr)	µg/L	5000	11.6	9	6.6	4.5	1.6	2.2	2.6	1.5	2.6
Cobalt (Co)	µg/L		26.5	37.3	56.8	66.6	67.8	73.2	75.5	78.9	48.6
Copper (Cu)	µg/L		13.2	7.6	8.5	1.7	35	14.9	7	31.9	5.9
Lead (Pb)	µg/L	5000	942.71	744.51	8.97	36.17	16.53	14.91	12.23	3.93	21.43
Mercury (Hg)	µg/L	200	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum (Mo)	µg/L		0.7	0.8	0.4J	0.3J	<0.2	0.2J	0.2J	<0.2	0.3J
Nickel (Ni)	µg/L		63.3	98.1	107.7	109.8	111.6	110.7	104.6	114.5	77
Selenium (Se)	µg/L	1000	<0.2	<0.2	0.8	0.4J	3.4	6.5	5.4	19.6	0.3J
Silver (Ag)	µg/L	5000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium (Tl)	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium (V)	µg/L		128.2	77.4	227.6	190	83.3	106.3	128.6	142.5	111.1
Zinc (Zn)	µg/L		6187.9	5215.9	432.3	766.7	879.8	642.6	620.6	301.3	384.2
<b>Base/Neutral Extractable Compounds</b>											
1,2,4-Trichlorobenzene	ng/L		<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	ng/L		<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	ng/L		<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	ng/L		<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
2,6-Dinitrotoluene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Chloronaphthalene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
3,3'-dichlorobenzidine	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Bromophenylphenylether	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Chlorophenylphenylether	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Azobenzene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzidine	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Hexachlorobenzene	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Hexachlorocyclopentadiene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Hexachloroethane	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50

Table 4. Summary of Oxford Retention Basin Sediment Chemistry using TCLP.

Parameter	Units	CRITERIA	EXCAVATION LAYER		NATIVE LAYER						
		TCLP	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
Isophorone	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
N-Nitrosodi-n-propylamine	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
N-Nitrosodimethylamine (NDMA)	ng/l		7600	24000	4500	6800	5400	7200	7300	6500	8200
N-Nitrosodiphenylamine (NDPA)	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Nitrobenzene	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
bis(2-Chloroethoxy)methane	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
bis(2-Chloroethyl)ether	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
bis(2-Chloroisopropyl)ether	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
<b>Acid Extractable Compounds</b>											
2,4,6-Trichlorophenol	ng/L	2000000	<50	<50	<50	<50	<50	<50	<50	<50	<50
2,4-Dichlorophenol	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
2,4-Dimethylphenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
2,4-Dinitrophenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Chlorophenol	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Methyl-4,6-dinitrophenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
2-Nitrophenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Chloro-3-methylphenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
4-Nitrophenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
Pentachlorophenol	ng/L	100000000	<50	<50	<50	<50	<50	<50	<50	<50	<50
Phenol	ng/L		<100	<100	<100	<100	<100	<100	<100	<100	<100
<b>Organochlorine Pesticides</b>											
2,4'-DDD	ng/L	10000000	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4'-DDE	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4'-DDT	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
4,4'-DDD	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
4,4'-DDE	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
4,4'-DDT	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Detectable DDTs	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Aldrin	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-alpha	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-beta	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-delta	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
BHC-gamma	ng/L	400000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlordane-alpha	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlordane-gamma	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Detectable Chlordane (a,g)	ng/L	30000	<1	<1	<1	<1	<1	<1	<1	<1	<1
DCPA (Dacthal)	ng/L		<5	<5	<5	<5	<5	<5	<5	<5	<5

Table 4. Summary of Oxford Retention Basin Sediment Chemistry using TCLP.

Parameter	Units	CRITERIA	EXCAVATION LAYER		NATIVE LAYER						
		TCLP	S-1-5-EL	S-6-10-EL	S-1-NL	S-2-NL	S-3-NL	S-4-NL	S-5-NL	S-6-NL	S-8-NL
Dicofol	ng/L		<50	<50	<50	<50	<50	<50	<50	<50	<50
Dieldrin	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan Sulfate	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan-I	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan-II	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Endrin	ng/L	20000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Endrin Aldehyde	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Endrin Ketone	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Heptachlor	ng/L	8000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Heptachlor Epoxide	ng/L	8000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methoxychlor	ng/L	10000000	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mirex	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-Nonachlor	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-Nonachlor	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Oxychlorane	ng/L		<1	<1	<1	<1	<1	<1	<1	<1	<1
Perthane	ng/L		<5	<5	<5	<5	<5	<5	<5	<5	<5
Toxaphene	ng/L	500000	<10	<10	<10	<10	<10	<10	<10	<10	<10

< Less than the method detection limit  
J Estimated value less than the reporting limit but greater than the method detection limit

### 3.3 Microbiological Characteristics of Sediment

Results of the sediment bacterial analyses are provided in Table 5. Currently, no sediment quality criteria have been established for indicator bacteria, therefore, these results should be interpreted based on an understanding of the behavior and natural occurrence of these parameters in the environment. Preliminary review of these data suggest the total coliform concentrations were likely indicative of nutrient rich sediment and may be influenced by recent activities in the Oxford Retention Basin to control algae. The fecal coliform, *E. coli*, and enterococci concentrations are considered indicative of natural sediment background levels. None of the indicator bacteria concentrations suggested anthropogenic sources that required abatement.

Table 5. Indicator Bacterial Concentrations in Oxford Retention Basin Sediment.

Parameter	Units	EXCAVATION LAYER									
		S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
Total Coliforms	MPN/Dry Gram	218	451	435	278	591	2,174	21,782	14,953	1,110	5,693
Fecal Coliforms	MPN/Dry Gram	10	34	33	18	81	625	554	935	236	436
<i>E. coli</i>	MPN/Dry Gram	11*	58*	66*	530*	640*	106	146	5851*	140	407
Enterococci	MPN/Dry Gram	3	58	59	10	81	<5	8	32	32	133

\* Although *E. coli* is a subgroup of fecal coliforms, some values may be higher due to differences in methodology, the sample's matrix (sediment), and statistical range.

## **4.0 REFERENCES**

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**Appendix A**  
**Sediment Core Photos**

**Appendix B**  
**Sediment Coring Logs and Field Notes**