

Appendix 4.12-7
Soil and Grdwtr, April 2003

**PRELIMINARY INVESTIGATION OF
SOIL AND GROUNDWATER CONTAMINANTS
F&G Street Marsh
Sweetwater National Wildlife Refuge
Chula Vista, California**

**P&D Project Number: 048175494, CHO5
San Diego County DEH Permit Number: W100748**

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April 14, 2003



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EXECUTIVE SUMMARY

This report summarizes the results of P&D Environmental's preliminary investigation of contaminants in soil and water samples from parts of the F&G Street Marsh unit (Marsh) of the Sweetwater Marsh National Wildlife Refuge in Chula Vista, California. The work was planned and implemented with the cooperation of the United States Fish & Wildlife Service and was funded by Pacifica Companies of San Diego, California, in connection with Pacifica's discussions with the Service regarding proposed future wetland restoration work at the Marsh.

The primary purpose of this contaminant screening investigation was to determine whether or not an area of undocumented fill in the northern part of the Marsh contains contaminants at concentration levels that would require special treatment and disposal if the material were excavated and removed from the Marsh. The study consisted of the collection and detailed laboratory analysis of soil and groundwater samples from six stations - five within the Marsh and one in an adjoining area. Of the five Marsh stations, four were located in an area of undocumented fill. One soil and one groundwater sample from each station were analyzed by California State-certified laboratories using appropriate analytical methods.

The analyses reported here show that some of the soil samples from the undocumented fill area contain lead, mercury, cadmium and dioxins at concentration levels that exceed the limits specified in guidelines established by the United States Environmental Protection Agency Region IX. The guidelines are known as Preliminary Remediation Goals (PRGs). Specifically, all four soil samples from the undocumented fill area contained lead - in two samples, the lead concentrations of 210 and 1,500 milligrams per kilogram (mg/kg) exceed the PRG for lead of 150 mg/kg. Further, in the undocumented fill area soil samples, mercury and cadmium were present in one or more samples at levels exceeding their respective PRGs of 0.0 mg/kg and 1.7 mg/kg. In two of the samples, mercury concentrations were 0.82 and 4.0 mg/kg. In a third sample, the cadmium concentration was 2.2 mg/kg and the mercury concentration was 2.3 mg/kg. Lastly, the combined toxicity values (referred to as the Toxicity Equivalence [TEQ]) of the dioxin compounds in three of the four samples from the undocumented fill area ranged from 5.39 to 8.38 nanograms per kilogram (ng/kg) which are above the PRG for residential use soil of 3.9 ng/kg but below the PRG for industrial use soil of 16 ng/kg.

In addition, total recoverable petroleum hydrocarbons (TRPH) were also detected in three of the four soil samples collected in the undocumented fill area. The TRPH concentrations in these three borings ranged from 460 to 960 mg/kg. There are no published regulatory limits for TRPH in soil but the concentrations found in the Marsh are considered to be low and by themselves would probably require no further action.

However, the presence of elevated metal and dioxin concentrations indicates that removal of the undocumented fill would require a hazardous waste remediation effort. If removal of the fill were to be undertaken, the San Diego County Department of Environmental Health, acting as the lead agency, would be expected to open a case file for the Marsh and monitor the removal of the fill as hazardous waste. A major site remediation effort would be required, as would transport of

the waste to a hazardous waste disposal site. In the undocumented fill area alone this could result in the disposal of more than 25,000 cubic yards of soil as hazardous waste.

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- A - Environmental Health Permit**
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1.0 INTRODUCTION

1.1 Project Authorization

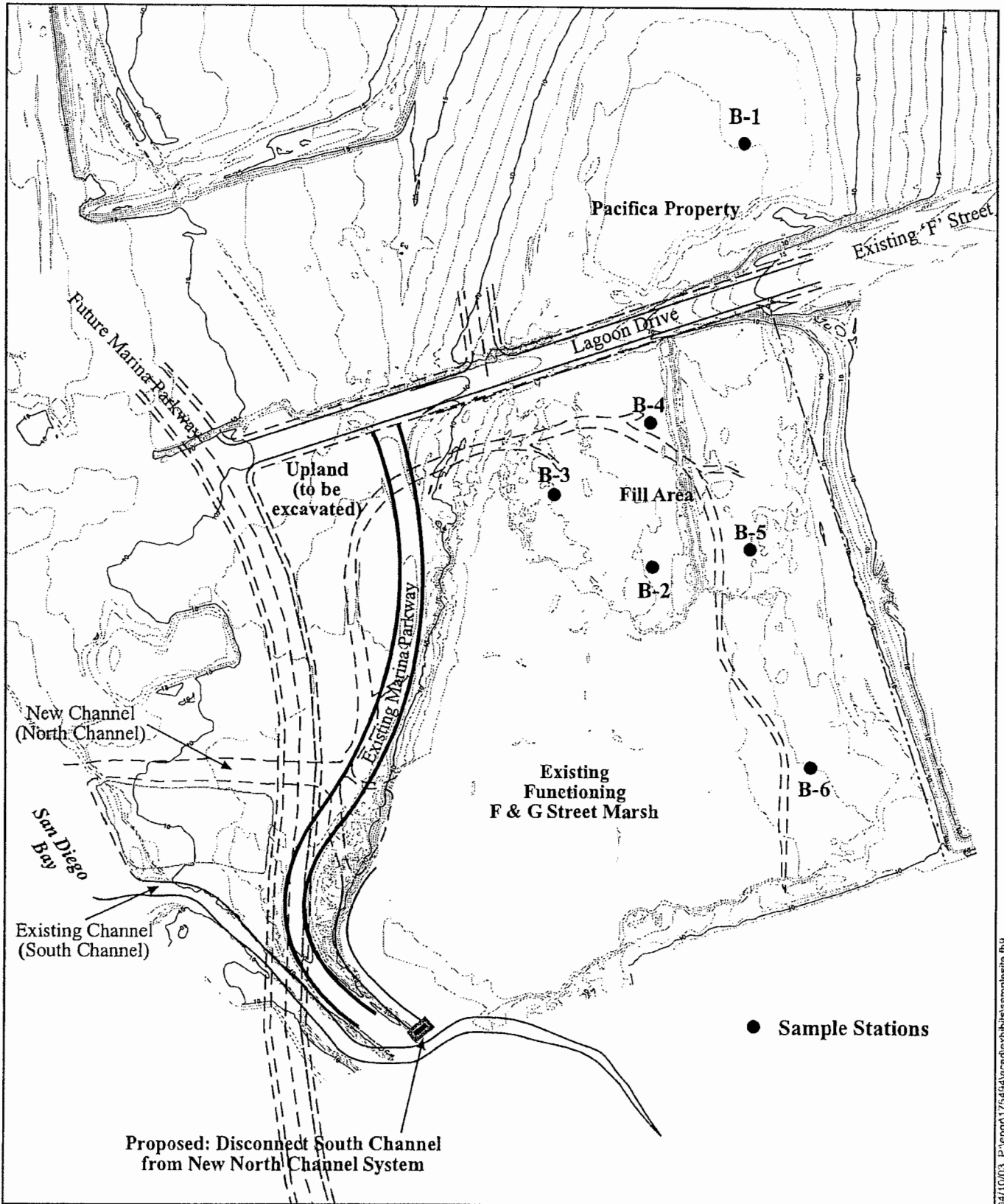
At the request of Pacifica Companies and with the cooperation of the U.S. Fish & Wildlife Service (Service), P&D Environmental, a division of P&D Consultants, Inc. (P&D), carried out a preliminary investigation of possible soil and groundwater contaminants in portions of the F&G Street Marsh unit (Marsh) of the Sweetwater Marsh National Wildlife Refuge. The F&G Street Marsh is located south of Lagoon Drive and east of Marina Parkway in the midbayfront area of Chula Vista, California (see Figure 1). The investigation was performed under contract with Pacifica Companies of San Diego, California. P&D's proposal, dated July 24, 2002, was accepted on August 12, 2002 by Mr. Deepak Israni, Senior Vice President of Pacifica Companies.

1.2 Purpose of the Investigation


The 17.5-acre F&G Street Marsh (see Figure 2) includes approximately 3.9 acres of undocumented fill in the northern portion of the site. The areas of degraded habitat in the F&G Street Marsh are being considered for restoration by the Service as part of the long-term Comprehensive Conservation Plan currently being prepared for the Sweetwater Marsh National Wildlife Refuge and other components of the Service's San Diego Refuge Complex.

The P&D investigation reported here was funded by Pacifica Companies in connection with planning for proposed development on private property situated north of the F&G Street Marsh. Related to the proposed development, Pacifica has proposed providing major technical and financial support to the Service for planning and implementing restoration actions in the F&G Street Marsh.

The purpose of this preliminary investigation was to determine whether or not specific areas of the F&G Street Marsh contain contaminants related to man's historical use of the site. The study focused primarily on the area of undocumented fill located in the northern portion of the F&G Street Marsh adjoining Lagoon Drive. If this fill contains contaminants at significant concentrations, then removal of the fill as part of a restoration program may not be feasible because of technical and financial considerations. Methods employed in this assessment included six borings with a hand auger and then analyzing selected soil and groundwater samples for various contaminants.



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 1 inch = 250 feet

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Sample Sites
Figure 2

2.0 SITE DESCRIPTION

2.1 Site Description and History

The 17.5-acre Marsh is bounded on the west by Marina Parkway, on the north by Lagoon Drive (formerly F Street), on the east by the headquarters building for Goodrich (successor to Rohr Industries), on the south by additional Goodrich property and structures as well as an undeveloped parcel owned by the San Diego Unified Port District (APN 567-010-27). Across Lagoon Drive to the north of the Marsh is a large, undeveloped parcel that was used primarily for agricultural purposes until the late 1980s (APN 567-011-05). The parcel is owned by Chula Vista Capital and has been optioned by Pacifica Companies for development.

As seen in Figures 1 and 2, the Marsh is largely cut off from San Diego Bay by natural upland topography along its west margin and by an area of hydraulic fill to the south that blocked the original southerly connection to the Bay. Tidal waters from the Bay reach the marsh via a narrow man-made channel that passes through twin culverts under Marina Parkway. Approximately two-thirds of the Marsh is functioning salt marsh and marsh/upland transition habitat. Because of the constrictive effect of the culverts, the marsh has a noticeably restricted tidal range.

As delineated in Figure 2, an area of undocumented fill occupies the northern portion of the Marsh. Prior to fencing by the Service (shortly after taking ownership in 1988), the undocumented fill area was readily accessible to public dumping via Lagoon Drive. Anecdotal information suggests the fill may contain a wide range of discarded materials, including construction debris, municipal street sweepings and ash from municipal trash burning. In addition, the upland areas adjoining the F&G Street Marsh have a long history of agricultural and industrial use which may have contributed waste to the fill.

2.2 Geology and Hydrology

Geology

The Marsh is in the coastal plain section of the Peninsular Range Province. Within San Diego, this section is characterized by a series of dissected wave-cut terraces that extend inland from the coast for about ten miles. Various rivers, such as the Sweetwater River, have formed a series of wide, flat-bottomed alluvium-filled valleys that have dissected the coastal plain section. (California Department of Water Resources, Bulletin 106-2, 1967)

Locally, the Marsh consists of a thin cover of clayey sediment and organic material underlain by the Pleistocene Bay Point formation that comprises the uplands adjoining the Marsh to the west, north and east. The Marsh occupies the southerly portion of a gentle swale eroded in the surface of the Bay Point formation. The marsh deposits are associated with the major world-wide rise in sea level resulting from melting of the last continental ice sheets. The Bay Point Formation is widespread and well exposed in areas adjacent to the coastline. It is composed mostly of marine

and nonmarine, poorly consolidated, fine- and medium-grained, pale brown, fossiliferous sandstone (California Division of Mines & Geology Bulletin #200).

Hydrology

Most of the Marsh area is inundated with saltwater for short periods during seasonal extreme high tides. As expected, the water table in the undocumented fill area is very shallow and found within five feet of ground surface (see boring logs in Appendix C). A narrow, shallow man-made channel extends northerly across the fill to a culvert under Lagoon Drive. Because the elevation of the inflow to the culvert is higher than the maximum tide level, tidal waters in this channel do not move through the culvert into the shallow natural basin north of Lagoon Drive. In periods of extreme winter rainfall, storm water runoff that collects in this basin may reach sufficient elevations to discharge through the culvert into the Marsh.

The Marsh is within the La Nacion Hydrologic Subarea of the Lower Sweetwater Hydrologic Area of the Sweetwater Hydrologic Unit (RWQCB Basin Number 909.12). The California Regional Water Quality Control Board - San Diego Region (RWQCB) lists groundwater within this basin number as having several beneficial uses including municipal, agricultural and industrial (*Water Quality Control Plan for the San Diego Basin (9)*, RWQCB, 1994 and 1995). However, from a practical standpoint, groundwater in the Marsh is too saline to be considered potable.

3.0 SAMPLING AND ANALYTICAL PROGRAM

3.1 Program Design

At a meeting with the Service in July, 2001, in discussions about the possibility of Pacifica Companies undertaking restoration work at the Marsh on behalf of the Service, it became evident that the technical and financial feasibility of alternative restoration concepts then under consideration would depend in part on whether the area of fill in the northern part of the Marsh contained contaminants. The Service indicated that funding was not then available for a testing program to determine if contaminants were present. Pacifica offered to assist the Service by authorizing and funding P&D to prepare a suggested sampling and analytical program for review and possible use by the Service.

In October 2001, on behalf of Pacifica Companies, P&D submitted to the Service a review draft of the proposed contaminant testing program for the Marsh. In a series of phone conference discussions with Service personnel over the next several months, the scope and focus of the field and laboratory work were refined. The final sampling plan and laboratory program agreed upon by the Service and P&D is dated June 6, 2002.

Following acceptance of the program and funding by Pacifica Companies, P&D proceeded with the work. P&D prepared and submitted an application for a boring construction permit from the San Diego County Department of Environmental Health (DEH). The Service also issued a Special Use Permit to Pacifica Companies limiting the months in which P&D could conduct sampling in order to avoid possible disturbance of endangered birds that might be using the Marsh for the summer nesting season. The field work was deferred in accordance with the Service permit, and the sampling work was conducted on September 23rd, 2002. Copies of both the DEH and Service permits are included in Appendix A.

3.2 Sampling Program

Two samples each were collected from six stations. The sampling program had originally envisioned collecting samples from four additional stations but written permission could not be obtained for legal access to two parcels (APNs 567-010-18 and 567-010-28) west of Marina Parkway. As shown in Figure 2, five of the six stations were in the F&G Street Marsh parcel and one was in the shallow basin area north of Lagoon Drive. Within the Marsh, four of the five stations were located in the undocumented fill area. The locations of the sampling stations were arrived at during the discussions with Service personnel.

At each sample station, borings were drilled with a three-inch diameter hand auger. For each boring, two side-by-side soil samples (one for each laboratory used) were collected and groundwater sampled at the depth at which the water table was encountered. A detailed summary of the P&D drilling and sampling procedures used in the work is presented in Appendix B.

3.3 Laboratory Analytical Program

The analytical program involved the services of two California State-certified analytical testing laboratories: SunStar Laboratories in Santa Ana, California, and Columbia Analytical Services in Houston, Texas. Transfer of the samples to these facilities employed standard sample-preservation and chain-of-custody protocols. Details of the analytical procedures used at both facilities are presented in the individual laboratory reports included in Appendix D, along with copies of the chain-of-custody records.

4.0 REGULATORY OVERVIEW

4.1 Introduction

In general terms, disposal of excavated soil material considered likely to contain contaminants is subject to the provisions of pertinent Federal, State and local regulations and guidelines, including but not limited to Title 40 Code of Federal Regulations (CFR) Parts 260 through 268, Title 22 California Code of Regulations (CCR) Division 4.5, the California Health & Safety Code, the Porter Cologne Water Quality Control Act and the San Diego County Department of Environmental Health (DEH) Site Assessment and Mitigation (SAM) Manual. Within San Diego County, the DEH serves as the “lead agency” with the authority to require cleanup of a property found to be contaminated with hazardous waste. DEH is responsible for establishing cleanup goals for a property which meet Federal, State and local guidelines and monitoring remediation efforts to achieve these goals.

4.2 Permit Requirements

In accordance with the SAM Manual, the DEH requires a special permit (*Monitoring Well and Boring Construction and Destruction Permit*) and reporting procedures for any type of boring that contacts the groundwater table. In order to obtain this permit, the applicant must provide information regarding the subject property, the proposed drilling procedures and the proposed analytical procedures. The permit application also includes an authorization form signed by the owner of the subject property to be sampled. In addition, when the work is completed, DEH requires a copy of the final report.

4.3 Regulatory Standards

For various types of hazardous waste, regulatory standards and technical guidelines have been developed by Federal and State agencies that include concentration limits to assist in defining the point at which a material becomes a hazardous waste. For most of the contaminants in soil that were studied in this investigation, the primary guideline for determining whether a contaminant is present in concentrations considered to be hazardous is the U.S. EPA Region IX Preliminary Remediation Goals (PRGs).

PRGs have been established for heavy metals, polychlorinated biphenyl compounds (PCBs), volatile organic compounds, semivolatile organic compounds, hexavalent chromium [CR (VI)] and one dioxin compound (2,3,7,8-TCDD). These concentration limits vary according to the particular contaminant and are generally expressed in milligrams per kilogram (mg/kg). For example, the concentration limit for mercury (Hg) is 0.0 mg/kg; by contrast the limit for zinc (Zn) is 1,500 mg/kg.

A concentration limit for petroleum hydrocarbons in soil has not been established. For petroleum hydrocarbons in low concentrations, the DEH usually follows the RWQCB *Supplemental*

Instructions to State Water Board December 8, 1995, Interim Guidance on Required Cleanup at Low-Risk Fuel Contaminated Sites (April 1, 1996). This guideline addresses the various factors for deciding when petroleum hydrocarbons should be remediated from soil that include, but are not limited to, such issues as whether potable groundwater is being impacted, the type of hydrocarbon detected and the mobility of the hydrocarbon in the particular soil type. It has been P&D's experience that California agencies do not generally require remediation of soils with petroleum hydrocarbon concentrations less than 1,000 mg/kg. However, if the soil is to be disposed in a landfill, additional testing to characterize the petroleum hydrocarbons may be necessary.

While the Federal and State governments have established specified standards for contaminants in drinking water, few applicable concentration limits have been developed for contaminants in non-potable, saline groundwater. The most relevant standard appears to be 40 CFR Part 131, U.S. EPA Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Rule (more commonly referred to as the California Toxics Rule). However, this rule lists concentration limits in saltwater for only a few of the contaminants studied in this investigation.

4.4 Detection Limits

Every analytical method has a limit at which the concentration of the contaminant being tested is no longer statistically reliable. This limit, known as a "detection limit", is based on the minimum weight of a contaminant which can be detected at a known confidence limit by the analytical equipment (*Principles of Instrumental Analysis, 3rd Edition*, Douglas Skoog, 1985). However, regulatory standards are not based on current analytical detection limits but rather the "...environmental impact of a pollutant...based on scientific determination" (May 18, 2000, Federal Register, Page 31701). As a result, a concentration limit may be lower than can be detected by current analytical methods.

Alternately, some analytical methods which may have lower detection limits are very expensive and not normally used in a typical screening process conducted during a preliminary investigation. This is the case with the analytical method used for the metals analyses of the samples in this investigation (U.S. EPA method 6010). As shown in Section 5.0, the analytical detection limits for arsenic, cadmium and mercury in soil and arsenic, cadmium, copper, silver and zinc in groundwater all exceed the regulatory limit.

4.5 Dioxin Reporting Limits

Different dioxin compounds have different toxicities, and dioxins are most often found in mixtures rather than as single compounds in the environment. The most toxic forms of dioxin are 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD. A method for comparing the toxicity of different types of mixtures of dioxins to the toxicity of 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD is called "Toxicity Equivalence" or TEQ. (*What Are Dioxins?*, Bay Area Dioxins Project, Updated June 11, 2002 [<http://dioxin.abag.ca.gov>]) Both the individual dioxin concentrations and the TEQ for each sample are reported in Section 5.0.

5.0 RESULTS OF LABORATORY ANALYSES

5.1 Analytical Methods

Samples of soil and groundwater from all six borings were analyzed for the various constituents of interest using the following methods:

- Title 22 Metals by U.S. EPA method 6010
- Hexavalent chromium [CR (VI)] by U.S. EPA method 7199
- Total Recoverable Petroleum Hydrocarbons (TRPH) by U.S. EPA method 418.1
- Volatile Organic Compounds (VOCs) by U.S. EPA method 8260
- Semi-volatile Organic Compounds (SVOCs) including Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. EPA method 8270
- Polychlorinated Biphenyl Compounds (PCBs) by U.S. EPA methods 8270 and 8080
- Polychlorinated Dibenzo-p-dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by U.S. EPA method 8290.

5.2 Summary of Results

The results of the laboratory analytical work are presented in Tables 1 through 4. A narrative of the results follows the tables. The laboratory reports on the analytical testing are presented in Appendix D.

Explanation of the Tables

Tables 1 and 2 present the data from the analytical work on soil samples from the six sample locations. Tables 3 and 4 present the data from the analyses of water samples. Table 1 presents the soil sample results for all analyses (expressed in milligrams per kilogram [mg/kg]) except PCDDs and PCDFs, which will be referred to from here on as dioxins. Table 2 presents the soil sample results for the dioxins (expressed in nanograms per kilogram [ng/kg]). Table 3 presents groundwater sample results except the dioxins (expressed in micrograms per liter [$\mu\text{g/L}$]). Table 4 presents groundwater sample results for the dioxins (expressed in nanograms per liter [ng/L]).

TABLE 1
ANALYTICAL RESULTS FROM SOIL SAMPLING
FOR ALL COMPOUNDS EXCEPT DIOXINS
(all results in mg/kg¹)

Title 22 Metals ²	PRG ³	B1-S	B2-S	B3-S	B4-S	B5-S	B6-S
Antimony (Sb)	31	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Arsenic (As)	0.39	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium (Ba)	5,400	50	42	38	46	45	17
Beryllium (Be)	150	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (Cd)	1.7	2.0	<2.0	<2.0	<2.0	2.2	<2.0
Chromium (Cr)	210	27	26	14	21	39	9.5
Cobalt (Co)	900	6.6	5.2	3.6	3.5	4.2	4.2
Copper (Cu)	3,100	38	36	81	180	46	250
Lead (Pb)	150	3.1	5.0	210	87	1,500	17
Mercury (Hg)	0.0	<0.10	4.0	0.82	<0.10	2.3	3.6
Molybdenum (Mo)	390	2.6	1.3	2.2	2.4	2.5	3.2
Nickel (Ni)	1,600	8.0	5.0	6.6	9.0	14	8.5
Selenium (Se)	390	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Silver (Ag)	390	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Thallium (Tl)	5.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Vanadium (V)	550	20	21	15	6.2	12	12
Zinc (Zn)	23,000	38	34	68	110	150	120

Analyte	PRG	B1-S	B2-S	B3-S	B4-S	B5-S	B6-S
Cr (VI)	30	<0.20	<0.20	<1.0	<0.20	<0.20	<1.0
PCBs	0.22	All <0.200	All <0.200	All <0.200	All <0.200	All <0.200	All <0.200
SVOCs	Various	BDL ⁴	BDL ⁴	BDL ⁴	BDL ⁴	BDL ⁴	BDL ⁴
VOCs	Various	All <0.005	All <0.005	All <0.005	All <0.005	All <0.005	All <0.005
TRPH	-- ⁵	<10	<16	960	460	750	<10

¹ mg/kg is the same as parts per million (ppm)

² Title 22 Metals refers to the seventeen heavy metals listed in Title 22 Division 4.5 of the State of California Code of Regulations. Title 22 includes management of hazardous waste. Another regulatory abbreviation used in for these metals is CAM-17.

³ U.S. EPA Region 9 Preliminary Remediation Goals for Residential Soil

⁴ Below Detection Limits (See laboratory report in Appendix D for detection limits for individual compounds.)

⁵ No limit established under current regulatory guidelines.

TABLE 2
ANALYTICAL RESULTS FROM SOIL SAMPLING FOR DIOXIN COMPOUNDS
(all results in ng/kg¹)

Analyte	PRG ²	B1-S	B2-S	B3-S	B4-S	B5-S	B6-S
Toxicity Equivalence (TEQ)	-	3.11	0.26	5.89	8.38	5.39	0.423
2,3,7,8-TCDD	3.9	ND ³	ND	ND	0.419	ND	ND
1,2,3,7,8-PeCDD	-	ND	ND	0.918	1.235	0.620	ND
1,2,3,4,7,8-HxCDD	-	0.379	ND	1.139	1.283	0.867	ND
1,2,3,6,7,8-HxCDD	-	1.987	0.282	3.842	4.844	3.766	0.372
1,2,3,7,8,9-HxCDD	-	1.779	0.364	3.104	4.121	2.696	ND
1,2,3,4,6,7,8-HpCDD	-	50.039	5.630	124.849	124.615	136.142	10.238
OCDD	-	335.432	57.651	1365.405	1129.815	999.416	45.523
2,3,7,8-TCDF	-	3.801	ND	2.349	5.656	1.655	0.915
1,2,3,7,8-PeCDF	-	0.718	ND	0.504	1.252	0.425	ND
2,3,4,7,8-PeCDF	-	1.489	ND	1.490	3.296	1.419	ND
1,2,3,4,7,8-HxCDF	-	1.791	0.306	1.798	3.323	1.692	0.571
1,2,3,6,7,8-HxCDF	-	1.062	0.139	1.840	3.195	1.663	ND
1,2,3,7,8,9-HxCDF	-	ND	ND	0.303	0.515	ND	ND
2,3,4,6,7,8-HxCDF	-	1.914	0.191	3.423	6.685	3.584	0.546
1,2,3,4,6,7,8-HpCDF	-	15.606	1.425	20.788	24.850	32.068	3.212
1,2,3,4,7,8,9-HpCDF	-	1.775	ND	0.886	0.724	ND	ND
OCDF	-	53.199	5.057	52.949	39.820	79.614	4.379
Total Tetra-Dioxins	-	0.787	ND	0.919	16.088	0.643	ND
Total Penta-Dioxins	-	0.420	ND	2.601	20.386	2.136	ND
Total Hexa-Dioxins	-	14.911	1.332	37.279	55.654	45.401	4.832
Total Hepta-Dioxins	-	107.719	14.434	415.161	352.152	843.565	27.378
Total Tetra-Furans	-	21.693	ND	56.324	102.820	30.403	ND
Total Penta-Furans	-	33.845	4.377	112.765	231.427	106.237	6.767
Total Hexa-Furans	-	29.547	3.084	66.202	120.641	71.119	5.902
Total Hepta-Furans	-	55.393	4.794	70.043	67.140	109.182	5.280

¹ ng/kg is the same as parts per trillion (ppt)

² U.S. EPA Region 9 Preliminary Remediation Goals for Residential Soil. Blank cells indicate that no value has been established. For Industrial Soil a PRG of 16 ng/kg has been established.

³ None Detected

TABLE 3
ANALYTICAL RESULTS FROM GROUNDWATER SAMPLING
FOR ALL COMPOUNDS EXCEPT DIOXINS
(all results in µg/L¹)

Title 22 Metals ²	Regulatory Limit ³	B1-S	B2-S	B3-S	B4-S	B5-S	B6-S
Antimony (Sb)	-- ⁴	<100	<100	<100	<100	<100	<100
Arsenic (As)	69	<250	<250	<250	<250	<250	<250
Barium (Ba)	-- ⁴	<50	130	220	81	62	<50
Beryllium (Be)	-- ⁴	<50	<50	<50	<50	<50	<50
Cadmium (Cd)	42	<50	<50	<50	<50	<50	<50
Chromium (Cr)	-- ⁴	<50	<50	<50	<50	<50	<50
Cobalt (Co)	-- ⁴	<50	56	<50	<50	<50	<50
Copper (Cu)	4.8	<50	50	210	120	160	53
Lead (Pb)	210	<50	<50	<50	<50	<50	<50
Mercury (Hg)	-- ⁴	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Molybdenum (Mo)	-- ⁴	62	150	81	74	210	80
Nickel (Ni)	74	<50	60	<50	55	55	55
Selenium (Se)	290	<250	<250	<250	<250	<250	<250
Silver (Ag)	1.9	<100	<100	<100	<100	<100	<100
Thallium (Tl)	-- ⁴	<100	<100	<100	<100	<100	<100
Vanadium (V)	-- ⁴	<100	<100	<100	<100	<100	<100
Zinc (Zn)	90	<50	<50	150	59	97	86

Analyte	Regulatory Limit ³	B1-S	B2-S	B3-S	B4-S	B5-S	B6-S
Cr (VI)	1,100	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
PCBs	-- ⁴	All BDL ⁵	All BDL	All BDL	All BDL	All BDL	All BDL
SVOCs	See Footnote 6	All BDL	All BDL	All BDL	All BDL	All BDL	All BDL
VOCs	-- ⁴	All BDL	All BDL	All BDL	All BDL	All BDL	All BDL
TRPH	-- ⁴	<6	<6	<6	<6	<6	<6

¹ µg/L is the same as parts per billion (ppb)

² Title 22 Metals refers to the seventeen heavy metals listed in Title 22 Division 4.5 of the State of California Code of Regulations. Title 22 includes management of hazardous waste. Another regulatory abbreviation used in for these metals is CAM-17.

³ Saltwater Criterion for Maximum Exposure, U.S. EPA California Toxics Rule (40 CFR Part 131)

⁴ No limit established under U.S. EPA California Toxics Rule.

⁵ Below Detection Limits (See laboratory report in Appendix D for detection limits for individual compounds.)

⁶ Limit for Pentachlorophenol is 13 µg/L; No other limits established for SVOCs analyzed during this assessment.

TABLE 4
ANALYTICAL RESULTS FROM GROUNDWATER SAMPLING
FOR DIOXIN COMPOUNDS
(all results in ng/L ¹)

Analyte	Regulatory Limit ²	B1-W	B2-W	B3-W	B4-W	B5-W	B6-W
Toxicity Equivalence (TEQ)		0.73	0.204	0.926	2.80	2.08	0.114
2,3,7,8-TCDD	-- ³	ND ⁴	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	-- ³	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	-- ³	ND	ND	0.236	ND	ND	ND
1,2,3,6,7,8-HxCDD	-- ³	0.674	0.278	1.367	4.197	1.643	ND
1,2,3,7,8,9-HxCDD	-- ³	0.516	0.184	0.787	5.525	1.033	ND
1,2,3,4,6,7,8-HpCDD	-- ³	11.069	6.155	26.097	101.413	72.902	4.618
OCDD	-- ³	63.813	38.588	200.354	743.047	471.353	26.086
2,3,7,8-TCDF	-- ³	0.995	ND	0.265	ND	0.550	ND
1,2,3,7,8-PeCDF	-- ³	0.205	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	-- ³	0.386	ND	ND	ND	0.487	ND
1,2,3,4,7,8-HxCDF	-- ³	0.392	0.157	0.364	ND	0.340	0.224
1,2,3,6,7,8-HxCDF	-- ³	0.234	0.110	0.410	ND	0.613	ND
1,2,3,7,8,9-HxCDF	-- ³	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	-- ³	0.365	0.167	0.634	ND	1.117	ND
1,2,3,4,6,7,8-HpCDF	-- ³	2.451	1.029	4.953	6.937	8.331	1.515
1,2,3,4,7,8,9-HpCDF	-- ³	ND	ND	ND	ND	ND	ND
OCDF	-- ³	5.275	3.999	8.410	ND	23.890	2.955
Total Tetra-Dioxins	-- ³	0.313	ND	ND	ND	ND	ND
Total Penta-Dioxins	-- ³	ND	ND	ND	ND	ND	ND
Total Hexa-Dioxins	-- ³	4.166	1.929	8.994	32.275	13.666	2.103
Total Hepta-Dioxins	-- ³	26.059	14.127	74.699	260.673	186.581	12.125
Total Tetra-Furans	-- ³	4.872	ND	0.955	ND	17.058	ND
Total Penta-Furans	-- ³	8.635	2.890	10.621	6.578	46.205	ND
Total Hexa-Furans	-- ³	4.902	3.074	12.002	10.729	21.740	1.579
Total Hepta-Furans	-- ³	2.451	2.649	14.105	13.020	24.040	2.237

¹ ng/L is the same as parts per trillion (ppt)
² Saltwater Criterion for Maximum Exposure, U.S. EPA California Toxics Rule (40 CFR Part 131)
³ No limit established under U.S. EPA California Toxics Rule.
⁴ None Detected

5.3 Discussion of Results

Metals

Soil Samples

Low concentrations of various metals were identified in all the soil samples. This was expected because metals occur naturally in soils, and background levels vary from region to region. Only cadmium, lead, and mercury were present in concentrations above the U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for soil. Specific concentrations for these three metals are as follows:

- Cadmium (Cd) concentrations higher than the PRG concentration of 1.7 mg/kg were present in borings B1 and B5; specifically, 2.0 mg/kg in Boring B1, and 2.2 mg/kg in Boring B5. In the samples from the other four borings, cadmium concentrations were below the method detection limit of 2.0 mg/kg.
- Lead (Pb) was found in all six samples in concentrations that ranged from 3.1 to 1,500 mg/kg. The concentrations in only two samples, Boring B3 at 210 mg/kg and Boring B5 at 1,500 mg/kg, were above the PRG concentration of 150 mg/kg. Both of these samples are from the undocumented fill area.
- Mercury (Hg) was found in four of the six samples in concentrations as follows: Boring B2 at 4.0 mg/kg, Boring B3 at 0.82 mg/kg, Boring B5 at 2.3 mg/kg and Boring B6 at 3.6 mg/kg. In Samples B1 and B4, mercury was not found above the method detection limit of 0.10 mg/kg. The PRG for mercury is 0.0 mg/kg.

Groundwater Samples

Similar to the soil samples, low concentrations of various metals were detected in the groundwater from all the borings. Metals are also naturally present in groundwater but comparable regulatory limits for metals in non-potable, saline groundwater published in the U.S. EPA California Toxics Rule are limited to arsenic, cadmium, copper, lead, nickel, selenium, silver and zinc. In the case of lead, nickel and selenium, concentrations of these metals were not detected above the regulatory limits of 210 µg/L, 74 µg/L and 290 µg/L, respectively. For arsenic, cadmium, copper and silver, the analytical method detection limits are all greater than the regulatory limits for these metals. (Refer to Section 4.4 for a discussion of detection limits.) Zinc was the only metal detected in groundwater above both the analytical method detection limits and the regulatory limit of 90 µg/L. Zinc was found in the range of 97 to 150 µg/L in three of the four borings in the undocumented fill area. In Boring B6, a zinc concentration of 86 µg/L was found which is just below the regulatory limit.

Other metals which were detected above their respective analytical method detection limits, but for which an applicable regulatory standard was not found, are as follows:

- Barium (Ba) was detected in all four samples from the undocumented fill area with concentrations ranging from 62 to 200 µg/L.
- Cobalt (Co) was detected in Boring B2 at 56 µg/L.
- Molybdenum (Mo) was detected in all six samples and ranged from 62 µg/L to 210 µg/L.

Hexavalent Chromium

A separate analysis was conducted for hexavalent chromium [Cr (VI)] in all the soil and groundwater samples. Cr (VI) was not detected in the six soil samples above the method detection limit or the PRG of 30 mg/kg. Cr (VI) was not detected in the six groundwater samples above the method detection limit or the U.S. EPA California Toxics Rule limit of 1,100 µg/L.

Organic Compounds (Except Dioxins)

Both soil and groundwater samples were analyzed for the following organic compounds:

- Polychlorinated biphenyl compounds (PCBs)
- Semivolatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs)
- Volatile organic compounds (VOCs)
- Total recoverable petroleum hydrocarbons (TRPH)

PCBs, SVOCs and PAHs and VOCs were not detected above the analytical method detection limits in either the soil or groundwater samples for all six borings.

TRPH was detected above method detection limits in the soil samples from Borings B3, B4 and B5 located in the undocumented fill area. The TRPH concentrations in these three borings ranged from 460 to 960 mg/kg. TRPH was not detected above method detection limits in the six groundwater samples.

Dioxins

As shown in Tables 2 and 4, the laboratory analyses addressed six polychlorinated dibenzo-p-dioxins (PCDDs) and nine polychlorinated dibenzofurans (PCDFs), as well as four categories each of total dioxins and total furans. The only PRG established for dioxin compounds is for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and is 3.9 ng/kg in soil used for residential purposes and 16 ng/kg in soil used for industrial purposes. By itself, 2,3,7,8-TCDD was not detected above the residential soil PRG in the six soil samples. However, as discussed in Section 4.5, use of the toxicity equivalence (TEQ) method resulted in soil samples from three of the four borings in the undocumented fill being above the residential soil PRG. These three TEQs ranged from 5.39 to 8.38 ng/kg.

Various concentrations of dioxins were found in the groundwater samples. However, 2,3,7,8-TCDD was not detected in any of the six groundwater samples. There is no established water quality limit which can be used for comparison of the dioxin TEQs.

6.0 CONCLUSIONS

The primary purpose of the contaminant screening investigation summarized in this report was to determine whether or not the area of undocumented fill in the northern portion of the Marsh contains contaminants that would require special treatment in the course of the proposed removal and disposal of the fill. The results of the sampling and analytical work indicate removal of this fill would require a hazardous waste remediation effort.

Specifically, the soil samples from the undocumented fill area contain lead, mercury, cadmium, and dioxins at concentrations that exceed the EPA Preliminary Remediation Goals (PRG) limits set for these analytes. Total recoverable petroleum hydrocarbons were also detected in the undocumented fill area.

Soil samples from the undocumented fill area contain lead, mercury, cadmium, dioxins and total recoverable petroleum hydrocarbons as follows:

- Lead - All four soil samples (B2 through B5) from the undocumented fill area in the northern part of the Marsh contained lead. The concentrations ranged from 3.1 to 1,500 mg/kg. In Borings B3 and B5, the lead concentrations of 210 and 1,500 mg/kg, respectively, exceed the PRG limit of 150 mg/kg. The lead concentrations in the other two samples are below the PRG limit. The source of lead in the fill material may have been due to street sweeping waste that would have included residue from leaded gasoline.
- Mercury and Cadmium - Within the undocumented fill, one or more of the soil samples contained cadmium and mercury at levels exceeding the specified PRGs of 1.7 mg/kg for cadmium and 0.0 mg/kg for mercury. In samples B2 and B3, mercury concentrations were 4.0 and 0.82 mg/kg, respectively. In sample B5, the cadmium concentration was 2.2 mg/kg, and the mercury concentration was 2.3 mg/kg. A specific source for these metals in the fill is not known.
- The combined toxicity values (referred to as the Toxicity Equivalence [TEQ]) of the dioxins in three of the four samples from the undocumented fill area ranged from 5.39 to 8.38 nanograms per kilogram (ng/kg), which are above the PRG for residential use soil of 3.9 ng/kg but below the PRG for industrial use soil of 16 ng/kg. The source of dioxins in the fill material could have been from municipal waste incineration ash, use of certain herbicides on the adjacent sites and possibly natural background levels.
- Total recoverable petroleum hydrocarbons (TRPH) were detected in three of the four soil samples collected in the undocumented fill area. The TRPH concentrations in Borings B3, B4 and B5 ranged from 460 to 960 mg/kg. There are no published regulatory limits for TRPH in soil, but the concentrations found in the Marsh are considered to be low and by themselves would probably require no further action. The TRPH in soil is probably

due to asphalt debris which was observed in the fill material in the vicinity of these borings. In asphalt form, TRPH will not readily leach into groundwater, which offers an explanation as to why it was not found in the groundwater also.

In addition, zinc levels in two groundwater samples from the undocumented fill area exceeded the regulatory limit of 90 µg/L. Borings B3 and B5 had zinc concentrations of 150 and 97 µg/L, respectively. Overall, there was no correlation between metal concentrations found in the soil and those found in the groundwater. It appears that the metals in the soils are not being transported at appreciable rates into the groundwater. It is also possible that some of the metals in the groundwater are naturally occurring or from an off-site source.

Although the metal and dioxin concentrations measured in these samples appear to be only moderately higher than PRG limits, and well below concentrations typically encountered in many industrial locations, it is anticipated that if removal of the undocumented fill were to proceed, the San Diego County Department of Environmental Health (DEH), acting as the lead agency, would open a case file for the Marsh. Once a case was opened, the DEH would monitor removal of the fill as hazardous waste which would include remediation procedures and special disposal. In the undocumented fill area alone, this could result in the disposal of more than 25,000 cubic yards of soil as hazardous waste.

7.0 QUALIFICATIONS

P&D's professional services were performed, findings obtained and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This warranty is in lieu of all other warranties either expressed or implied. P&D is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and/or laboratory data presented in this report.

It should be noted that all surficial environmental assessments are inherently limited in the sense that conclusions are drawn and recommendations developed from information obtained from limited research and site evaluation. Subsequent field investigations may differ from the conditions defined by this investigation. Additionally, the passage of time may result in a change in the environmental characteristics at this site.

It must be noted that no investigation can absolutely rule out the existence of any hazardous materials at a given site. This assessment was based upon prior site history and observable conditions and activities. Existing hazardous materials and contaminants can escape detection using these methods.

The work performed in conjunction with this assessment and the data developed are intended as a description of available information at the dates and location given. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.